Chevron Appalachia, LLC

G70-D General Permit Application
Crow Natural Gas Production Site

Moundsville, West Virginia

Prepared By:

ENVIRONMENTAL RESOURCES MANAGEMENT, Inc.
Hurricane, West Virginia

September 2017

Chevron Appalachia, LLC
700 Cherrington Parkway
Coraopolis, PA 15108

September 29, 2017

Mr. William F. Durham, Director
WV Department of Environmental Protection
Division of Air Quality
601 57th Street, SE
Charleston, West Virginia 25304

HAND DELIVERED

Re: G70-D General Permit Registration Application
Chevron Appalachia, LLC
Crow Natural Gas Production Facility

Dear Director Durham:

Enclosed are one (1) original hard copy and two (2) complete PDFs included on CD-ROM of a G70-D General Permit Registration Application for the authority to modify the Crow natural gas production site located in Marshall County, West Virginia.

A legal advertisement will be published in the next few days and proof of publication will be forwarded as soon as it is received. Please see the attached check for payment of the application fee.

If you have any questions concerning this permit application, please contact Ms. Erica Blumenschein, Environmental Specialist - Air, of my staff at (412) 865-3148 or by email at eblumenschein@chevron.com.

Sincerely,

Gary Orr
Appalachia Area Manager for Chevron Appalachia, LLC

Enclosures:

1.0 INTRODUCTION NARRATIVE

Chevron Appalachia, LLC submits this G70-D General Permit application to the West Virginia Department of Environmental Protection's Division of Air Quality (WVDAQ) for modification of the Crow natural gas production site located in Marshall County, West Virginia. This application addresses the operational activities associated with the production of natural gas, condensate, and produced water at the Crow pad.

Chevron would like to submit a G70-D General Permit application to reflect the following at the Crow site:

- One (1) Natural Gas Well;
- One (1) Gas Production Unit/Heater rated at 1.00 MMBtu/hr input (BAP-0110);
- One (1) 400 bbl Test Tank (ABJ-0014);
- One (1) 400 bbl Produced Water Storage Tank (ABJ-0011);
- One (1) enclosed ground flare with a capacity of 4.4 MMBtu/hr heat input (ZZZ-0060);
- One (1) Liquids Loading Rack (LR-1); and
- One (1) 47 hp Arrow A-42 compression engine (CBA-0050).

Chevron Appalachia, LLC is submitting this G70-D General Permit application for modification of the Crow site currently permitted under R13-3143B. This permit application addresses the replacement of the previously permitted 95 hp Caterpillar G3304NA compression engine with the 47 hp Arrow A-42 compression engine listed above. WVDAQ determined in a Permit Determination dated August 25, 2017 that the proposed replacement triggers a substantive requirement of a Federal air regulation and, therefore, requires an update from R13-3143B to this G70-D for the compressor engine replacement.

Statement of aggregation

The Crow natural gas production site is located in Marshall County, WV and operated by Chevron. Stationary sources of air pollutants may require aggregation of total emission levels if these sources share the same industrial grouping, are operating under common control, and are classified as contiguous or adjacent properties. Chevron operates Crow with the same industrial grouping as nearby facilities, and some of these facilities are under common control. The Crow site is not subject to the aggregation of stationary emission sources because these sites do meet the definition of contiguous or adjacent facilities.

The Crow site operates under SIC code 1311 (Crude Petroleum and Natural Gas Extraction). There are surrounding sites operated by Crow that share the same two-digit major SIC code of 13 for Crude Petroleum and Natural Gas Extraction. Therefore, the Crow Site does share the same SIC codes as the surrounding wells and compressor stations.

Chevron is the sole operator of the Crow site. Chevron is also the sole operator of other production sites and compressor stations in the area. Therefore, Chevron does qualify as having nearby operations under common control.

Based on the EPA's Source Determination Guidance for Certain Emission Units in the Oil and Natural Gas Sector, effective on August 2, 2016, the term "adjacent" is defined as follows:

> *Equipment and activities in the oil and gas sector that are under common control will be considered part of the same source if they are located near each other – specifically, if they are located on the same site or on sites that share equipment and are within ¼ mile of each other.*

The Crow site does not exist within a 1/4 mile of another site and does not share equipment with another site. Based on this reasoning, Chevron is not subject to the aggregation of stationary emission sources since the stationary sources are not considered contiguous or adjacent facilities.

2.0 REGULATORY DISCUSSION

This section outlines the State air quality regulations that could be reasonably expected to apply to the Crow site and makes an applicability determination for each regulation based on activities conducted at the site and the emissions of regulated air pollutants. This review is presented to supplement and/or add clarification to the information provided in the WVDEP G70-D permit application forms. The West Virginia State Regulations address federal regulations, including Prevention of Significant Deterioration permitting, Title V permitting, New Source Performance Standards, and National Emission Standards for Hazardous Air Pollutants.

The regulatory requirements in reference to the Crow Site are described in detail in the below section.

West Virginia State Air Regulations

45 CSR 02 – To Prevent and Control Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers

The line heater associated with the gas production unit is an indirect heat exchanger that combusts natural gas but is exempt from this regulation since the heat input capacity is less than 10 MMBtu/hr.

45 CSR 04 – To Prevent and Control the Discharge of Air Pollutants into the Air Which Causes or Contributes to an Objectionable Odor

Operations conducted at the Crow site are subject to this requirement. Based on the nature of the process at the site, the presence of objectionable odors is unlikely.

45 CSR 06 – Control of Air Pollution from the Combustion of Refuse

The enclosed combustion devices located at the Crow site will be subject to this regulation. Per 45 CSR 6-4.3, opacity of emissions from the enclosed combustion device shall not exceed 20 percent, except as provided by 4.4. Particulate matter emissions from this unit will not exceed the levels calculated in accordance with 6-4.1.

§45-6-4.1 Determination for Maximum Allowable Particulate Emissions

4.4 MMBtu/hr Combustor

Emissions (lb/hr) = F x Incinerator Capacity (tons/hr)

ρ_{WG} = 0.09505 lb/scf – Density of Waste Gas Firing Incinerator
Incinerator Rating = 4.4 mmBtu/hr
Waste Gas Heating Value = 1,895.25 Btu/scf

Incinerator Capacity Calculation:

$$\frac{4.4\ mmBtu}{hr}\ X\ \frac{10^6 Btu}{mmBtu}\ X\ \frac{scf}{1{,}895.25\ Btu} X\ \frac{0.09505\ lb\ Test\ Tank\ Vent\ Gas}{scf}\ X\ \frac{ton}{2000\ lbs} = 0.110\ tons/hr$$

If the Incinerator Capacity is less than 15,000 lbs/hr, then F = 5.43

Emissions (lb/hr) = 5.43 * (0.110 tons/hour)

Emissions (lb/hr) = 0.60 lbs/hr

The enclosed combustion devices utilize a ProMax simulation to determine emissions from the combustion of refuse natural gas. Based upon the type of fuel combusted and the emission factors utilized, the PM emissions from the enclosed combustion devices will be below the maximum allowable particulate emissions mandated by 45 CSR 06.

45 CSR 10 – To Prevent and Control Air Pollution from the Emission of Sulfur Oxides

The line heater is an indirect heat exchanger that combusts natural gas but is exempt from this regulation since the heat input capacities are less than 10 MMBtu/hr.

45 CSR 13 – Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants

This G70-D permit application is being submitted for the operational activities associated with Chevron's production of natural gas.

45 CSR 14 – Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution for the Prevention of Significant Deterioration

Federal construction permitting programs regulate new and modified sources of attainment pollutants under Prevention of Significant Deterioration (PSD). The G70-D applicability criteria excludes facilities that meet the definition of a major source as defined in 45 CSR 19 for being eligible for the general permit.

Operation of equipment at the Crow site will not exceed emission thresholds established by this permitting program. Chevron will monitor future construction and modification activities at the site closely and will compare any future increase in emissions with the PSD thresholds to ensure these activities will not trigger this program.

45 CSR 16 - Standards of Performance for New Stationary Sources (NSPS)

45 CSR 16 applies to all registrants that are subject to any of the NSPS requirements described in more detail in the Federal Regulations section.

45 CSR 19 – Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution which Cause or Contributed to Non-attainment

Federal construction permitting programs regulate new and modified sources of non-attainment pollutants under Non-Attainment New Source Review (NNSR). The G70-D applicability criterion excludes facilities that meet the definition of a major source as defined in 45 CSR 19 for being eligible for the general permit.

Operation of equipment at the Crow site will not exceed emission thresholds established by either of these permitting programs. Chevron Appalachia, LLC will monitor future construction and modification activities at the site closely and will compare any future increase in emissions with the NSR thresholds to ensure these activities will not trigger this program.

45 CSR 25 – Control of Air Pollution from Hazardous Waste Treatment, Storage, and Disposal Facilities

No hazardous waste will be burned at this well site; therefore, it is not subject to this hazardous waste rule.

45 CSR 30 – Requirements for Operating Permits

45 CSR 30 applies to the requirements of the federal Title V operating permit program (40 CFR 70). The major source thresholds for the Title V operating permit program regulations are 10 tons per year (tpy) of a single hazardous air pollutant (HAP), 25 tpy of any combination of HAPs, or 100 tpy of all other regulated pollutants.

The potential emissions of all regulated pollutants at the proposed facility are below the corresponding major source threshold(s). Therefore, the Crow site will not be a major source under the Title V program.

45 CSR 34 – National Emission Standards for Hazardous Air Pollutants (NESHAP)

45 CSR 34 applies to all registrants that are subject to any of the NESHAP requirements. The NESHAP Rules are discussed further in the Federal Regulation section of this document.

Federal Regulations

New Source Performance Standards

40 CFR 60, Subpart OOOO (Standards of Performance for Crude oil and Natural Gas Production, Transmission and Distribution)

Subpart OOOO establishes emission standards and compliance schedules for the control of volatile organic compounds (VOC) and sulfur dioxide (SO_2) emissions from affected facilities that commence construction, modification or reconstruction between August 23, 2011 and September 18, 2015. The applicable provisions and requirements of Subpart OOOO are included under the G70-D permit. The Crow site does not qualify as a gas well affected facility as the well was completed prior to August 23, 2011.

There are several equipment types that have been installed at Crow that do not meet the affected facility definitions as specified by EPA. These include:

- Storage vessels: Emissions from each storage vessel (ABJ-0014 and ABJ-0011) were determined to be below 6 tons per year (tpy) of VOC. Therefore, the produced water tank and test tank are not affected storage vessels.
- Pneumatic devices: All pneumatic devices installed at the Crow facility are either low-continuous bleed or intermittent bleed and do not qualify as affected sources.

Subpart OOOOa (Standards Of Performance For Crude Oil And Natural Gas Facilities For Which Construction, Modification, Or Reconstruction Commenced After September 18, 2015)

The Crow facility commenced construction before September 18, 2015 and, therefore, will not qualify as an affected facility under OOOOa, and no major modifications, as defined under Subpart OOOO, have taken place at the facility since that time.

40 CFR 60 Subpart JJJJ (Standards of Performance for Stationary Spark Ignition Internal Combustion Engines)

The Crow site has a compressor engine that was constructed after June 12, 2006 and is subject to this rule. One (1) engine is a non-emergency, spark-ignition, lean-burn reciprocating internal combustion engine with a horsepower rating of 47 bhp. These units are subject to the following emission standards:

- NOx – 1.0 g/bhp-hr
- CO – 2.0 g/bhp-hr
- VOCs – 0.7 g/bhp-hr

Since the compressor engine does not possess an EPA Certificate of Conformity, Chevron will comply with the rule by demonstrating the emission standards are met in an initial performance test. No continuous emissions testing requirements apply to this unit, and no additional NSPS are expected to be applicable to this facility.

National Emissions Standards for Hazardous Air Pollutants

40 CFR 63, Subpart ZZZZ (National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines)

The 47 hp Arrow A-42 compression engine complies with Subpart ZZZZ by complying with the JJJJ regulations.

The following NESHAP included in the G70-D permit are not applicable to the Crow:

- *40 CFR 63 Subpart HH (National Emission Standards for Hazardous Air Pollutants from Oil and Natural Gas Production Facilities).*

  Subpart HH is not applicable since the Crow Site does not have an dehydration units.

No additional NESHAP are expected to be applicable to this facility.

General Permit G70-D will establish an emission cap on the following regulated and hazardous air pollutants (consistent with the PTE of the facility):

Regulated Pollutant	Potential Annual Emissions (tpy)	Maximum Annual Emission Limit (tpy)
CO	2.68	80
NOx	3.02	50
PM	0.08	20
PM-10	0.08	20
SO_2	0.01	20
VOC	2.50	80
Total HAPs	0.14	20

The fugitive emissions of a stationary source shall not be considered in determining whether it is a major stationary source for the purposes of 45CSR30-2.26.b or for eligibility of this General Permit.

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

G70-D GENERAL PERMIT REGISTRATION APPLICATION

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

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

SECTION 1. GENERAL INFORMATION

Name of Applicant (as registered with the WV Secretary of State's Office): **Chevron Appalachia, LLC**

Federal Employer ID No. (FEIN): **25-0527925**

Applicant's Mailing Address: **700 Cherrington Parkway**

City: **Coraopolis** | State: **Pennsylvania** | ZIP Code: **15108**

Facility Name: **Crow Natural Gas Production Site**

Operating Site Physical Address: **Middle Grave Creek Road**
If none available, list road, city or town and zip of facility.

City: **Moundsville, WV** | Zip Code: **26041** | County: **Marshall**

Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits):
Latitude: **39.88644**
Longitude: **-80.6540**

SIC Code: **1311**
NAICS Code: **211111**

DAQ Facility ID No. (For existing facilities)
051-00187

CERTIFICATION OF INFORMATION

This G70-D General Permit Registration Application shall be signed below by a Responsible Official. A Responsible Official is a President, Vice President, Secretary, Treasurer, General Partner, General Manager, a member of the Board of Directors, or Owner, depending on business structure. A business may certify an Authorized Representative who shall have authority to bind the Corporation, Partnership, Limited Liability Company, Association, Joint Venture or Sole Proprietorship. Required records of daily throughput, hours of operation and maintenance, general correspondence, compliance certifications and all required notifications must be signed by a Responsible Official or an Authorized Representative. If a business wishes to certify an Authorized Representative, the official agreement below shall be checked off and the appropriate names and signatures entered. **Any administratively incomplete or improperly signed or unsigned G70-D Registration Application will be returned to the applicant. Furthermore, if the G70-D forms are not utilized, the application will be returned to the applicant. No substitution of forms is allowed.**

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

I hereby certify that all information contained in this G70-D General Permit Registration Application and any supporting documents appended hereto is, to the best of my knowledge, true, accurate and complete, and that all reasonable efforts have been made to provide the most comprehensive information possible.

Responsible Official Signature:_____
Name and Title: **Gary Orr – Appalachia Area Manager** Phone: **412-865-2509** Fax:
Email: **orrga@chevron.com** Date:

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

If applicable:
Environmental Contact
Name and Title: **Erica Blumenschein, Environmental Specialist - Air** Phone: **412-865-3148** Fax:
Email: **eblumenschein@chevron.com** Date:

west virginia department of environmental protection

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

G70-D GENERAL PERMIT REGISTRATION APPLICATION

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

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

OPERATING SITE INFORMATION

Briefly describe the proposed new operation and/or any change(s) to the facility: **Replacement of 95 hp Caterpillar G3304NA compression engine with a 47 hp Arrow A-42 compression engine.**

Directions to the facility: **Directions from Moundsville, WV. Travel East on 4th Street for approximately 1.4 miles. Continue onto Middle Grave Creek Road for approximately 7 miles. The entrance road for the Crow natural gas production site is on the left.**

ATTACHMENTS AND SUPPORTING DOCUMENTS

I have enclosed the following required documents:

Check payable to WVDEP – Division of Air Quality with the appropriate application fee (per 45CSR13 and 45CSR22).

☒ Check attached to front of application.
☐ I wish to pay by electronic transfer. Contact for payment (incl. name and email address):
☐ I wish to pay by credit card. Contact for payment (incl. name and email address):

☒$500 (Construction, Modification, and Relocation) ☐$300 (Class II Administrative Update)
☒$1,000 NSPS fee for 40 CFR60, Subpart IIII, JJJJ, OOOO and/or OOOOa [1]
☐$2,500 NESHAP fee for 40 CFR63, Subpart ZZZZ and/or HH [2]

[1] Only one NSPS fee will apply.
[2] Only one NESHAP fee will apply. The Subpart ZZZZ NESHAP fee will be waived for new engines that satisfy requirements by complying with NSPS, Subparts IIII and/or JJJJ.
NSPS and NESHAP fees apply to new construction or if the source is being modified.

☒ Responsible Official or Authorized Representative Signature (if applicable)	
☒ Single Source Determination Form **(must be completed)** – Attachment A	
☐ Siting Criteria Waiver (if applicable) – Attachment B	☒ Current Business Certificate – Attachment C
☒ Process Flow Diagram – Attachment D	☒ Process Description – Attachment E
☒ Plot Plan – Attachment F	☒ Area Map – Attachment G
☒ G70-D Section Applicability Form – Attachment H	☒ Emission Units/ERD Table – Attachment I
☒ Fugitive Emissions Summary Sheet – Attachment J	
☒ Gas Well Affected Facility Data Sheet (if applicable) – Attachment K	
☒ Storage Vessel(s) Data Sheet (include gas sample data, USEPA Tanks, simulation software (e.g. ProMax, E&P Tanks, HYSYS, etc.), etc. where applicable) – Attachment L	
☒ Natural Gas Fired Fuel Burning Unit(s) Data Sheet (GPUs, Heater Treaters, In-Line Heaters if applicable) – Attachment M	
☒ Internal Combustion Engine Data Sheet(s) (include manufacturer performance data sheet(s) if applicable) – Attachment N	
☒ Tanker Truck/Rail Car Loading Data Sheet (if applicable) – Attachment O	
☐ Glycol Dehydration Unit Data Sheet(s) (include wet gas analysis, GRI- GLYCalc™ input and output reports and information on reboiler if applicable) – Attachment P	

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

G70-D GENERAL PERMIT REGISTRATION APPLICATION

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

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

☒ Pneumatic Controllers Data Sheet – Attachment Q

☒ Pneumatic Pump Data Sheet – Attachment R

☒ Air Pollution Control Device/Emission Reduction Device(s) Sheet(s) (include manufacturer performance data sheet(s) if applicable) – Attachment S

☒ Emission Calculations (please be specific and include all calculation methodologies used) – Attachment T

☒ Facility-wide Emission Summary Sheet(s) – Attachment U

☒ Class I Legal Advertisement – Attachment V

☒ One (1) paper copy and two (2) copies of CD or DVD with pdf copy of application and attachments

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

Attachment A

ATTACHMENT A - SINGLE SOURCE DETERMINATION FORM

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

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

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

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

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

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

Attachment B
(Not Applicable)

Attachment C

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

ATLAS AMERICA, 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

CHEVRON APPALACHIA, LLC

Given under my hand and the Great Seal of the State of West Virginia on this day of April 28, 2011

Natalie E Tennant

Secretary of State

Natalie E. Tennant
Secretary of State
1900 Kanawha Blvd E.
Bldg 1, Suite 157-K
Charleston, WV 25305

Penney Barker, Manager
Corporations Division
Tel: (304)558-8000
Fax: (304)558-8381
www.wvsos.com
Hrs: 8:30 a.m. – 5:00 p.m. ET

FILE ONE ORIGINAL
(Two if you want a filed stamped copy returned to you)
FEE: $25.00

WV APPLICATION FOR AMENDED CERTIFICATE OF AUTHORITY OF A LIMITED LIABILITY COMPANY

In accordance with the provisions of the West Virginia Code, the undersigned limited liability company hereby applies for an Amended Certificate of Authority and submits the following statement:

1. Name under which the organization was authorized to transact business in WV: Atlas America, LLC

2. Date Certificate of Authority was issued in West Virginia: 03/08/2007

3. Change of Name Information or Text of Amendment: (Attach one certified copy of the name change as filed in the home state)

   Change of name from: Atlas America, LLC

   To: Chevron Appalachia, LLC

   Name the organization elects to use in WV: _____
   (Due to home state name not being available)

   Other amendment (use additional pages if necessary)

FILED
APR 28 2011
IN THE OFFICE OF
SECRETARY OF STATE

4. Contact name and number to reach in case of a problem with filing: (optional, however, listing one may help to avoid a return or rejection of filing if there is a problem with the document)

   Jerome L. Suarez — Contact Name
   800-927-9801 x2207 — Phone Number

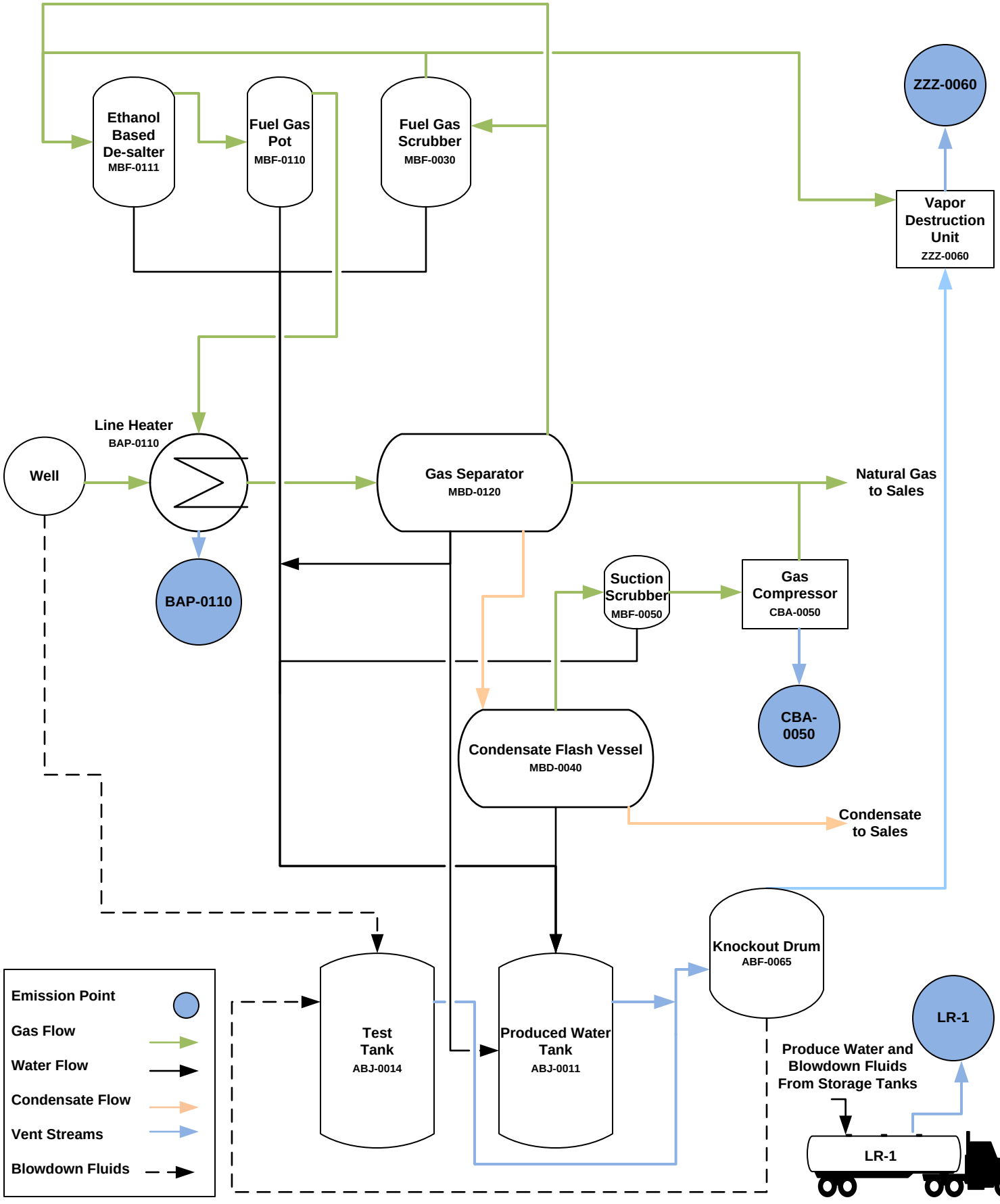
   Business e-mail address, if any: jsuarez@cscinfo.com

5. Signature of person executing document:

   _____ — Signature
   Assistant Secretary — Title/Capacity
   (Example: member, manager, etc.)

Attachment D

Attachment D
Crow Natural Gas Production
Site Process Flow Diagram



Attachment E

Attachment E
Process Description

This G70-D General Permit application is being filed for Chevron Appalachia, LLC (Chevron) and addresses the replacement of the flash compressor engine associated with the Crow natural gas production site. The new flash gas compressor engine (CBA-0050) has a lower capacity with a rating of 47 horsepower (hp) than the previously permitted engine which was rated at 95 hp. Chevron is seeking to reflect this change in this G70-D as a replacement to the current R13.

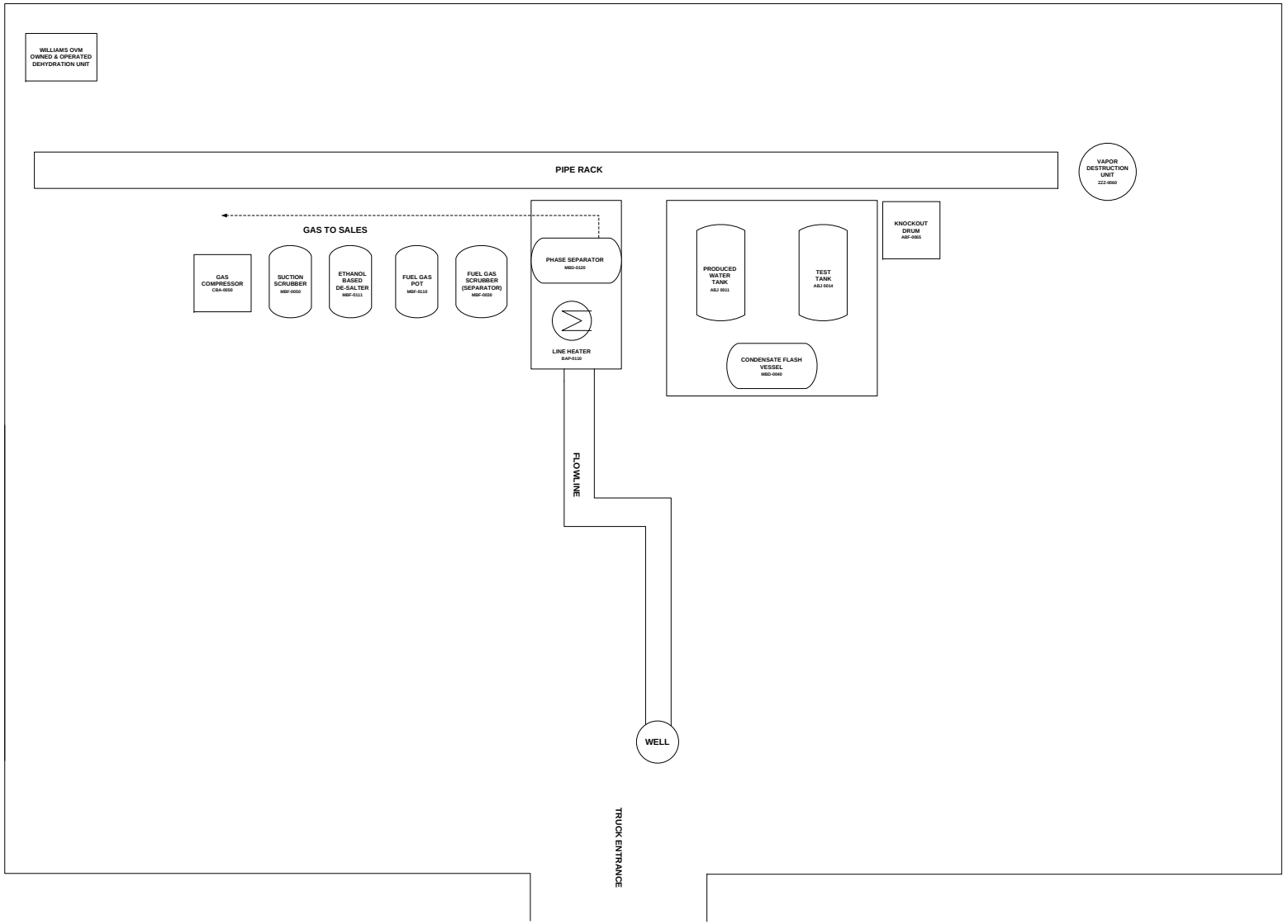
Incoming raw natural gas from the wells enters the site through a pipeline. The raw gas is first routed through a line heater (BAP-0110) to assist with the phase separation process in the downstream three-phase separator (MBD-0120); especially during cooler ambient temperatures. In the separator, a produced water and condensate mix is removed from the raw gas and transferred to the condensate flash vessel (MBD-0040). Volatiles within the fluid flash off within the condensate flash vessel and are directed to the suction scrubber (MBF-0050). Any additional fluids within the gas are removed in the suction scrubber and directed to the blowdown tank (ABJ-0014). From the suction scrubber, gas flows to the gas compressor (CBA-0050), where the pressure is increased to enter the gas sales line. The remaining condensate fluids flow from the condensate flash vessel to a condensate sales line. The produced water from the condensate flash tank flows to the produced water storage tank (ABJ-0011). From the phase separator, natural gas flows to the downstream sales pipeline. A smaller gas stream is routed from the phase separator to the fuel gas scrubber (MBF-0030). Produced water is removed in the scrubber and transferred to the produced water storage tank (ABJ-0011). From the scrubber, gas either flows to the vapor destruction unit, (ZZZ-0060) where it burned, or to the ethanol based de-salter (MBF-0111). Gas flows from the ethanol based de-salter to the fuel gas pot (MBF-0110) and then to the line heater, where it is burned as a fuel source. Produced water is removed in the de-salter and gas pot and transferred to the produced water storage tank (ABJ-0011). Emissions from the produced water, condensate, and blowdown tanks are directed to a knockout drum, (ABF-0065) and then to the vapor destruction unit (ZZZ-0060), where they are incinerated. Water that accumulates in the knockout drum (ABF-0065) is pumped back into the blowdown tank (ABJ-0014). From the storage tanks, the produced water and blowdown fluid is pumped into a tank truck on an as needed basis and is disposed of off-site. Condensate is sent off-site through piping.

Various control systems are used at the site to monitor and regulate temperature, flow, and pressure. Numerous other activities, including blowdowns are required to conduct maintenance activities, pneumatic device venting, and fugitive component leaks occur at the production site.

A process flow diagram is included as Attachment D.

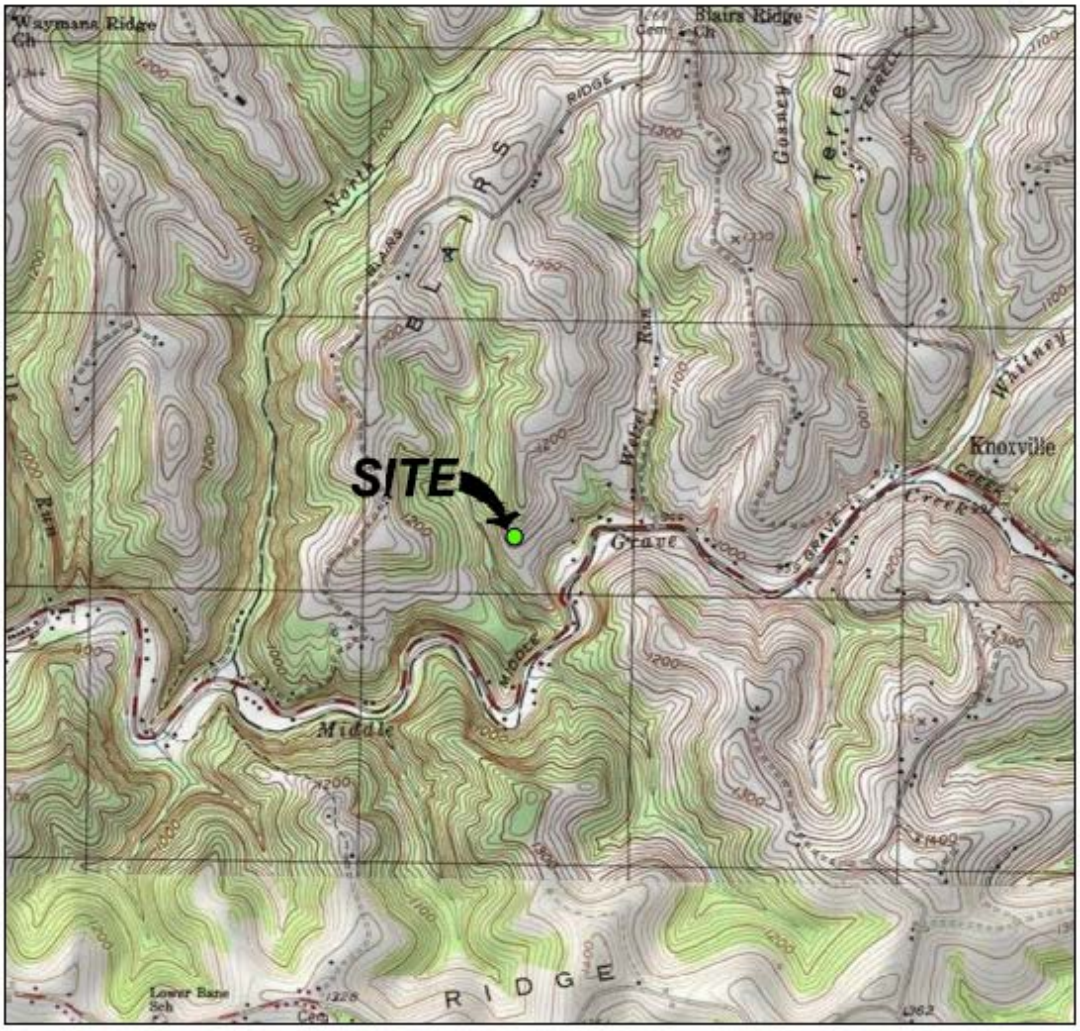
Attachment F

Attachment F
Plot Plan
Chevron Crow Natural Gas Production Site



Attachment G

LAT. 39.8864 LON. -80.6540
CITY OF MOUNDSVILLE
MARSHALL COUNTY
WEST VIRGINIA



SITE LOCATION MAP

ADAPTED FROM USGS

REVISIONS ARE TO BE MADE ON THE CADD FILE ONLY

ERM.	**CHEVRON APPALACHIA, LLC** CROW NATURAL GAS PRODUCTION SITE MOUNDSVILLE, WEST VIRGINIA	CADD Review CHK'D GM 0334598
Drawn By MLB/7-29-14	Environmental Resources Management	Attachment G

Attachment H

ATTACHMENT H – G70-D SECTION APPLICABILITY FORM

General Permit G70-D Registration
Section Applicability Form

General Permit G70-D was developed to allow qualified applicants to seek registration for a variety of sources. These sources include gas well affected facilities, storage vessels, gas production units, in-line heaters, heater treaters, glycol dehydration units and associated reboilers, pneumatic controllers, pneumatic pumps, reciprocating internal combustion engines (RICEs), tank truck/rail car loading, fugitive emissions, completion combustion devices, flares, enclosed combustion devices, and vapor recovery systems. All registered facilities will be subject to Sections 1.0, 2.0, 3.0, and 4.0.

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

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

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

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

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

Attachment I

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

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

Emission Unit ID[1]	Emission Point ID[2]	Emission Unit Description	Year Installed	Manufac. Date[3]	Design Capacity	Type[4] and Date of Change	Control Device(s)[5]	ERD(s)[6]
BAP-0110	BAP-0110	Line Heater	2013	2013	1.0 MMBtu/hr	Existing	NA	NA
CBA-0050	CBA-0050	Arrow A-42 Compression Engine	2017	2009	47 bhp	New	Oxidation Catalyst	NA
ABJ-0014	ZZZ-0060	Test Tank	2013	2013	400 bbl	Existing	NA	ZZZ-0060
ABJ-0011	ZZZ-0060	Produced Water Tank	2013	2013	400 bbl	Existing	NA	ZZZ-0060
ZZZ-0060	ZZZ-0060	Enclosed Ground Flare	2013	2013	4.4 MMBtu	Existing	NA	NA
LR-1	LR-1	Liquids Loading Rack	2013	2013	5,040 gal/day	Existing	NA	NA

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

Attachment J

ATTACHMENT J – FUGITIVE EMISSIONS SUMMARY SHEET

Sources of fugitive emissions may include loading operations, equipment leaks, blowdown emissions, etc.
Use extra pages for each associated source or equipment if necessary.

Source/Equipment: **Crow site equipment**

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

Component Type	Closed Vent System	Count	Source of Leak Factors (EPA, other (specify))	Stream type (gas, liquid, etc.)	Estimated Emissions (tpy)		
					VOC	HAP	GHG (methane, CO_2e)
Pumps	☐ Yes ☐ No			☐ Gas ☐ Liquid ☐ Both			
Valves	☐ Yes ☒ No	59	**EPA**	☒ Gas ☐ Liquid ☐ Both	0.15	<0.01	0.19, 4.84
Safety Relief Valves	☐ Yes ☒ No	1	**EPA**	☒ Gas ☐ Liquid ☐ Both	<0.01	<0.01	<0.01, 0.12
Open Ended Lines	☐ Yes ☒ No	3	**EPA**	☒ Gas ☐ Liquid ☐ Both	0.01	<0.01	0.02, 0.46
Sampling Connections	☐ Yes ☐ No			☐ Gas ☐ Liquid ☐ Both			
Connections (Not sampling)	☐ Yes ☒ No	256	**EPA**	☒ Gas ☐ Liquid ☐ Both	0.07	<0.01	0.09, 2.34
Compressors	☐ Yes ☐ No			☐ Gas ☐ Liquid ☐ Both			
Flanges	☐ Yes ☐ No			☐ Gas ☐ Liquid ☐ Both			
Other[1]	☒ Yes ☐ No	N/A	**ProMax**	☒ Gas ☐ Liquid ☐ Both	0.04	<0.01	

[1] Uncontrolled Working and Breathing losses from Produced Water and Test Tanks for a maximum of 200 hrs/year

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

Please indicate if there are any closed vent bypasses (include component):
NA

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

Attachment K

ATTACHMENT K – GAS WELL AFFECTED FACILITY DATA SHEET

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

API Number	Date of Flowback	Date of Well Completion	Green Completion and/or Combustion Device	Subject to OOOO or OOOOa?
47051013950000	6/17/11	6/14/11	No	No

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

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

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

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

Where,

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

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

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

Attachment L

ATTACHMENT L – STORAGE VESSEL DATA SHEET

Complete this data sheet if you are the owner or operator of a storage vessel that contains condensate and/or produced water. This form must be completed for ***each*** new or modified bulk liquid storage vessel(s) that contains condensate and/or produced water. (If you have more than one (1) identical tank (i.e. 4-400 bbl condensate tanks), then you can list all on one (1) data sheet). **Include gas sample analysis, flashing emissions, working and breathing losses, USEPA Tanks, simulation software (ProMax, E&P Tanks, HYSYS, etc.), and any other supporting documents where applicable.**

The following information is REQUIRED:

□ Composition of the representative sample used for the simulation
□ For each stream that contributes to flashing emissions:
- □ Temperature and pressure (inlet and outlet from separator(s))
- □ Simulation-predicted composition
- □ Molecular weight
- □ Flow rate

□ Resulting flash emission factor or flashing emissions from simulation
□ Working/breathing loss emissions from tanks and/or loading emissions if simulation is used to quantify those emissions

Additional information may be requested if necessary.

GENERAL INFORMATION (REQUIRED)

1. Bulk Storage Area Name **Tank Area**	2. Tank Name **Produced Water Tank**
3. Emission Unit ID number **ABJ-0011**	4. Emission Point ID number **ZZZ-0060**
5. Date Installed , Modified or Relocated *(for existing tanks)* **2013** Was the tank manufactured after August 23, 2011 and on or before September 18, 2015? ☒ Yes ☐ No Was the tank manufactured after September 18, 2015? ☐ Yes ☒ No	6. Type of change: ☐ New construction ☐ New stored material ☐ Other ☐ Relocation
7A. Description of Tank Modification *(if applicable)* **NA**	
7B. Will more than one material be stored in this tank? *If so, a separate form must be completed for each material.* ☐ Yes ☒ No	
7C. Was USEPA Tanks simulation software utilized? ☐ Yes ☒ No ***If Yes, please provide the appropriate documentation and items 8-42 below are not required.***	

TANK INFORMATION

8. Design Capacity *(specify barrels or gallons).* Use the internal cross-sectional area multiplied by internal height. **400 bbl**	
9A. Tank Internal Diameter (ft.) **15**	9B. Tank Internal Height (ft.) **20**
10A. Maximum Liquid Height (ft.) **18**	10B. Average Liquid Height (ft.) **10**
11A. Maximum Vapor Space Height (ft.) **18**	11B. Average Vapor Space Height (ft.) **10**
12. Nominal Capacity *(specify barrels or gallons).* This is also known as "working volume". **400 bbl**	
13A. Maximum annual throughput (gal/yr) **2,217,638**	13B. Maximum daily throughput (gal/day) **6,075**
14. Number of tank turnovers per year **132**	15. Maximum tank fill rate (gal/min) **3.0**
16. Tank fill method ☒ Submerged ☐ Splash ☐ Bottom Loading	
17. Is the tank system a variable vapor space system? ☐ Yes ☒ No If yes, (A) What is the volume expansion capacity of the system (gal)? (B) What are the number of transfers into the system per year?	
18. Type of tank (check all that apply): ☒ Fixed Roof ☒ vertical ☐ horizontal ☐ flat roof ☐ cone roof ☐ dome roof ☐ other (describe) ☐ External Floating Roof ☐ pontoon roof ☐ double deck roof ☐ Domed External (or Covered) Floating Roof ☐ Internal Floating Roof ☐ vertical column support ☐ self-supporting ☐ Variable Vapor Space ☐ lifter roof ☐ diaphragm ☐ Pressurized ☐ spherical ☐ cylindrical ☐ Other (describe)	

PRESSURE/VACUUM CONTROL DATA

19. Check as many as apply:

☒ Does Not Apply ☐ Rupture Disc (psig)

☐ Inert Gas Blanket of _____ ☐ Carbon Adsorption[1]

☐ Vent to Vapor Combustion Device[1] (vapor combustors, flares, thermal oxidizers, enclosed combustors)

☐ Conservation Vent (psig) ☐ Condenser[1]

Vacuum Setting Pressure Setting

☐ Emergency Relief Valve (psig)

Vacuum Setting Pressure Setting

☐ Thief Hatch Weighted ☐ Yes ☐ No

[1] Complete appropriate Air Pollution Control Device Sheet

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

Material Name	Flashing Loss		Breathing Loss		Working Loss		Total Emissions Loss		Estimation Method[1]
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	
See Attachment U									

[1] 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 and other modeling summary sheets if applicable.

TANK CONSTRUCTION AND OPERATION INFORMATION			
21. Tank Shell Construction: ☐ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☒ Other (describe) **Welded**			
21A. Shell Color: **Green**	21B. Roof Color: **Green**	21C. Year Last Painted: **2013**	
22. Shell Condition (if metal and unlined): ☒ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable			
22A. Is the tank heated? ☐ Yes ☒ No	22B. If yes, operating temperature:	22C. If yes, how is heat provided to tank?	
23. Operating Pressure Range (psig): **0.031 to 1** **Must be listed for tanks using VRUs with closed vent system.**			
24. Is the tank a **Vertical Fixed Roof Tank**? ☒ Yes ☐ No	24A. If yes, for dome roof provide radius (ft): **6**	24B. If yes, for cone roof, provide slop (ft/ft): **NA**	
25. Complete item 25 for **Floating Roof Tanks** ☐ Does not apply ☒			
25A. Year Internal Floaters Installed:			
25B. Primary Seal Type *(check one):* ☐ Metallic (mechanical) shoe seal ☐ Liquid mounted resilient seal ☐ Vapor mounted resilient seal ☐ Other (describe):			
25C. Is the Floating Roof equipped with a secondary seal? ☐ Yes ☐ No			
25D. If yes, how is the secondary seal mounted? *(check one)* ☐ Shoe ☐ Rim ☐ Other (describe):			
25E. Is the floating roof equipped with a weather shield? ☐ Yes ☐ No			
25F. Describe deck fittings:			
26. Complete the following section for **Internal Floating Roof Tanks** ☒ Does not apply			
26A. Deck Type: ☐ Bolted ☐ Welded	26B. For bolted decks, provide deck construction:		
26C. Deck seam. Continuous sheet construction: ☐ 5 ft. wide ☐ 6 ft. wide ☐ 7 ft. wide ☐ 5 x 7.5 ft. wide ☐ 5 x 12 ft. wide ☐ other (describe)			
26D. Deck seam length (ft.):	26E. Area of deck (ft^2):	26F. For column supported tanks, # of columns:	26G. For column supported tanks, diameter of column:
27. Closed Vent System with VRU? ☐ Yes ☐ No			
28. Closed Vent System with Enclosed Combustor? ☒ Yes ☐ No			
SITE INFORMATION			
29. Provide the city and state on which the data in this section are based: **Charleston, WV**			
30. Daily Avg. Ambient Temperature (°F): **70**	31. Annual Avg. Maximum Temperature (°F): **65.5**		
32. Annual Avg. Minimum Temperature (°F): **44.0**	33. Avg. Wind Speed (mph): **18 mph**		
34. Annual Avg. Solar Insulation Factor (BTU/ft^2-day): **1,123**	35. Atmospheric Pressure (psia): **14.70**		
LIQUID INFORMATION			
36. Avg. daily temperature range of bulk liquid (°F):	36A. Minimum (°F):	36B. Maximum (°F):	
37. Avg. operating pressure range of tank (psig):	37A. Minimum (psig):	37B. Maximum (psig):	
38A. Minimum liquid surface temperature (°F):	38B. Corresponding vapor pressure (psia):		
39A. Avg. liquid surface temperature (°F):	39B. Corresponding vapor pressure (psia):		
40A. Maximum liquid surface temperature (°F):	40B. Corresponding vapor pressure (psia):		
41. Provide the following for each liquid or gas to be stored in the tank. Add additional pages if necessary.			
41A. Material name and composition:	**Produced Water**		
41B. CAS number:	**NA**		
41C. Liquid density (lb/gal):	**8.32**		

41D. Liquid molecular weight (lb/lb-mole):	**18.02**		
41E. Vapor molecular weight (lb/lb-mole):	**18.02**		
41F. Maximum true vapor pressure (psia):	**NA**		
41G. Maximum Reid vapor pressure (psia):	**NA**		
41H. Months Storage per year. From: To:	**January to December**		
42. Final maximum gauge pressure and temperature prior to transfer into tank used as inputs into flashing emission calculations.			

ATTACHMENT L – STORAGE VESSEL DATA SHEET

Complete this data sheet if you are the owner or operator of a storage vessel that contains condensate and/or produced water. This form must be completed for ***each*** new or modified bulk liquid storage vessel(s) that contains condensate and/or produced water. (If you have more than one (1) identical tank (i.e. 4-400 bbl condensate tanks), then you can list all on one (1) data sheet). **Include gas sample analysis, flashing emissions, working and breathing losses, USEPA Tanks, simulation software (ProMax, E&P Tanks, HYSYS, etc.), and any other supporting documents where applicable.**

The following information is REQUIRED:

□ Composition of the representative sample used for the simulation
□ For each stream that contributes to flashing emissions:
- □ Temperature and pressure (inlet and outlet from separator(s))
- □ Simulation-predicted composition
- □ Molecular weight
- □ Flow rate

□ Resulting flash emission factor or flashing emissions from simulation
□ Working/breathing loss emissions from tanks and/or loading emissions if simulation is used to quantify those emissions

Additional information may be requested if necessary.

GENERAL INFORMATION (REQUIRED)

1. Bulk Storage Area Name **Tank Area**	2. Tank Name **Test Tank**
3. Emission Unit ID number **ABJ-0014**	4. Emission Point ID number **ZZZ-0060**
5. Date Installed , Modified or Relocated *(for existing tanks)* **2013** Was the tank manufactured after August 23, 2011 and on or before September 18, 2015? ☒ Yes ☐ No Was the tank manufactured after September 18, 2015? ☐ Yes ☒ No	6. Type of change: ☐ New construction ☐ New stored material ☐ Other ☒ Relocation
7A. Description of Tank Modification *(if applicable)*	
7B. Will more than one material be stored in this tank? *If so, a separate form must be completed for each material.* ☒ Yes ☐ No **This emission unit data sheet addresses the produced water loading to tank ABJ-0014**	
7C. Was USEPA Tanks simulation software utilized? ☐ Yes ☒ No ***If Yes, please provide the appropriate documentation and items 8-42 below are not required.***	

TANK INFORMATION

8. Design Capacity *(specify barrels or gallons).* Use the internal cross-sectional area multiplied by internal height. **400 bbl**	
9A. Tank Internal Diameter (ft.) **15**	9B. Tank Internal Height (ft.) **20**
10A. Maximum Liquid Height (ft.) **18**	10B. Average Liquid Height (ft.) **10**
11A. Maximum Vapor Space Height (ft.) **18**	11B. Average Vapor Space Height (ft.) **10**
12. Nominal Capacity *(specify barrels or gallons).* This is also known as "working volume". **400 bbl**	
13A. Maximum annual throughput (gal/yr) **117,780**	13B. Maximum daily throughput (gal/day) **323**
14. Number of tank turnovers per year **7**	15. Maximum tank fill rate (gal/min) **3.0**
16. Tank fill method ☒ Submerged ☐ Splash ☐ Bottom Loading	
17. Is the tank system a variable vapor space system? ☐ Yes ☒ No If yes, (A) What is the volume expansion capacity of the system (gal)? (B) What are the number of transfers into the system per year?	
18. Type of tank (check all that apply): ☒ Fixed Roof ☒ vertical ☐ horizontal ☐ flat roof ☐ cone roof ☐ dome roof ☐ other (describe) ☐ External Floating Roof ☐ pontoon roof ☐ double deck roof ☐ Domed External (or Covered) Floating Roof ☐ Internal Floating Roof ☐ vertical column support ☐ self-supporting ☐ Variable Vapor Space ☐ lifter roof ☐ diaphragm ☐ Pressurized ☐ spherical ☐ cylindrical ☐ Other (describe)	

PRESSURE/VACUUM CONTROL DATA

19. Check as many as apply:

☒ Does Not Apply ☐ Rupture Disc (psig)

☐ Inert Gas Blanket of _____ ☐ Carbon Adsorption[1]

☐ Vent to Vapor Combustion Device[1] (vapor combustors, flares, thermal oxidizers, enclosed combustors)

☐ Conservation Vent (psig) ☐ Condenser[1]

Vacuum Setting Pressure Setting

☐ Emergency Relief Valve (psig)

Vacuum Setting Pressure Setting

☐ Thief Hatch Weighted ☐ Yes ☐ No

[1] Complete appropriate Air Pollution Control Device Sheet

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

Material Name	Flashing Loss		Breathing Loss		Working Loss		Total Emissions Loss		Estimation Method[1]
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	
See Attachment U									

[1] 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 and other modeling summary sheets if applicable.

TANK CONSTRUCTION AND OPERATION INFORMATION			
21. Tank Shell Construction: ☐ Riveted ☐ Gunite lined ☐ Epoxy-coated rivets ☒ Other (describe) **Welded**			
21A. Shell Color: **Green**	21B. Roof Color: **Green**	21C. Year Last Painted: **2013**	
22. Shell Condition (if metal and unlined): ☒ No Rust ☐ Light Rust ☐ Dense Rust ☐ Not applicable			
22A. Is the tank heated? ☐ Yes ☒ No	22B. If yes, operating temperature:	22C. If yes, how is heat provided to tank?	
23. Operating Pressure Range (psig): **0.031 to 1** **Must be listed for tanks using VRUs with closed vent system.**			
24. Is the tank a **Vertical Fixed Roof Tank**? ☒ Yes ☐ No	24A. If yes, for dome roof provide radius (ft): **6**	24B. If yes, for cone roof, provide slop (ft/ft): **NA**	
25. Complete item 25 for **Floating Roof Tanks** ☐ Does not apply ☒			
25A. Year Internal Floaters Installed:			
25B. Primary Seal Type *(check one):* ☐ Metallic (mechanical) shoe seal ☐ Liquid mounted resilient seal ☐ Vapor mounted resilient seal ☐ Other (describe):			
25C. Is the Floating Roof equipped with a secondary seal? ☐ Yes ☐ No			
25D. If yes, how is the secondary seal mounted? *(check one)* ☐ Shoe ☐ Rim ☐ Other (describe):			
25E. Is the floating roof equipped with a weather shield? ☐ Yes ☐ No			
25F. Describe deck fittings:			
26. Complete the following section for **Internal Floating Roof Tanks** ☒ Does not apply			
26A. Deck Type: ☐ Bolted ☐ Welded	26B. For bolted decks, provide deck construction:		
26C. Deck seam. Continuous sheet construction: ☐ 5 ft. wide ☐ 6 ft. wide ☐ 7 ft. wide ☐ 5 x 7.5 ft. wide ☐ 5 x 12 ft. wide ☐ other (describe)			
26D. Deck seam length (ft.):	26E. Area of deck (ft^2):	26F. For column supported tanks, # of columns:	26G. For column supported tanks, diameter of column:
27. Closed Vent System with VRU? ☐ Yes ☐ No			
28. Closed Vent System with Enclosed Combustor? ☐ Yes ☐ No			
SITE INFORMATION			
29. Provide the city and state on which the data in this section are based: **Charleston, WV**			
30. Daily Avg. Ambient Temperature (°F): **70**	31. Annual Avg. Maximum Temperature (°F): **65.5**		
32. Annual Avg. Minimum Temperature (°F): **44.0 F**	33. Avg. Wind Speed (mph): **18 mph**		
34. Annual Avg. Solar Insulation Factor (BTU/ft^2-day): **1,123**	35. Atmospheric Pressure (psia): **14.70**		
LIQUID INFORMATION			
36. Avg. daily temperature range of bulk liquid (°F):	36A. Minimum (°F):	36B. Maximum (°F):	
37. Avg. operating pressure range of tank (psig):	37A. Minimum (psig):	37B. Maximum (psig):	
38A. Minimum liquid surface temperature (°F):	38B. Corresponding vapor pressure (psia):		
39A. Avg. liquid surface temperature (°F):	39B. Corresponding vapor pressure (psia):		
40A. Maximum liquid surface temperature (°F):	40B. Corresponding vapor pressure (psia):		
41. Provide the following for each liquid or gas to be stored in the tank. Add additional pages if necessary.			
41A. Material name and composition:	**Produced Water**		
41B. CAS number:	**NA**		
41C. Liquid density (lb/gal):	**8.32**		

41D. Liquid molecular weight (lb/lb-mole):	**18.02**		
41E. Vapor molecular weight (lb/lb-mole):	**18.02**		
41F. Maximum true vapor pressure (psia):	**NA**		
41G. Maximum Reid vapor pressure (psia):	**NA**		
41H. Months Storage per year. From: To:	**January to December**		
42. Final maximum gauge pressure and temperature prior to transfer into tank used as inputs into flashing emission calculations.			

STORAGE TANK DATA TABLE

List all deminimis storage tanks (i.e. lube oil, glycol, diesel etc.)

Source ID #[1]	Status[2]	Content[3]	Volume[4]
N/A			

1. Enter the appropriate Source Identification Numbers (Source ID #) for each storage tank located at the well site. 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, diesel, mercaptan etc.
4. Enter the maximum design storage tank volume in gallons.

Attachment M

ATTACHMENT M – SMALL HEATERS AND REBOILERS NOT SUBJECT TO 40CFR60 SUBPART DC
DATA SHEET

Complete this data sheet for each small heater and reboiler not subject to 40CFR60 Subpart Dc at the facility. ***The Maximum Design Heat Input (MDHI) must be less than 10 MMBTU/hr.***

Emission Unit ID#[1]	Emission Point ID#[2]	Emission Unit Description (manufacturer, model #)	Year Installed/ Modified	Type[3] and Date of Change	Maximum Design Heat Input (MMBTU/hr)[4]	Fuel Heating Value (BTU/scf)[5]
BAP-0110	**BAP-0110**	**Line Heater**	**2013**	**NA**	**1.0 MMBtu/hr**	**1,319**

1 Enter the appropriate Emission Unit (or Source) identification number for each fuel burning unit located at the production pad. Gas Producing Unit Burners should be designated GPU-1, GPU-2, etc. Heater Treaters should be designated HT-1, HT-2, etc. Heaters or Line Heaters should be designated LH-1, LH-2, etc. For sources, use 1S, 2S, 3S…or other appropriate designation. Enter glycol dehydration unit Reboiler Vent data on the Glycol Dehydration Unit Data Sheet.

2 Enter the appropriate Emission Point identification numbers for each fuel burning unit located at the production pad. Gas Producing Unit Burners should be designated GPU-1, GPU-2, etc. Heater Treaters should be designated HT-1, HT-2, etc. Heaters or Line Heaters should be designated LH-1, LH-2, etc. For emission points, use 1E, 2E, 3E…or other appropriate designation.

3 New, modification, removal.

4 Enter design heat input capacity in MMBtu/hr.

5 Enter the fuel heating value in BTU/standard cubic foot.

Attachment N

ATTACHMENT N – INTERNAL COMBUSTION ENGINE DATA SHEET

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

Emission Unit ID#[1]	**CBA-0050**		
Engine Manufacturer/Model	**Arrow A-42**		
Manufacturers Rated bhp/rpm	**47/1800**		
Source Status[2]	**NS**		
Date Installed/ Modified/Removed/Relocated[3]	**2017**		
Engine Manufactured /Reconstruction Date[4]	**8/5/2009**		
Check all applicable Federal Rules for the engine (include EPA Certificate of Conformity if applicable)[5]	☒40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☐40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources	☐40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☐40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources	☐40CFR60 Subpart JJJJ ☐JJJJ Certified? ☐40CFR60 Subpart IIII ☐IIII Certified? ☐40CFR63 Subpart ZZZZ ☐ NESHAP ZZZZ/ NSPS JJJJ Window ☐ NESHAP ZZZZ Remote Sources
Engine Type[6]	**4SRB**		
APCD Type[7]	**A/F**		
Fuel Type[8]	**PQ**		
H_2S (gr/100 scf)	**<0.01**		
Operating bhp/rpm	**47/1800**		
BSFC (BTU/bhp-hr)	**9,889**		
Hourly Fuel Throughput	ft^3/hr gal/hr	ft^3/hr gal/hr	ft^3/hr gal/hr
Annual Fuel Throughput (Must use 8,760 hrs/yr unless emergency generator)	$MMft^3$/yr gal/yr	$MMft^3$/yr gal/yr	$MMft^3$/yr gal/yr
Fuel Usage or Hours of Operation Metered	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐

Calculation Methodology[9]	**Pollutant[10]**	**Hourly PTE (lb/hr)[11]**	**Annual PTE (tons/year) [11]**	**Hourly PTE (lb/hr) [11]**	**Annual PTE (tons/year) [11]**	**Hourly PTE (lb/hr) [11]**	**Annual PTE (tons/year) [11]**
MD	NO_x	**0.21**	**0.91**				
MD	CO	**0.21**	**0.91**				
MD	VOC	**0.01**	**0.06**				
AP-42	SO_2	**<0.01**	**<0.01**				
AP-42	PM_{10}	**<0.01**	**0.02**				
AP-42	Formaldehyde	**<0.01**	**0.04**				
AP-42	Total HAPs	**0.01**	**0.05**				
AP-42	GHG (CO_2e)	**54.53**	**238.42**				

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

2 Enter the Source Status using the following codes:

NS	Construction of New Source (installation)	ES	Existing Source
MS	Modification of Existing Source	RS	Relocated Source
REM	Removal of Source		

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

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

5 Is the engine a certified stationary spark ignition internal combustion engine according to 40CFR60 Subpart IIII/JJJJ? If so, the engine and control device must be operated and maintained in accordance with the manufacturer's emission-related written instructions. You must keep records of conducted maintenance to demonstrate compliance, but no performance testing is required. If the certified engine is not operated and maintained in accordance with the manufacturer's emission-related written instructions, the engine will be considered a non-certified engine and you must demonstrate compliance as appropriate.

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

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

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

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

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

8 Enter the Fuel Type using the following codes:

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

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

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

10 Enter each engine's Potential to Emit (PTE) for the listed regulated pollutants in pounds per hour and tons per year. PTE shall be calculated at manufacturer's rated brake horsepower and may reflect reduction efficiencies of listed Air Pollution Control Devices. Emergency generator engines may use 500 hours of operation when calculating PTE. PTE data from this data sheet shall be incorporated in the *Emissions Summary Sheet*.

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

Engine Air Pollution Control Device
(Emission Unit ID# CBA-0050, use extra pages as necessary)

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

☐ NSCR ☐ SCR ☒ Oxidation Catalyst

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

Manufacturer: USA Compression	Model #: VXC-1408-04-HSG
Design Operating Temperature: °F	Design gas volume: scfm
Service life of catalyst:	Provide manufacturer data? ☐Yes ☐ No
Volume of gas handled: acfm at °F	Operating temperature range for NSCR/Ox Cat: From °F to °F
Reducing agent used, if any:	Ammonia slip (ppm):

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

Provide description of warning/alarm system that protects unit when operation is not meeting design conditions:

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

How often is catalyst recommended or required to be replaced (hours of operation)?

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

USA COMPRESSION

Emissions Report

6/19/2017

USA Compression Unit 5281, VR260/VRC2

Engine Serial Number	4B081105362	**Engine Manufactured Date**	8/5/2009
Max HP	47	**Max RPM**	1800
Number of Engine Cylinders	4	**Total Displacement (in3)**	253
Combustion Type & Setting	4 Stroke Rich Burn	**Fuel Delivery Method**	Carburetor
Compression Ratio	10:01	**Combustion Air Treatment**	Naturally Aspirated
Engine Modified/Reconstructed?	EMD after 7/1/08 (uncertified)		
Compressor Frame Serial #	09060	**Unit Packaged Date**	9/29/2009
Compressor Frame Max RPM	1800	**# of Compressor Throws**	2

AIR ENVIRONMENTAL REGULATIONS

County and State selected for Quote: Indiana, PA

NSPS JJJJ	**NOx**	2.8 g/hp-hr	**CO**	4.8 g/hp-hr	**VOC**	
Ozone Non-Attainment/General Permit	**NOx**	2 g/hp-hr	**CO**	2 g/hp-hr	**VOC**	**CH20**

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: 9889 HHV BTU/bhp-hr

	g/bhp-hr	lb/MMBTU	lb/hr	TPY
Nitrogren Oxides (NOx)	12.8		1.326	5.808
Carbon Monoxide (CO)	5.1		0.528	2.313
Volatile Organic Compounds (NMNEHC excluding CH2O)	0.04		0.004	0.018
Formaldehyde (CH2O)	0.09		0.009	0.039
Particulate Matter (PM) Filterable+Condensable		0.0194	0.009	0.0395
Sulfur Dioxide (SO2)		0.0006	0.0003	0.0012

	g/bhp-hr	lb/MMBTU	lb/hr	Metric Tonne/yr
Carbon Dioxide (CO2)		110	51.126	203.113
Methane (CH4)		0.23	0.107	0.425

CONTROLLED EMISSIONS

Catalytic Converter Make/Model	VXC-1408-04-HSG
Catalyst Element Type	3-Way
# of Catalyst Elements Currently in Housing	1
Air/Fuel Ratio Control	Yes
Other Engine Emissions Control Equipment	None

	% Reduction Required to Comply with JJJJ & Non-Attainment / General Permit Limits	lb/hr	TPY
Nitrogen Oxides (NOx)	84	0.2072	0.908
Carbon Monoxide (CO)	61	0.2072	0.908
Volatile Organic Compounds (NMNEHC excluding CH2O)	0	0.004	0.018
Formaldehyde (CH2O)	0	0.009	0.039
Particulate Matter (PM) Filterable+Condensable	0	0.009	0.0395
Sulfur Dioxide (SO2)	0	0.0003	0.0012

	% Reduction Required to Comply with JJJJ & Non-Attainment / General Permit Limits	lb/hr	Metric Tonne/yr
Carbon Dioxide (CO2)	0		
Methane (CH4)	0	0.107	0.425

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 Combution Sources (Section 3.2 Natural Gas-Fired Reciprocating Engines).

Attachment O

ATTACHMENT O – TANKER TRUCK/RAIL CAR LOADING DATA SHEET

Complete this data sheet for each new or modified bulk liquid transfer area or loading rack at the facility. This is to be used for bulk liquid transfer operations to tanker trucks/rail cars. Use extra pages if necessary.

Truck/Rail Car Loadout Collection Efficiencies

The following applicable capture efficiencies of a truck/rail car loadout are allowed:

- For tanker trucks/rail cars passing the MACT level annual leak test – 99.2%
- For tanker trucks/rail cars passing the NSPS level annual leak test – 98.7%
- For tanker trucks/rail cars not passing one of the annual leak tests listed above – 70%

Compliance with this requirement shall be demonstrated by keeping records of the applicable MACT or NSPS Annual Leak Test certification for ***every*** truck and railcar loaded/unloaded. This requirement can be satisfied if the trucking/rail car company provided certification that its entire fleet was compliant. This certification must be submitted in writing to the Director of the DAQ. These additional requirements must be noted in the Registration Application.

Emission Unit ID#: **LR-1**	Emission Point ID#: **LR-1**	Year Installed/Modified: **2013**
Emission Unit Description: **Tank Loading Operations**		
Loading Area Data		
Number of Pumps: **1**	Number of Liquids Loaded: **1**	Max number of trucks/rail cars loading at one (1) time: **1**
Are tanker trucks/rail cars pressure tested for leaks at this or any other location? ☐ Yes ☒ No ☐ Not Required If Yes, Please describe:		
Provide description of closed vent system and any bypasses.		
Are any of the following truck/rail car loadout systems utilized? ☐ Closed System to tanker truck/rail car passing a MACT level annual leak test? ☐ Closed System to tanker truck/rail car passing a NSPS level annual leak test? ☐ Closed System to tanker truck/rail car not passing an annual leak test and has vapor return?		

Projected Maximum Operating Schedule (for rack or transfer point as a whole)

Time	Jan – Mar	Apr - Jun	Jul – Sept	Oct - Dec
Hours/day	**24**	**24**	**24**	**24**
Days/week	**7**	**7**	**7**	**7**

Bulk Liquid Data (use extra pages as necessary)

Liquid Name	**Produced Water**		
Max. Daily Throughput (1000 gal/day)	**6.4**		
Max. Annual Throughput (1000 gal/yr)	**2,335.4**		
Loading Method[1]	**Submerged**		
Max. Fill Rate (gal/min)	**6.0**		
Average Fill Time (min/loading)	**200 min**		
Max. Bulk Liquid Temperature (^{o}F)	**70 F**		
True Vapor Pressure[2]	**NA**		
Cargo Vessel Condition[3]	**U**		

Control Equipment or Method[4]		**NA**		
Max. Collection Efficiency (%)		**NA**		
Max. Control Efficiency (%)		**NA**		
Max.VOC Emission Rate	Loading (lb/hr)	**<0.01**		
	Annual (ton/yr)	**<0.01**		
Max.HAP Emission Rate	Loading (lb/hr)	**<0.01**		
	Annual (ton/yr)	**<0.01**		
Estimation Method[5]		**ProMax**		

1 BF Bottom Fill SP Splash Fill SUB Submerged Fill
2 At maximum bulk liquid temperature
3 B Ballasted Vessel C Cleaned U Uncleaned (dedicated service)
O Other (describe)
4 List as many as apply (complete and submit appropriate Air Pollution Control Device Sheets)
CA Carbon Adsorption VB Dedicated Vapor Balance (closed system)
ECD Enclosed Combustion Device F Flare
TO Thermal Oxidization or Incineration
5 EPA EPA Emission Factor in AP-42 MB Material Balance
TM Test Measurement based upon test data submittal O Other (describe)

Attachment P
(Not Applicable)

Attachment Q

ATTACHMENT Q – PNEUMATIC CONTROLLERS DATA SHEET

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

☐ Yes ☒ No

Please list approximate number.

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

☐ Yes ☒ No

Please list approximate number.

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

☐ Yes ☒ No

Please list approximate number.

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

☐ Yes ☒ No

Please list approximate number.

Attachment R

ATTACHMENT R – PNEUMATIC PUMP DATA SHEET

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

☐ Yes ☒ No

Please list.

Source ID #	Date	Pump Make/Model	Pump Size

Attachment S

ATTACHMENT S – AIR POLLUTION CONTROL DEVICE / EMISSION REDUCTION DEVICE SHEETS

Complete the applicable air pollution control device sheets for each flare, vapor combustor, thermal oxidizer, condenser, adsorption system, vapor recovery unit, BTEX Eliminator, Reboiler with and without Glow Plug, etc. at the facility. Use extra pages if necessary.

Emissions calculations must be performed using the most conservative control device efficiency.

The following five (5) rows are only to be completed if registering an alternative air pollution control device.

Emission Unit ID: **ZZZ-0060**	Make/Model: **Flare Industries/ FEF-36**
Primary Control Device ID: **ZZZ-0060**	Make/Model:
Control Efficiency (%): **98 %**	APCD/ERD Data Sheet Completed: ☒ Yes ☐ No
Secondary Control Device ID:	Make/Model:
Control Efficiency (%):	APCD/ERD Data Sheet Completed: ☐ Yes ☐ No

VAPOR COMBUSTION
(Including Enclosed Combustors)

General Information

Control Device ID#: **ZZZ-0060**	Installation Date: **2013** ☐ New ☐ Modified ☐ Relocated	
Maximum Rated Total Flow Capacity **2,100 scfh** **50,400 scfd**	Maximum Design Heat Input (from mfg. spec sheet) **4.4 MMBTU/hr**	Design Heat Content **1,319 BTU/scf**

Control Device Information

Type of Vapor Combustion Control?

☒ Enclosed Combustion Device ☐ Elevated Flare ☐ Ground Flare
☐ Thermal Oxidizer

Manufacturer: **Flare Industries** Model: **FEF-36 or equivalent**	Hours of operation per year? **8760**

List the emission units whose emissions are controlled by this vapor control device (Emission Point ID# **ZZZ-0060**)

Emission Unit ID#	Emission Source Description	Emission Unit ID#	Emission Source Description
ABJ-0011	**Produced Water Tank**		
ABJ-0014	**Test Tank**		

If this vapor combustor controls emissions from more than six (6) emission units, please attach additional pages.

Assist Type (Flares only)	Flare Height	Tip Diameter	Was the design per §60.18?
☐ Steam ☐ Air ☐ Pressure ☒ Non	**30 feet**	**3 feet**	☐ Yes ☐ No Provide determination.

Waste Gas Information

Maximum Waste Gas Flow Rate **4.47 (scfm)**	Heat Value of Waste Gas Stream **2065.09 BTU/ft^3**	Exit Velocity of the Emissions Stream **0.01 (ft/s)**

Provide an attachment with the characteristics of the waste gas stream to be burned.

Pilot Gas Information

Number of Pilot Lights **1**	Fuel Flow Rate to Pilot Flame per Pilot **62 scfh**	Heat Input per Pilot **81,778 BTU/hr**	Will automatic re-ignition be used? ☒ Yes ☐ No

If automatic re-ignition is used, please describe the method. **Honeywell**

Is pilot flame equipped with a monitor to detect the presence of the flame? ☒ Yes ☐ No	If Yes, what type? ☐ Thermocouple ☐ Infrared ☒ Ultraviolet ☐ Camera ☐ Other:

Describe all operating ranges and maintenance procedures required by the manufacturer to maintain the warranty. *(If unavailable, please indicate).* N/A

Additional information attached? ☐ Yes ☒ No
Please attach copies of manufacturer's data sheets, drawings, flame demonstration per §60.18 or §63.11(b) and performance testing.

Attachment T

Line Heater
BAP-0110

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Basis / Source	Heater Rating (MMBtu/hr)	Heat Value of Natural Gas (Btu/scf)	Annual Operating Hours	Max. Hourly Emissions. (lb/hr)	Max. Annual Emissions. (tpy)
VOCs	5.5	$lb/10^6$ scf	AP-42 Chapter 1.4	1.00	1,319	8,760	<0.01	0.02
Hexane	1.8	$lb/10^6$ scf	AP-42 Chapter 1.4	1.00	1,319	8,760	<0.01	<0.01
Formaldehyde	0.075	$lb/10^6$ scf	AP-42 Chapter 1.4	1.00	1,319	8,760	<0.01	<0.01
Benzene	0.0021	$lb/10^6$ scf	AP-42 Chapter 1.4	1.00	1,319	8,760	<0.01	<0.01
Toluene	0.0034	$lb/10^6$ scf	AP-42 Chapter 1.4	1.00	1,319	8,760	<0.01	<0.01
Pb	0.0005	$lb/10^6$ scf	AP-42 Chapter 1.4	1.00	1,319	8,760	<0.01	<0.01
CO	84	$lb/10^6$ scf	AP-42 Chapter 1.4	1.00	1,319	8,760	0.06	0.279
NOx	100	$lb/10^6$ scf	AP-42 Chapter 1.4	1.00	1,319	8,760	0.08	0.332
PM_{10}	7.6	$lb/10^6$ scf	AP-42 Chapter 1.4	1.00	1,319	8,760	<0.01	0.025
SO_2	0.6	$lb/10^6$ scf	AP-42 Chapter 1.4	1.00	1,319	8,760	<0.01	<0.01
CO_2	53.06	kg CO_2 / MMBtu	40 CFR Subpart C	1.00	1,319	8,760	116.98	512.360
CH_4	0.001	kg CO_2 / MMBtu	40 CFR Subpart C	1.00	1,319	8,760	<0.01	<0.01
N_2O	0.0001	kg CO_2 / MMBtu	40 CFR Subpart C	1.00	1,319	8,760	<0.01	<0.01
Total HAPs							<0.01	<0.01
Total CO_2e							117.10	512.89

Notes:

-Emission rates displayed above represent the max. hourly and max. annual emissions for one line heater.

-Greenhouse Gas Emissions are calculated using 40 CFR 98 Subpart C Table C-1 and C-2 emission factors.

-AP-42, Chapter 1.4 references are from the July 1998 revision.

-Max. Annual Emissions based upon Max. Hourly Emissions @ 8760 hr/yr.

-CO_2 equivalency solved for using Global Warming Potentials found in 40CFR98 Table A-1 (Updated January 2014). GWP CO_2=1, GWP CH_4=25, GWP N_2O=298

Example Equations:

Max. Hourly Emission Rate **(lb/hr) =** Emission Factor **($lb/10^6$ scf)** ÷ Heating Value of Natural Gas **(Btu/scf)** x Boiler Rating (**MMBtu/hr)**

Flash Gas Compressor Engine - CBA-0050

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Basis / Source	Heat Value of Natural Gas (Btu/scf)	Rated bhp	BSFC (Btu/hp-hr)	Annual Operating Hours	% Reduction by Catalytic Converter	Max. Hourly Emissions. (lb/hr)	Max. Annual Emissions. (tpy)
VOCs	0.13	g/bhp-hr	Manufacturer Guarantee	1,319	47	9,889	8,760		0.01	0.06
Formaldehyde	0.09	g/bhp-hr	Manufacturer Guarantee	1,319	47	9,889	8,760		<0.01	0.04
Benzene	1.58E-03	lb/MMBtu	AP-42 Chapter 3.2	1,319	47	9,889	8,760		<0.01	<0.01
Toluene	5.58E-04	lb/MMBtu	AP-42 Chapter 3.2	1,319	47	9,889	8,760		<0.01	<0.01
Ethylbenzene	2.48E-05	lb/MMBtu	AP-42 Chapter 3.2	1,319	47	9,889	8,760		<0.01	<0.01
Xylenes	1.95E-04	lb/MMBtu	AP-42 Chapter 3.2	1,319	47	9,889	8,760		<0.01	<0.01
CO	5.10	g/bhp-hr	Manufacturer Guarantee	1,319	47	9,889	8,760	61%	0.21	0.91
NOx	12.80	g/bhp-hr	Manufacturer Guarantee	1,319	47	9,889	8,760	84%	0.21	0.91
PMFil-10/2.5	9.50E-03	lb/MMBtu	AP-42 Chapter 3.2	1,319	47	9,889	8,760		<0.01	0.02
PMCondensable	9.91E-03	lb/MMBtu	AP-42 Chapter 3.2	1,319	47	9,889	8,760		<0.01	0.02
SO_2	5.88E-04	lb/MMBtu	AP-42 Chapter 3.2	1,319	47	9,889	8,760		<0.01	<0.01
CO_2	53.06	kg CO_2 / MMBtu	40 CFR Subpart C	1,319	47	9,889	8,760		11.19	49.01
CH_4	0.001	kg CO_2 / MMBtu	40 CFR Subpart C	1,319	47	9,889	8,760		<0.01	<0.01
N_2O	1.00E-04	kg CO_2 / MMBtu	40 CFR Subpart C	1,319	47	9,889	8,760		<0.01	<0.01
Total HAPs									0.01	0.05
Total CO_2e									11.20	49.06

Notes:

- Engine emissions are controlled through the operation of a catalytic converter.
- Greenhouse Gas Emissions are calculated using 40 CFR 98 Subpart C Table C-1 and C-2 emission factors.
- AP-42, Chapter 3.2 references are from the August 2000 revision.
- Max. Annual Emissions based upon Max. Hourly Emissions @ 8760 hr/yr.
- CO_2 equivalency solved for using Global Warming Potentials found in 40CFR98 Table A-1 (Updated January 2014). GWP CO_2=1, GWP CH_4=25, GWP N_2O=298

Example Equations:

Max. Hourly Emission Rate **(lb/hr) =** Emission Factor **(lb/MMBtu)** x BSFC **(Btu/hp-hr)** ÷ 1,000,000 x Engine Rating **(bhp)**

Produced Water Tank ABJ-0011

Pollutant	Max. Uncontrolled Hourly Emissions using ProMax (lb/hr)	Max. Uncontrolled Annual Emissions using ProMax (tons/yr)
VOCs	11.16	48.90
Total HAPs	0.49	2.15
n-Hexane	0.49	2.15
Benzene	<0.01	<0.01
Toluene	<0.01	<0.01
Ethylbenzene	<0.01	<0.01
Xylenes	<0.01	<0.01
CO_2	<0.01	0.02
CH_4	1.05	4.58
Total CO_2e	26.17	114.63

Notes:

- Emission rates for Produced Water Tank ABJ-0011 were calculated using ProMax software. ProMax output sheets for the Crow Pad are attached.

- Emissions were calculated using Engineering Estimates to establish input to the ProMax software. Chevron has applied an industry standard assumption that 1% of the produced water realized in the tank will be condensate, based upon imperfect fluid separation.

- The emission rates displayed above are pre-control device emissions. Emissions are routed to Enclosed Ground Flare ZZZ-0060.

- CO_2 equivalency solved for using Global Warming Potentials found in 40CFR98 Table A-1 (Updated January 2014). GWP CO_2=1, GWP CH_4=25, GWP N_2O=298

Test Tank (ABJ-0014)

Pollutant	Max. Uncontrolled Hourly Emissions using ProMax (lb/hr)	Max. Uncontrolled Annual Emissions using ProMax (tons/yr)
VOCs	14.86	65.10
Total HAPs	0.59	2.60
n-Hexane	0.59	2.60
Benzene	<0.01	<0.01
Toluene	<0.01	<0.01
Ethylbenzene	<0.01	<0.01
Xylenes	<0.01	<0.01
CO_2	<0.01	0.026
CH_4	1.01	4.44
Total CO_2e	25.33	110.97

Notes:

- Emission rates for blowdown test tank ABJ-0014 were calculated using ProMax software. ProMax output sheets for the Crow Pad are attached.
- Emissions were calculated using Engineering Estimates to establish input to the ProMax software. Chevron has applied an industry standard assumption that 1% of the produced water realized in the tank will be condensate, based upon imperfect fluid separation.
- The emission rates displayed above are pre-control device emissions. Emissions are routed to Enclosed Ground Flare ZZZ-0060.
- CO_2 equivalency solved for using Global Warming Potentials found in 40CFR98 Subpart W Table A-1 (Updated January 2014). GWP CO_2=1, GWP CH_4=25, GWP N_2O=298

Equations

VOCs **(lb/hr)** = Total emission rate output from ProMax **(lb/hr)**

VOCs **(tons/yr)** = Max. Hourly Emissions **(lb/hr)** x 8760 (hrs/yr) ÷ 2000 (**lbs/ton**)

Uncontrolled Working and Breathing Emissions

Total Emissions from Tank Unloading Operations

Tank	Pollutant	Max. Hourly Emissions (lb/hr)	Max. Yearly Emissions (tons/yr)
PW Tank	VOCs	0.02	<0.01
Test Tank	VOCs	0.36	0.04
Totals	VOCs	0.37	0.04

Notes:

- Working and Breathing emissions will be uncontrolled from the Produced Water Tank and Test Tank for a maximum of 200 hours per year.
- Emission rates for Working and Breathing tank losses were calculated using ProMax software. All Working and Breathing losses were assumed to be VOCs to provide a conservative estimate of emissions. ProMax summary sheets are attached.

Tank Unloading Operations (LR-1)

Total Emissions from Tank Unloading Operations

Tank	Pollutant	Max. Hourly Emissions (lb/hr)	Max. Yearly Emissions (tons/yr)
PW Tank	VOCs	0.01	0.05
Test Tank	VOCs	0.01	0.05
Totals	VOCs	0.02	0.10

Notes:

- Tank Unloading Operations will be uncontrolled at the Crow natural gas production site
- Emission rates for liquid unloading operations were calculated using ProMax software. All loading losses were assumed to be VOCs to provide a conservative estimate of emissions. ProMax summary sheets are attached.

Vapor Destruction Unit (ZZZ-0060) - 4.4 MMBtu/hr

Emissions from Tanks

Input to Vapor Destruction Unit	Pollutant	Amount of Gas Sent to VDU (lbs/hr)	Amount of Gas Sent to VDU (tons/year)	Vapor Destruction Unit Combustion Efficiency	Max. Hourly Emissions (lb/hr)	Max. Yearly Emissions (tons/yr)
Produced Water Tank ABJ-0011	VOCs	11.16	48.90	98%	0.22	0.98
	HAPs	0.49	2.15	98%	<0.01	0.04
	Hexane	0.49	2.15	98%	<0.01	0.04
	Benzene	<0.01	<0.01	98%	<0.01	<0.01
	Toluene	<0.01	<0.01	98%	<0.01	<0.01
	Ethylbenzene	<0.01	<0.01	98%	<0.01	<0.01
	Xylene	<0.01	<0.01	98%	<0.01	<0.01
	CO_2	<0.01	0.02	98%	33.91	148.51
	CH_4	1.05	4.58	98%	0.02	0.09
Test Tank ABJ-0014	VOCs	14.86	65.10	98%	0.30	1.30
	HAPs	0.59	2.60	98%	0.01	0.05
	Hexane	0.59	2.60	98%	0.01	0.05
	Benzene	<0.01	<0.01	98%	<0.01	<0.01
	Toluene	<0.01	<0.01	98%	<0.01	<0.01
	Ethylbenzene	<0.01	<0.01	98%	<0.01	<0.01
	Xylene	<0.01	<0.01	98%	<0.01	<0.01
	CO_2	<0.01	0.03	98%	49.73	217.81
	CH_4	1.01	4.44	98%	0.02	0.09
Totals	VOCs	26.03	114.00	--	0.52	2.28
	HAPs	1.08	4.75	--	0.02	0.10
	Hexane	1.08	4.75	--	0.02	0.09
	Benzene	<0.01	<0.01	--	<0.01	<0.01
	Toluene	<0.01	<0.01	--	<0.01	<0.01
	Ethylbenzene	<0.01	<0.01	--	<0.01	<0.01
	Xylene	<0.01	<0.01	--	<0.01	<0.01
	CO_2	0.01	0.04	--	83.63	366.32
	CH_4	2.06	9.02	--	0.04	0.18
	CO2e	51.51	225.60	--	84.66	370.83

Gas Composition of Vent Gas

Gas Stream	Mole Fraction
Methane	0.20
Ethane	0.21
Propane	0.24
Butane	0.17
Pentanes	0.09
Carbon Dioxide	0.000

Vent Gas Properties

Vent Gas Properties	Mass Flow Rate (lb/hr)	Density (lb/ft^3)
Produced Water Tank	13.78	0.11
Test Tank	20.16	0.11

Emissions from Pilot Operations

Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factors (kg XX/MMBtu)	Heat Value of Natural Gas (Btu/scf)	Enclosed Ground Flare Pilot Rating (Btu/hr)	Enclosed Ground Flare Burner Rating (Btu/hr)	Pilot Max. Hourly Emissions (lb/yr)	Pilot Max. Hourly Emissions (tons/yr)	Burner Max.Hourly Emissions (lb/hr)	Burner Max.Hourly Emissions (tons/hr)	Max. Hourly Emissions (lb/hr)	Max. Yearly Emissions (tons/yr)
VOCs	5.50	--	1,088	30,000	4,400,000	<0.01	<0.01	--	--	<0.01	<0.01
Hexane	1.80	--	1,088	30,000	4,400,000	<0.01	<0.01	--	--	<0.01	<0.01
Formaldehyde	0.075	--	1,088	30,000	4,400,000	<0.01	<0.01	--	--	<0.01	<0.01
CO	84	--	1,088	30,000	4,400,000	<0.01	0.01	0.34	1.49	0.34	1.50
NO_x	100	--	1,088	30,000	4,400,000	<0.01	0.01	0.40	1.77	0.41	1.78
$PM_{Condensable}$	5.70	--	1,088	30,000	4,400,000	<0.01	<0.01	0.02	0.10	0.02	0.10
$PM_{Filterable}$	1.90	--	1,088	30,000	4,400,000	<0.01	<0.01	<0.01	0.03	<0.01	0.03
PM_{Total}	7.60	--	1,088	30,000	4,400,000	<0.01	<0.01	0.03	0.13	0.03	0.14
SO_2	0.60	--	1,088	30,000	4,400,000	<0.01	<0.01	<0.01	0.01	<0.01	0.01
CO_2	120,000	53.06	1,088	30,000	4,400,000	3.51	15.37	514.70	2,254.38	518.21	2,269.75
CH_4	2.3	0.001	1,088	30,000	4,400,000	<0.01	<0.01	<0.01	0.04	<0.01	0.04
N_2O	2.2	<0.001	1,088	30,000	4,400,000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total HAPs										<0.01	<0.01
CO_2e										518.74	2,272.10

Total Enclosed Combustion Device Emissions

Pollutant	Max. Hourly Emissions (lb/hr)	Max. Yearly Emissions (tons/yr)
VOCs	0.52	2.28
HAPs	0.02	0.10
CO	0.34	1.50
NO_x	0.41	1.78
$PM_{Condensable}$	0.02	0.10
$PM_{Filterable}$	<0.01	0.03
PM_{Total}	0.03	0.14
SO_2	<0.01	0.01
CO_2	601.84	2,636.07
CH_4	0.05	0.22
N_2O	<0.01	<0.01
CO_2e	603.41	2,642.93

Notes:

- Emissions from Enclosed Combustion Device Operations from AP-42, Chapter 1.4 references are from the July 1998 revision.
- Greenhouse Gas Emissions from the Enclosed Combustion Device Pilot and Burner calculated using 40 CFR 98 Subpart C Table C-1 and C-2 emission factors.
- Max. Annual Emissions based upon Max. Hourly Emissions @ 8760 hr/yr.
- CO_2 equivalency solved for using Global Warming Potentials found in 40CFR98 Table A-1 (Updated January 2014). GWP CO_2=1, GWP CH_4=25, GWP N_2O=298

Example Calculations:

- Emissions from Tanks VOCs (lb/hr) = Amount of Gas sent to Enclosed Combustion Device (lb/hr) x 0.02 = Max. Hourly Emissions (lb/hr)
- Emissions from Enclosed Combustion Device Operations (lb/hr) = Emission factor (lb/106 Btu) x Heat Value of Natural Gas (Btu/scf) ÷ 1,000,000 x Enclosed Combustion Device Pilot Gas Usage (mcfd) x 1,000 ÷ 24
- Emissions from Enclosed Combustion Device Vapor Destruction CO2 Methodologies shown below sample equation

- Emissions from Enclosed Combustion Device Operations CO2 (tons/yr) = ((Enclosed Combustion Device Pilot Gas Usage (mcfd) x 1,000 x 365 x Fraction of Gas Combusted by Enclosed Combustion Device x Mole Fraction of Methane x Number of Carbon Atoms in Methane) + … + (Enclosed Combustion Device Pilot Gas Usage (mcfd) x 1,000 x 365 x Fraction of Gas Combusted by Enclosed Combustion Device x Mole Fraction of Pentanes-plus x Number of Carbon Atoms in Pentanes-plus)) x .0526 (kg/ft3) CO2 x .001 x 1.102 tons/tonnes

$$E_{a,CH_4}(un-combusted) = V_a * (1-\eta) * X_{CH4} \qquad \text{(Eq. W-19)}$$

$$E_{a,CO2}(un-combusted) = V_a * X_{CO2} \qquad \text{(Eq. W-20)}$$

$$E_{a,CO2}(combusted) = \sum_{J=1}^{5} (\eta * V_a * Y_j * R_j) \qquad \text{(Eq. W-21)}$$

Where:

Ea,CH_4(un-combusted) = Contribution of annual un-combusted CH4 emissions from Enclosed Combustion Device stack in cubic feet, under actual conditions.

Ea,CO_2(un-combusted) = Contribution of annual un-combusted CO2 emissions from Enclosed Combustion Device stack in cubic feet, under actual conditions.

Ea,CO_2(combusted) = Contribution of annual combusted CO2 emissions from Enclosed Combustion Device stack in cubic feet, under actual conditions.

Va = Volume of gas sent to Enclosed Combustion Device in cubic feet, during the year.

η = Fraction of gas combusted by a burning Enclosed Combustion Device (default is 0.98). For gas sent to an unlit Enclosed Combustion Device, η is zero.

XCH4 = Mole fraction of CH4 in gas to the Enclosed Combustion Device.

XCO2 = Mole fraction of CO2 in gas to the Enclosed Combustion Device.

Y_j = Mole fraction of gas hydrocarbon constituents j (such as methane, ethane, propane, butane, and pentanes-plus).

R_j = Number of carbon atoms in the gas hydrocarbon constituent j: 1 for methane, 2 for ethane, 3 for propane, 4 for butane, and 5 for pentanes plus).

Fugitive Emissions from Unpaved Haul Roads

Constant	Industrial Roads		
	PM	PM-10	PM-2.5
k (lb/VMT)	4.9	1.5	0.15
a	0.7	0.9	0.9
b	0.45	0.45	0.45

where

k		Patricle size multiplier[1]
s	4.8	Silt content of road surface material (%)
p	150	Number of days per year with precipitation

Item Number	Description	Number of Wheels	W: Mean Vehicle Weight (tons)	Mean Vehicle Speed (mph)	Miles per Trip	Maximum Trips per Hour	Maximum Trips per Year	Control Device ID Number	Control Efficiency (%)	PM Emissions (lbs/hr)	PM Emissions (tons/yr)	PM-10 Emissions (lbs/hr)	PM-10 Emissions (tons/yr)	PM-2.5 Emissions (lbs/hr)	PM-2.5 Emissions (tons/yr)
1	Liquids Hauling	14	30	10	0.32	1	289,080	NA	NA	1.37	198.12	0.35	50.49	0.03	5.05
2	Employee Vehicles	4	3	10	0.32	1	200	NA	NA	0.49	0.05	0.12	0.01	0.01	0.001
									Totals:	**1.86**	**198.17**	**0.47**	**50.51**	**0.05**	**5.05**

Notes:

[1] - Particle Size Multiplier used from AP-42 13.2.2 - Final Version 11/2006

[2] - Silt Content of Road Surface uses Sand and Gravel Processing Plant Road from AP-42 13.2.2 - Final Version 11/2006

[3] - Number of days per year with precipitation >0.01 in3 found using AP-42 13.2.2 Figure 13.2.2-1 - Final Version 11/2006

Example Calculations:

Emissions (lb/Vehicle Mile Traveled) - $E = k \times (s/12)^a \times (W/3)^b$ Equation 1a from AP-42 13.2.2 - Final Version 11/2006

Size Specific Emissions (lb/VMT) - $E_{ext} = E[(365-p)/365]$ Equation 2 from AP-42 13.2.2 - Final Version 11/2006

Fugitive Leaks

Default Average Component Counts for Major Onshore Natural Gas Production Equipment[1]				
Facility Equipment Type	**Valves**	**Connectors**	**Open-ended Lines**	**Pressure Relief Valves**
Wellheads	8	38	0.5	0
Separators	1	6	0	0
Meters/Piping	12	45	0	0
Compressors	12	57	0	0
In-line Heaters	14	65	2	1
Dehydrators	24	90	2	2

[1]- Table W-1B to 40CFR98 Subpart W

Well Specific Equipment Counts	
Facility Equipment Type	**Count on Site**
Wellheads	1
Separators	1
Meters/Piping	2
Compressors	1
In-line Heaters	1
Dehydrators	0

Well Gas Composition														
Emissions from Flaring Operations	**Propane**	**Butane**	**Pentanes**	**Heptane**	**Octane**	**Nonanes**	**Decanes**	**n-Hexane**	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylene**	**CO_2**	**CH_4**
Mole %	7.187	3.30	1.50	0.35	0.53	0.33	0.289	0.39	0.01	0.026	0.023	0.070	0.15	66.90
MW	44	58	72	100	114	128.000	142	86.00	78.00	92.00	106.00	106.00	44.00	16.00

Fugitive Emissions													
Facility Equipment Type	**Total Count**	**Emission Rate (scf/hr/component)[2]**	**Hours of Operation**	**VOCs (lbs/hr)**	**VOCs (tons/yr)**	**HAPs (lbs/hr)**	**HAPs (tons/yr)**	**CO_2 (lbs/hr)**	**CO_2 (tons/yr)**	**CH_4 (lbs/hr)**	**CH_4 (tons/yr)**	**Total CO_2e (lbs/hr)**	**Total CO_2e (tons/yr)**
Valves	59	0.027	8760	0.03	0.15	<0.01	<0.01	<0.01	<0.01	0.04	0.19	1.11	4.84
Connectors	256	0.003	8760	0.02	0.07	<0.01	<0.01	<0.01	<0.01	0.02	0.09	0.53	2.34
Open-ended Lines	3	0.06	8760	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.11	0.46
Pressure Relief Valves	1	0.04	8760	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.12
			Total Emissions:	**0.06**	**0.24**	**<0.01**	**0.01**	**<0.01**	**<0.01**	**0.07**	**0.31**	**1.77**	**7.77**

[2]- Table W-1A to 40CFR98 Subpart W

Notes:
-The "Wellstream" gas composition in the attached ProMax simulations is utilized to calculate emission from fugitive leaks for the most conservative estimate.

Example Equations:
Fugitive Emissions (lb/hr) = Count x Emission Rate x Hours of Operation ÷ 385.5 scf/lbmol x mol VOC's

Crow Natural Gas Production Site Total Emissions

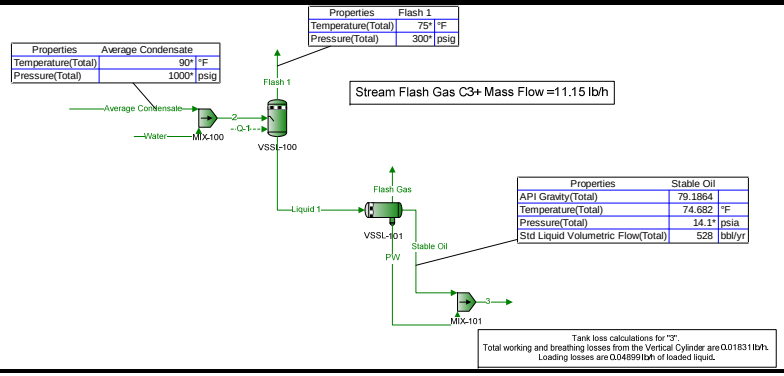
	VOCs		HAPs		CO		NO_x		PM - 10/2.5		SO_2		CO_2		CH_4		N_2O		CO_2e	
Emission Sources	**lb/hr**	**tons/yr**	**lb/hr**	**tons/yr**	**lb/hr**	**tons/yr**	**lb/hr**	**tons/yr**	**lb/hr**	**tons/yr**	**lb/hr**	**tons/yr**	**lb/hr**	**tons/yr**	**lb/hr**	**tons/yr**	**lb/hr**	**tons/yr**	**lb/hr**	**tons/yr**
Line Heater (E0110)	<0.01	0.02	<0.01	<0.01	0.06	0.28	0.08	0.33	<0.01	0.03	<0.01	<0.01	116.98	512.36	<0.01	<0.01	<0.01	<0.01	117.10	512.89
Flash Gas Compressor (E0050)	0.01	0.06	0.01	0.05	0.21	0.91	0.21	0.91	<0.01	0.02	<0.01	<0.01	11.19	49.01	<0.01	<0.01	<0.01	<0.01	11.20	49.06
Vapor Destruction Unit (ZZZ-0060)	0.52	2.28	0.02	0.10	0.34	1.50	0.41	1.78	<0.01	0.03	<0.01	0.01	601.84	2,636.07	0.05	0.22	<0.01	<0.01	603.41	2,642.93
Tank Truck Loading Activities (VS-1)	0.02	0.10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Uncontrolled Tank Working & Breathing Losses	0.37	0.04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Haul Roads	--	--	--	--	--	--	--	--	0.52	55.56	--	--	--	--	--	--	--	--	--	--
Fugitives Leaks	0.06	0.24	<0.01	0.01	--	--	--	--	--	--	--	--	<0.01	<0.01	0.07	0.31	--	--	1.77	7.77
Totals	**0.99**	**2.74**	**0.03**	**0.15**	**0.61**	**2.68**	**0.69**	**3.02**	**0.52**	**55.63**	**<0.01**	**0.01**	**730.01**	**3,197.44**	**0.12**	**0.53**	**<0.01**	**<0.01**	**733.48**	**3,212.64**

Crow Site Total Controlled Emission Levels - HAP Speciation

	Total HAPs		n-Hexane		Benzene		Toluene		Ethylbenzene		Xylene		Formaldehyde	
Emission Sources	**lb/hr**	**tons/yr**	**lb/hr**	**tons/yr**	**lb/hr**	**tons/yr**	**lb/hr**	**tons/yr**	**lb/hr**	**tons/yr**	**lb/hr**	**tons/yr**	**lb/hr**	**tons/yr**
Line Heater (E0110)	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Flash Gas Compressor (E0050)	0.01	0.05	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04
Vapor Destruction Unit (ZZZ-0060)	0.02	0.10	0.02	0.09	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tank Truck Loading Activities (VS-1)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Uncontrolled Working and Breathing	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Haul Roads	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fugitives Leaks	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	--
Totals	**0.03**	**0.15**	**0.02**	**0.10**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**0.04**

Crow 1H
Plant Schematic

Client Name:	Chevron Appalachia, LLC	Job: Crow Produced Water
Location:		
Flowsheet:	Crow 1H	



Process Streams Report
All Streams
Tabulated by Total Phase

Client Name:	Chevron Appalachia, LLC	Job: Crow Produced Water
Location:		
Flowsheet:	Crow 1H	

Connections

	Average Condensate	Flash Gas	Flash 1	Liquid 1	PW
From Block	--	VSSL-101	VSSL-100	VSSL-100	VSSL-101
To Block	MIX-100	--	--	VSSL-101	MIX-101

Stream Composition

Mole Fraction	Average Condensate %	Flash Gas %	Flash 1 %	Liquid 1 %	PW %
Nitrogen	0	0		0	0
Carbon Dioxide	0.0228112	0.0282082		9.42714E-05	1.33658E-05
Methane	13.6989	19.651		0.056613	0.000460267
Ethane	14.5567	20.5911		0.0601582	0.000560751
Propane	17.2894	23.6104		0.0714514	0.000713233
i-Butane	3.01413	3.82781		0.0124564	3.99588E-05
n-Butane	10.7646	12.9487		0.0444866	0.00029666
i-Pentane	3.54938	3.4518		0.0146684	5.43031E-05
n-Pentane	6.13992	5.35181		0.0253743	8.29062E-05
Neohexane	0.05399	0.0358709		0.000223123	1.90903E-07
2-Methylpentane	2.24019	1.16314		0.009258	8.52871E-06
3-Methylpentane	1.14508	0.553315		0.00473223	1.10463E-05
n-Hexane	4.1568	1.71642		0.0171787	1.00093E-05
Heptane	23.3681	4.05881		0.0965728	2.7005E-05
Water	0	3.01154		99.5867	99.9977

Molar Flow	Average Condensate lbmol/h	Flash Gas lbmol/h	Flash 1 lbmol/h	Liquid 1 lbmol/h	PW lbmol/h
Nitrogen	0	0	0	0	0
Carbon Dioxide	0.00010979	9.36583E-05	0	0.00010979	1.55007E-05
Methane	0.0659325	0.0652461	0	0.0659325	0.000533785
Ethane	0.0700613	0.0683675	0	0.0700613	0.00065032
Propane	0.0832136	0.0783925	0	0.0832136	0.000827158
i-Butane	0.014507	0.0127093	0	0.014507	4.63414E-05
n-Butane	0.0518099	0.042993	0	0.0518099	0.000344046
i-Pentane	0.0170831	0.0114608	0	0.0170831	6.2977E-05
n-Pentane	0.0295514	0.0177693	0	0.0295514	9.61488E-05
Neohexane	0.000259853	0.0001191	0	0.000259853	2.21396E-07
2-Methylpentane	0.010782	0.00386191	0	0.010782	9.89101E-06
3-Methylpentane	0.00551124	0.00183714	0	0.00551124	1.28108E-05
n-Hexane	0.0200066	0.00569892	0	0.0200066	1.1608E-05
Heptane	0.11247	0.0134762	0	0.11247	3.13186E-05
Water	0	0.00999905	0	115.98	115.97

Mass Fraction	Average Condensate %	Flash Gas %	Flash 1 %	Liquid 1 %	PW %
Nitrogen	0	0		0	0
Carbon Dioxide	0.0169668	0.028559		0.000228142	3.26503E-05
Methane	3.71417	7.25231		0.0499419	0.000409852
Ethane	7.39756	14.2436		0.0994701	0.000935915
Propane	12.8849	23.9508		0.173254	0.00174572
i-Butane	2.9608	5.11814		0.039812	0.000128914
n-Butane	10.5742	17.3137		0.142184	0.000957079
i-Pentane	4.32799	5.72922		0.0581956	0.000217471
n-Pentane	7.48681	8.88281		0.10067	0.000332019
Neohexane	0.0786324	0.0711125		0.00105732	9.13153E-07
2-Methylpentane	3.26268	2.30588		0.0438711	4.07956E-05
3-Methylpentane	1.66772	1.09692		0.0224247	5.28383E-05
n-Hexane	6.05408	3.40272		0.0814052	4.78775E-05
Heptane	39.5736	9.35611		0.53212	0.000150199

Process Streams Report
All Streams
Tabulated by Total Phase

Client Name:	Chevron Appalachia, LLC	Job: Crow Produced Water
Location:		
Flowsheet:	Crow 1H	

Mass Fraction	Average Condensate %	Flash Gas %	Flash 1 %	Liquid 1 %	PW %
Water	0	1.2481		98.6554	99.9949

Mass Flow	Average Condensate lb/h	Flash Gas lb/h	Flash 1 lb/h	Liquid 1 lb/h	PW lb/h
Nitrogen	0	0	0	0	0
Carbon Dioxide	0.00483181	0.00412185	0	0.00483181	0.000682178
Methane	1.05772	1.04671	0	1.05772	0.00856323
Ethane	2.10668	2.05575	0	2.10668	0.0195545
Propane	3.66935	3.45676	0	3.66935	0.036474
i-Butane	0.843178	0.73869	0	0.843178	0.00269346
n-Butane	3.01131	2.49885	0	3.01131	0.0199967
i-Pentane	1.23252	0.826886	0	1.23252	0.00454372
n-Pentane	2.13209	1.28204	0	2.13209	0.00693702
Neohexane	0.0223929	0.0102635	0	0.0223929	1.90789E-05
2-Methylpentane	0.929145	0.332802	0	0.929145	0.000852361
3-Methylpentane	0.474934	0.158316	0	0.474934	0.00110397
n-Hexane	1.72408	0.491107	0	1.72408	0.00100033
Heptane	11.2698	1.35035	0	11.2698	0.00313818
Water	0	0.180136	0	2089.42	2089.24

Stream Properties

Property	Units	Average Condensate	Flash Gas	Flash 1	Liquid 1	PW
Temperature	°F	90 *	74.6823	75 *	75	74.6823
Pressure	psia	1014.1 *	14.1	314.1 *	314.1	14.1
Mole Fraction Vapor	%	0	100		0	0
Mole Fraction Light Liquid	%	100	0		0.366535	100
Mole Fraction Heavy Liquid	%	0	0		99.6335	0
Molecular Weight	lb/lbmol	59.1691	43.469		18.1854	18.0158
Mass Density	lb/ft^3	36.1706	0.108542		61.6836	62.2296
Molar Flow	lbmol/h	0.481299	0.332025	0	116.462	115.973
Mass Flow	lb/h	28.478	14.4328	0	2117.9	2089.35
Vapor Volumetric Flow	ft^3/h	0.787324	132.969		34.3349	33.5748
Liquid Volumetric Flow	gpm	0.0981599	16.578		4.28071	4.18595
Std Vapor Volumetric Flow	MMSCFD	0.00438349	0.00302396	0	1.06069	1.05624
Std Liquid Volumetric Flow	sgpm	0.0995804 *	0.0573062	0	4.27648	4.17699
Compressibility		0.281225	0.984708		0.0161388	0.000711842
Specific Gravity		0.579945	1.50087		0.989011	0.997765
API Gravity		104.704			11.2359	10.0152
Enthalpy	Btu/h	-30903	-16041.6	0	-1.42868E+07	-1.42568E+07
Mass Enthalpy	Btu/lb	-1085.15	-1111.47		-6745.73	-6823.59
Mass Cp	Btu/(lb*°F)	0.571155	0.412858		0.977111	0.982817
Ideal Gas CpCv Ratio		1.08909	1.12539		1.32218	1.32561
Dynamic Viscosity	cP	0.169009	0.00844841		0.919778	0.938939
Kinematic Viscosity	cSt	0.291698	4.85909		0.925684	0.941932
Thermal Conductivity	Btu/(h*ft*°F)	0.061802	0.0112589		0.34255	0.34921
Surface Tension	lbf/ft	0.000405466 ?			0.0049111 ?	0.00500668 ?
Net Ideal Gas Heating Value	Btu/ft^3	3059.97	2249.07		12.6459	0.0476759
Net Liquid Heating Value	Btu/lb	19472.5	19476.3		-783.676	-1058.71
Gross Ideal Gas Heating Value	Btu/ft^3	3315.16	2446.17		63.8026	50.3607
Gross Liquid Heating Value	Btu/lb	21109.2	21196.9		283.841	1.08571

Remarks

* User Specified Values
? Extrapolated or Approximate Values

Process Streams Report
All Streams
Tabulated by Total Phase

Client Name:	Chevron Appalachia, LLC	Job: Crow Produced Water
Location:		
Flowsheet:	Crow 1H	

Connections

	Stable Oil	Water	2	3	
From Block	VSSL-101	--	MIX-100	MIX-101	
To Block	MIX-101	MIX-100	VSSL-100	--	

Stream Composition

Mole Fraction	Stable Oil %	Water %	2 %	3 %	
Nitrogen	0	0	0	0	
Carbon Dioxide	0.000402787	0	9.42714E-05	1.38912E-05	
Methane	0.0973936	0	0.056613	0.000591059	
Ethane	0.665932	0	0.0601582	0.00145854	
Propane	2.54887	0	0.0714514	0.00415147	
i-Butane	1.11771	0	0.0124564	0.00154803	
n-Butane	5.40726	0	0.0444866	0.0075923	
i-Pentane	3.54785	0	0.0146684	0.00484136	
n-Pentane	7.45775	0	0.0253743	0.0101456	
Neohexane	0.0896851	0	0.000223123	0.000121203	
2-Methylpentane	4.41	0	0.009258	0.00595895	
3-Methylpentane	2.33658	0	0.00473223	0.00316379	
n-Hexane	9.12356	0	0.0171787	0.0123205	
Heptane	63.1566	0	0.0965728	0.0852445	
Water	0.0403673	100	99.5867	99.8628	

Molar Flow	Stable Oil lbmol/h	Water lbmol/h	2 lbmol/h	3 lbmol/h	
Nitrogen	0	0	0	0	
Carbon Dioxide	6.31144E-07	0	0.00010979	1.61318E-05	
Methane	0.00015261	0	0.0659325	0.000686396	
Ethane	0.00104348	0	0.0700613	0.0016938	
Propane	0.00399394	0	0.0832136	0.00482109	
i-Butane	0.00175138	0	0.014507	0.00179773	
n-Butane	0.00847288	0	0.0518099	0.00881692	
i-Pentane	0.00555929	0	0.0170831	0.00562226	
n-Pentane	0.0116859	0	0.0295514	0.011782	
Neohexane	0.000140531	0	0.000259853	0.000140753	
2-Methylpentane	0.00691023	0	0.010782	0.00692012	
3-Methylpentane	0.00366129	0	0.00551124	0.0036741	
n-Hexane	0.0142961	0	0.0200066	0.0143077	
Heptane	0.0989629	0	0.11247	0.0989942	
Water	6.32532E-05	115.98	115.98	115.97	

Mass Fraction	Stable Oil %	Water %	2 %	3 %	
Nitrogen	0	0	0	0	
Carbon Dioxide	0.000196703	0	0.000228142	3.37517E-05	
Methane	0.0173377	0	0.0499419	0.000523492	
Ethane	0.222197	0	0.0994701	0.00242128	
Propane	1.24719	0	0.173254	0.0101066	
i-Butane	0.720875	0	0.039812	0.00496741	
n-Butane	3.48746	0	0.142184	0.0243626	
i-Pentane	2.84043	0	0.0581956	0.0192843	
n-Pentane	5.97072	0	0.10067	0.0404123	
Neohexane	0.0857616	0	0.00105732	0.00057664	
2-Methylpentane	4.21708	0	0.0438711	0.0283505	
3-Methylpentane	2.23436	0	0.0224247	0.0150522	
n-Hexane	8.72444	0	0.0814052	0.0586162	
Heptane	70.2239	0	0.53212	0.471574	
Water	0.00806975	100	98.6554	99.3237	

Process Streams Report
All Streams
Tabulated by Total Phase

Client Name:	Chevron Appalachia, LLC	Job: Crow Produced Water
Location:		
Flowsheet:	Crow 1H	

Mass Flow	Stable Oil lb/h	Water lb/h	2 lb/h	3 lb/h
Nitrogen	0	0	0	0
Carbon Dioxide	2.77763E-05	0	0.00483181	0.000709955
Methane	0.00244825	0	1.05772	0.0110115
Ethane	0.0313764	0	2.10668	0.0509309
Propane	0.176115	0	3.66935	0.212589
i-Butane	0.101794	0	0.843178	0.104488
n-Butane	0.492462	0	3.01131	0.512459
i-Pentane	0.401096	0	1.23252	0.405639
n-Pentane	0.843122	0	2.13209	0.850059
Neohexane	0.0121103	0	0.0223929	0.0121294
2-Methylpentane	0.595491	0	0.929145	0.596344
3-Methylpentane	0.315513	0	0.474934	0.316617
n-Hexane	1.23197	0	1.72408	1.23297
Heptane	9.91627	0	11.2698	9.91941
Water	0.00113952	2089.42	2089.42	2089.24

Stream Properties

Property	Units	Stable Oil	Water	2	3
Temperature	°F	74.6823	90 *	90.0283	74.6823
Pressure	psia	14.1 *	1014.1 *	1014.1	14.1
Mole Fraction Vapor	%	0	0	0	0
Mole Fraction Light Liquid	%	100	100	0.366004	0.13493
Mole Fraction Heavy Liquid	%	0	0	99.634	99.8651
Molecular Weight	lb/lbmol	90.1177	18.0153	18.1854	18.1131
Mass Density	lb/ft^3	41.4264	62.1238	61.5645	62.0205
Molar Flow	lbmol/h	0.156694	115.98	116.462	116.13
Mass Flow	lb/h	14.1209	2089.42	2117.9	2103.47
Vapor Volumetric Flow	ft^3/h	0.340868	33.6332	34.4013	33.9156
Liquid Volumetric Flow	gpm	0.0424978	4.19323	4.28899	4.22844
Std Vapor Volumetric Flow	MMSCFD	0.00142711	1.05631	1.06069	1.05767
Std Liquid Volumetric Flow	sgpm	0.0421918	4.1769 *	4.27648	4.21918
Compressibility		0.00534885	0.0498538	0.0507789	0.000718098
Specific Gravity		0.664214	0.996068	0.987101	0.994413
API Gravity		79.1864	9.89095	11.1262	10.4838
Enthalpy	Btu/h	-13904	-1.42207E+07	-1.42516E+07	-1.42707E+07
Mass Enthalpy	Btu/lb	-984.64	-6806.02	-6729.1	-6784.39
Mass Cp	Btu/(lb*°F)	0.514546	0.980196	0.975134	0.979673
Ideal Gas CpCv Ratio		1.05937	1.32489	1.32137	1.32365
Dynamic Viscosity	cP	0.32547	0.793234	0.77745	0.932774
Kinematic Viscosity	cSt	0.49047	0.797118	0.784429	0.937395
Thermal Conductivity	Btu/(h*ft*°F)	0.0697371	0.355983	0.348989	0.346401
Surface Tension	lbf/ft	0.0012702 ?	0.00489079	0.00479218 ?	0.00496913 ?
Net Ideal Gas Heating Value	Btu/ft^3	4598.03	0	12.6459	6.25175
Net Liquid Heating Value	Btu/lb	19203.1	-1059.76	-783.676	-922.688
Gross Ideal Gas Heating Value	Btu/ft^3	4964.34	50.31	63.8026	56.9912
Gross Liquid Heating Value	Btu/lb	20745.6	0	283.841	140.347

Remarks

Energy Stream Report

Client Name:	Chevron Appalachia, LLC	Job: Crow Produced Water
Location:		
Flowsheet:	Crow 1H	

Energy Streams

Energy Stream	Energy Rate	Power	From Block	To Block
Q-1	-35219.1 Btu/h	-13.8416 hp	--	VSSL-100

Remarks

Blocks
MIX-100
Mixer/Splitter Report

Client Name:	Chevron Appalachia, LLC	Job: Crow Produced Water	
Location:		Modified: 11:35 AM, 8/13/2013	
Flowsheet:	Crow 1H	Status: Solved 9:45 AM, 7/17/2014	

Connections

Stream	Connection Type	Other Block	Stream	Connection Type	Other Block
Average Condensate	Inlet		Water	Inlet	
2	Outlet	VSSL-100			

Block Parameters

Pressure Drop	0 psi	Fraction to PStream 2	100 %

Remarks

Blocks
MIX-101
Mixer/Splitter Report

Client Name:	Chevron Appalachia, LLC	Job: Crow Produced Water
Location:		Modified: 11:35 AM, 8/13/2013
Flowsheet:	Crow 1H	Status: Solved 9:45 AM, 7/17/2014

Connections

Stream	Connection Type	Other Block	Stream	Connection Type	Other Block
Stable Oil	Inlet	VSSL-101	PW	Inlet	VSSL-101
3	Outlet				

Block Parameters

Pressure Drop	0 psi	Fraction to PStream 3	100 %

Remarks

Blocks
VSSL-100
Separator Report

Client Name:	Chevron Appalachia, LLC	Job: Crow Produced Water
Location:		Modified: 11:35 AM, 8/13/2013
Flowsheet:	Crow 1H	Status: Solved 9:45 AM, 7/17/2014

Connections

Stream	Connection Type	Other Block	Stream	Connection Type	Other Block
2	Inlet	MIX-100	Flash 1	Vapor Outlet	
Liquid 1	Light Liquid Outlet	VSSL-101	Q-1	Energy	

Block Parameters

Pressure Drop	700	psi	Main Liquid Phase	Light Liquid	
Mole Fraction Vapor	0	%	Heat Duty	-35219.1	Btu/h
Mole Fraction Light Liquid	0.366535	%	Heat Release Curve Type	Plug Flow	
Mole Fraction Heavy Liquid	99.6335	%	Heat Release Curve Increments	5	

Remarks

Blocks
VSSL-101
Separator Report

Client Name:	Chevron Appalachia, LLC	Job: Crow Produced Water	
Location:		Modified: 11:35 AM, 8/13/2013	
Flowsheet:	Crow 1H	Status: Solved 9:45 AM, 7/17/2014	

Connections

Stream	Connection Type	Other Block	Stream	Connection Type	Other Block
Liquid 1	Inlet	VSSL-100	Flash Gas	Vapor Outlet	
Stable Oil	Light Liquid Outlet	MIX-101	PW	Heavy Liquid Outlet	MIX-101

Block Parameters

Pressure Drop	300	psi	Main Liquid Phase	Light Liquid	
Mole Fraction Vapor	0.285093	%	Heat Duty	0	Btu/h
Mole Fraction Light Liquid	0.134546	%	Heat Release Curve Type	Plug Flow	
Mole Fraction Heavy Liquid	99.5804	%	Heat Release Curve Increments	5	

Remarks

Flowsheet Environment
Environment1

Client Name:	Chevron Appalachia, LLC	Job: Crow Produced Water
Location:		
Flowsheet:	Crow 1H	

Environment Settings

Number of Poynting Intervals	0	Freeze Out Temperature Threshold Difference	10 °F
Gibbs Excess Model Evaluation Temperature	77 °F	Phase Tolerance	1 %

Components

Component Name	Henry`s Law Component	Phase Initiator	Component Name	Henry`s Law Component	Phase Initiator
Nitrogen	False	False	n-Pentane	False	False
Carbon Dioxide	False	False	Neohexane	False	False
Methane	False	False	2-Methylpentane	False	False
Ethane	False	False	3-Methylpentane	False	False
Propane	False	False	n-Hexane	False	False
i-Butane	False	False	Heptane	False	False
n-Butane	False	False	Water	False	True
i-Pentane	False	False			

Physical Property Method Sets

Liquid Molar Volume	COSTALD	Overall Package	Peng-Robinson
Stability Calculation	Peng-Robinson	Vapor Package	Peng-Robinson
Light Liquid Package	Peng-Robinson	Heavy Liquid Package	Peng-Robinson

Remarks

Environments Report

Client Name:	Chevron Appalachia, LLC	Job: Crow Produced Water
Location:		

Project-Wide Constants

Atmospheric Pressure	14.1 psia	IG Ref Pressure	14.6959 psia
IG Ref Temperature	60 °F	IG Ref Volume	379.485 ft^3/lbmol
Liq Ref Temperature	60 °F		

Environment [Environment1]

Environment Settings

Number of Poynting Intervals	0	Freeze Out Temperature Threshold Difference	10 °F
Gibbs Excess Model Evaluation Temperature	77 °F	Phase Tolerance	1 %

Components

Component Name	Henry`s Law Component	Phase Initiator	Component Name	Henry`s Law Component	Phase Initiator
Nitrogen	False	False	n-Pentane	False	False
Carbon Dioxide	False	False	Neohexane	False	False
Methane	False	False	2-Methylpentane	False	False
Ethane	False	False	3-Methylpentane	False	False
Propane	False	False	n-Hexane	False	False
i-Butane	False	False	Heptane	False	False
n-Butane	False	False	Water	False	True
i-Pentane	False	False			

Physical Property Method Sets

Liquid Molar Volume	COSTALD	Overall Package	Peng-Robinson
Stability Calculation	Peng-Robinson	Vapor Package	Peng-Robinson
Light Liquid Package	Peng-Robinson	Heavy Liquid Package	Peng-Robinson

Remarks

Calculator Report

Client Name:	Chevron Appalachia, LLC	Job: Crow Produced Water
Location:		

Crow_Oil

Source Code

Residual Error (for CV1) = Crow_Oil / 528 - 1

Calculated Variable [CV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Crow 1H!PStreams!Average Condensate!Phases!Total!Properties!Std Liquid Volumetric Flow
Value	3.41418
Unit	bbl/d

Measured Variable [Crow_Oil]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Crow 1H!PStreams!Stable Oil!Phases!Total!Properties!Std Liquid Volumetric Flow
Value	528
Unit	bbl/yr

Solver Properties

Status: Solved

Error	-3.76437E-08		Iterations	4
Calculated Value	0.0995804	sgpm	Max Iterations	20
Lower Bound		sgpm	Weighting	1
Upper Bound		sgpm	Priority	0
Step Size		sgpm	Solver Active	Active
Is Minimizer	False		Group	
Algorithm	Default		Skip Dependency Check	False

Remarks

Crow_PW

Source Code

Residual Error (for CV1) = Crow_PW / 52272 - 1

Calculated Variable [CV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Crow 1H!PStreams!Water!Phases!Total!Properties!Std Liquid Volumetric Flow
Value	52271
Unit	bbl/yr

Measured Variable [Crow_PW]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Crow 1H!PStreams!PW!Phases!Total!Properties!Std Liquid Volumetric Flow
Value	52272
Unit	bbl/yr

Solver Properties

Status: Solved

Error	-1.30032E-11		Iterations	4
Calculated Value	4.1769	sgpm	Max Iterations	20
Lower Bound		sgpm	Weighting	1
Upper Bound		sgpm	Priority	0
Step Size		sgpm	Solver Active	Active
Is Minimizer	False		Group	
Algorithm	Default		Skip Dependency Check	False

Remarks

User Value Sets Report

Client Name:	Chevron Appalachia, LLC	Job: Crow Produced Water
Location:		

Crow_VOC Flash (lb/hr)

User Value [CnPlusSum]

* Parameter	11.1461	lb/h	Upper Bound	lb/h
Lower Bound		lb/h	* Enforce Bounds	False

Remarks
This User Value Set was programmatically generated. GUID={7D939BE9-1E96-479B-BB94-59E77F0AB4FF}

Crow_Tank Losses (lb/hr)

User Value [ShellLength]

* Parameter	20	ft	Upper Bound	
* Lower Bound	0	ft	* Enforce Bounds	False

User Value [ShellDiam]

* Parameter	15	ft	Upper Bound	
* Lower Bound	0	ft	* Enforce Bounds	False

User Value [BreatherVP]

* Parameter	0.03	psig	Upper Bound	
Lower Bound			* Enforce Bounds	False

User Value [BreatherVacP]

* Parameter	-0.03	psig	Upper Bound	
Lower Bound			* Enforce Bounds	False

User Value [DomeRadius]

Parameter		ft	Upper Bound	ft
Lower Bound		ft	* Enforce Bounds	False

User Value [OpPress]

* Parameter	0	psig	Upper Bound	
Lower Bound			* Enforce Bounds	False

User Value [AvgPercentLiq]

* Parameter	50	%	Upper Bound	
Lower Bound		%	* Enforce Bounds	False

User Value [MaxPercentLiq]

* Parameter	90	%	Upper Bound	
Lower Bound		%	* Enforce Bounds	False

User Value [AnnNetTP]

* Parameter	144.975	bbl/day	Upper Bound	
* Lower Bound	0	bbl/day	* Enforce Bounds	False

User Value [OREff]

* Parameter	0	%	Upper Bound	
Lower Bound		%	* Enforce Bounds	False

User Value [AtmPressure]

* Parameter	97274.7	Pa	Upper Bound	Pa
Lower Bound		Pa	* Enforce Bounds	False

User Value Sets Report

Client Name:	Chevron Appalachia, LLC	Job: Crow Produced Water
Location:		

User Value [WorkingLosses]

* Parameter	0.0612417	ton/yr	Upper Bound	
Lower Bound			* Enforce Bounds	False

User Value [StandingLosses]

* Parameter	0.0189508	ton/yr	Upper Bound	
Lower Bound			* Enforce Bounds	False

User Value [RimSealLosses]

* Parameter	0	ton/yr	Upper Bound	ton/yr
Lower Bound		ton/yr	* Enforce Bounds	False

User Value [WithdrawalLoss]

* Parameter	0	ton/yr	Upper Bound	ton/yr
Lower Bound		ton/yr	* Enforce Bounds	False

User Value [LoadingLosses]

* Parameter	0.0489932	lb/h	Upper Bound	
Lower Bound			* Enforce Bounds	False

User Value [DeckFittingLosses]

* Parameter	0	ton/yr	Upper Bound	ton/yr
Lower Bound		ton/yr	* Enforce Bounds	False

User Value [DeckSeamLosses]

* Parameter	0	ton/yr	Upper Bound	ton/yr
Lower Bound		ton/yr	* Enforce Bounds	False

User Value [FlashingLosses]

* Parameter	0	ton/yr	Upper Bound	ton/yr
Lower Bound		ton/yr	* Enforce Bounds	False

User Value [GasMoleWeight]

* Parameter	0.0196571	kg/mol	Upper Bound	kg/mol
Lower Bound		kg/mol	* Enforce Bounds	False

User Value [MaxLiqSurfaceT]

* Parameter	66.3119	°F	Upper Bound	°F
Lower Bound		°F	* Enforce Bounds	False

User Value [TotalLosses]

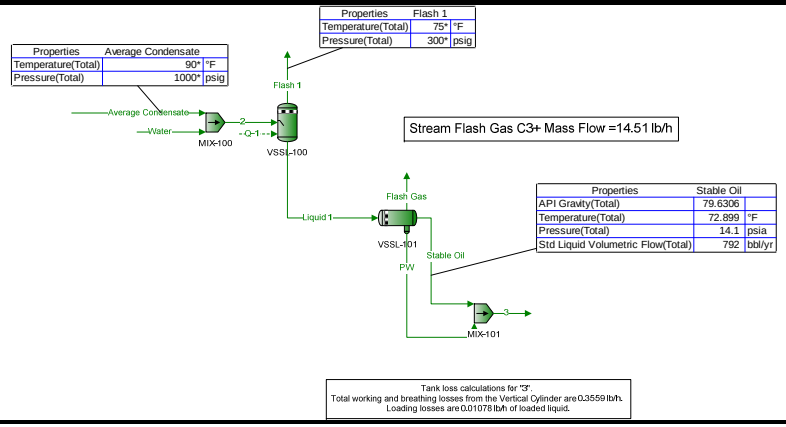
* Parameter	0.0183088	lb/h	Upper Bound	lb/h
Lower Bound		lb/h	* Enforce Bounds	False

Remarks

This User Value Set was programmatically generated. GUID={21A053D7-FA37-49F2-83D2-F060C8962F32}

Crow Blowdown
Plant Schematic

Client Name:	Chevron Appalachia, LLC	Job: Crow Test Tank
Location:		
Flowsheet:	Crow Blowdown	



Process Streams Report
All Streams
Tabulated by Total Phase

Client Name:	Chevron Appalachia, LLC	Job: Crow Test Tank
Location:		
Flowsheet:	Crow Blowdown	

Connections

	Average Condensate	Flash Gas	Flash 1	Liquid 1	PW
From Block	--	VSSL-101	VSSL-100	VSSL-100	VSSL-101
To Block	MIX-100	--	--	VSSL-101	MIX-101

Stream Composition

Mole Fraction	Average Condensate %	Flash Gas %	Flash 1 %	Liquid 1 %	PW %
Nitrogen	0	0	0	0	0
Carbon Dioxide	0.0228112	0.0331333	0.0206277	0.000254451	1.60292E-05
Methane	13.6989	15.3891	63.8963	0.110583	0.00036491
Ethane	14.5567	21.2143	22.2064	0.154962	0.000587339
Propane	17.2894	25.8973	9.92034	0.197541	0.000804915
i-Butane	3.01413	4.2001	0.764441	0.0352292	4.49122E-05
n-Butane	10.7646	14.1449	1.9826	0.12643	0.000330705
i-Pentane	3.54938	3.63705	0.299512	0.0419775	5.87951E-05
n-Pentane	6.13992	5.54729	0.402465	0.07271	8.77848E-05
Neohexane	0.05399	0.0359432	0.00209724	0.00064054	1.96725E-07
2-Methylpentane	2.24019	1.13769	0.0601657	0.0265998	8.50328E-06
3-Methylpentane	1.14508	0.538616	0.0279014	0.0135989	1.10157E-05
n-Hexane	4.1568	1.64908	0.0828159	0.049381	9.8162E-06
Heptane	23.3681	3.74061	0.186245	0.277832	2.63043E-05
Water	0	2.83482	0.148022	98.8923	99.9976

Molar Flow	Average Condensate lbmol/h	Flash Gas lbmol/h	Flash 1 lbmol/h	Liquid 1 lbmol/h	PW lbmol/h
Nitrogen	0	0	0	0	0
Carbon Dioxide	0.000155928	0.000135972	9.71622E-06	0.000146212	9.10698E-06
Methane	0.0936399	0.0631534	0.030097	0.063543	0.000207323
Ethane	0.0995038	0.0870589	0.0104599	0.0890439	0.000333696
Propane	0.118183	0.106277	0.00467276	0.11351	0.000457311
i-Butane	0.0206034	0.0172363	0.000360073	0.0202433	2.55168E-05
n-Butane	0.0735825	0.0580476	0.000933859	0.0726486	0.000187889
i-Pentane	0.0242621	0.0149257	0.000141079	0.024121	3.34043E-05
n-Pentane	0.04197	0.0227649	0.000189572	0.0417804	4.98748E-05
Neohexane	0.000369053	0.000147503	9.8786E-07	0.000368066	1.11769E-07
2-Methylpentane	0.0153131	0.00466882	2.83397E-05	0.0152847	4.83112E-06
3-Methylpentane	0.00782728	0.00221036	1.31424E-05	0.00781414	6.25856E-06
n-Hexane	0.0284142	0.00676746	3.90086E-05	0.0283752	5.57706E-06
Heptane	0.159735	0.0153506	8.77265E-05	0.159647	1.49447E-05
Water	0	0.0116335	6.97224E-05	56.8252	56.8135

Mass Fraction	Average Condensate %	Flash Gas %	Flash 1 %	Liquid 1 %	PW %
Nitrogen	0	0	0	0	0
Carbon Dioxide	0.0169668	0.0326023	0.0381807	0.000605308	3.91566E-05
Methane	3.71417	5.51976	43.1116	0.0958926	0.00032494
Ethane	7.39756	14.2622	28.0831	0.251867	0.00098029
Propane	12.8849	25.5322	18.3979	0.470845	0.00197011
i-Butane	2.9608	5.45806	1.86867	0.11068	0.000144895
n-Butane	10.5742	18.3814	4.84645	0.397206	0.00106691
i-Pentane	4.32799	5.86699	0.908847	0.163708	0.000235459
n-Pentane	7.48681	8.94843	1.22125	0.283562	0.000351556
Neohexane	0.0786324	0.0692526	0.00760114	0.0029837	9.40996E-07
2-Methylpentane	3.26268	2.19201	0.218061	0.123905	4.06739E-05
3-Methylpentane	1.66772	1.03777	0.101125	0.0633448	5.26916E-05
n-Hexane	6.05408	3.17732	0.300154	0.230022	4.6954E-05
Heptane	39.5736	8.38022	0.784887	1.50482	0.000146301

Process Streams Report
All Streams
Tabulated by Total Phase

Client Name:	Chevron Appalachia, LLC	Job: Crow Test Tank	
Location:			
Flowsheet:	Crow Blowdown		

Mass Fraction	Average Condensate %	Flash Gas %	Flash 1 %	Liquid 1 %	PW %
Water	0	1.14184	0.112154	96.3006	99.9946

Mass Flow	Average Condensate lb/h	Flash Gas lb/h	Flash 1 lb/h	Liquid 1 lb/h	PW lb/h
Nitrogen	0	0	0	0	0
Carbon Dioxide	0.00686232	0.00598406	0.000427606	0.00643472	0.000400793
Methane	1.50221	1.01314	0.48283	1.01939	0.00332597
Ethane	2.99198	2.61778	0.314518	2.67747	0.0100339
Propane	5.21136	4.68635	0.206048	5.00531	0.0201654
i-Butane	1.19751	1.00181	0.0209282	1.17659	0.00148309
n-Butane	4.27678	3.37385	0.054278	4.2225	0.0109205
i-Pentane	1.75048	1.07687	0.0101787	1.7403	0.00241008
n-Pentane	3.02808	1.64246	0.0136774	3.01441	0.0035984
Neohexane	0.0318033	0.0127111	8.51292E-05	0.0317182	9.63171E-06
2-Methylpentane	1.31961	0.402337	0.00244219	1.31717	0.000416324
3-Methylpentane	0.674519	0.190479	0.00113255	0.673386	0.000539334
n-Hexane	2.4486	0.583188	0.00336158	2.44524	0.000480605
Heptane	16.0057	1.53816	0.00879036	15.997	0.00149749
Water	0	0.209581	0.00125607	1023.72	1023.51

Stream Properties

Property	Units	Average Condensate	Flash Gas	Flash 1	Liquid 1	PW
Temperature	°F	90 *	72.8985	75 *	75	72.8985
Pressure	psia	1014.1 *	14.1	314.1 *	314.1	14.1
Mole Fraction Vapor	%	0	100	100	0	0
Mole Fraction Light Liquid	%	100	0	0	1.06026	100
Mole Fraction Heavy Liquid	%	0	0	0	98.9397	0
Molecular Weight	lb/lbmol	59.1691	44.7263	23.7768	18.5001	18.0158
Mass Density	lb/ft^3	36.1706	0.112177	1.45858	60.7371	62.247
Molar Flow	lbmol/h	0.683559	0.410378	0.0471028	57.4617	56.8148
Mass Flow	lb/h	40.4455	18.3547	1.11995	1063.05	1023.57
Vapor Volumetric Flow	ft^3/h	1.11819	163.623	0.767838	17.5025	16.4436
Liquid Volumetric Flow	gpm	0.139411	20.3998	0.0957305	2.18212	2.05011
Std Vapor Volumetric Flow	MMSCFD	0.0062256	0.00373757	0.000428995	0.52334	0.517448
Std Liquid Volumetric Flow	sgpm	0.141428 *	0.0721538	0.00618198	2.18174	2.0463
Compressibility		0.281225	0.983649	0.892361	0.0166739	0.000714028
Specific Gravity		0.579945	1.54428	0.820948	0.973835	0.998044
API Gravity		104.704			13.4137	10.0153
Enthalpy	Btu/h	-43889.6	-20040.9	-1686.08	-7.02707E+06	-6.98616E+06
Mass Enthalpy	Btu/lb	-1085.15	-1091.87	-1505.49	-6610.3	-6825.32
Mass Cp	Btu/(lb*°F)	0.571155	0.409711	0.512813	0.967066	0.982937
Ideal Gas CpCv Ratio		1.08909	1.12252	1.2218	1.31606	1.32569
Dynamic Viscosity	cP	0.169009	0.00832409	0.010704	0.891247	0.959996
Kinematic Viscosity	cSt	0.291698	4.63248	0.458137	0.901828	0.962787
Thermal Conductivity	Btu/(h*ft*°F)	0.061802	0.0108751	0.0171904	0.331704	0.34839
Surface Tension	lbf/ft	0.000405466 ?			0.0047514 ?	0.00502028 ?
Net Ideal Gas Heating Value	Btu/ft^3	3059.97	2313.68	1295.99	35.3388	0.0508359
Net Liquid Heating Value	Btu/lb	19472.5	19470.6	20595	-301.388	-1058.64
Gross Ideal Gas Heating Value	Btu/ft^3	3315.16	2515.37	1424.14	88.0222	50.3641
Gross Liquid Heating Value	Btu/lb	21109.2	21181.9	22640.4	779.283	1.15687

Warnings

ProMax:ProMax!Project!Flowsheets!Crow Blowdown!PStreams!Flash Gas

Error: The flash conditions for stream Flash Gas are already defined by Temperature and Mole Fraction Vapor. Before specifying another property, one specification must be cleared.

* User Specified Values
? Extrapolated or Approximate Values

Process Streams Report
All Streams
Tabulated by Total Phase

Client Name:	Chevron Appalachia, LLC	Job: Crow Test Tank
Location:		
Flowsheet:	Crow Blowdown	

Remarks

Process Streams Report
All Streams
Tabulated by Total Phase

Client Name:	Chevron Appalachia, LLC	Job: Crow Test Tank	
Location:			
Flowsheet:	Crow Blowdown		

Connections

	Stable Oil	Water	2	3	
From Block	VSSL-101	--	MIX-100	MIX-101	
To Block	MIX-101	MIX-100	VSSL-100	--	

Stream Composition

Mole Fraction	Stable Oil %	Water %	2 %	3 %	
Nitrogen	0	0	0	0	
Carbon Dioxide	0.000479032	0	0.000271138	1.79488E-05	
Methane	0.0770414	0	0.162827	0.000682813	
Ethane	0.698121	0	0.173024	0.00347933	
Propane	2.86472	0	0.205504	0.0126788	
i-Butane	1.26048	0	0.0358265	0.00527071	
n-Butane	6.09343	0	0.12795	0.0255929	
i-Pentane	3.87338	0	0.0421884	0.0161177	
n-Pentane	8.01807	0	0.0729801	0.0333306	
Neohexane	0.0931996	0	0.000641733	0.000386604	
2-Methylpentane	4.48602	0	0.0266273	0.0186076	
3-Methylpentane	2.36645	0	0.0136106	0.00982234	
n-Hexane	9.1327	0	0.0494084	0.0378742	
Heptane	60.9976	0	0.277757	0.252924	
Water	0.0382957	100	98.8114	99.5832	

Molar Flow	Stable Oil lbmol/h	Water lbmol/h	2 lbmol/h	3 lbmol/h	
Nitrogen	0	0	0	0	
Carbon Dioxide	1.13309E-06	0	0.000155928	1.02401E-05	
Methane	0.000182231	0	0.0936399	0.000389554	
Ethane	0.00165131	0	0.0995038	0.00198501	
Propane	0.00677609	0	0.118183	0.0072334	
i-Butane	0.0029815	0	0.0206034	0.00300701	
n-Butane	0.0144132	0	0.0735825	0.0146011	
i-Pentane	0.00916195	0	0.0242621	0.00919535	
n-Pentane	0.0189657	0	0.04197	0.0190155	
Neohexane	0.000220451	0	0.000369053	0.000220563	
2-Methylpentane	0.0106111	0	0.0153131	0.0106159	
3-Methylpentane	0.00559752	0	0.00782728	0.00560378	
n-Hexane	0.0216022	0	0.0284142	0.0216077	
Heptane	0.144282	0	0.159735	0.144296	
Water	9.05833E-05	56.8253	56.8253	56.8136	

Mass Fraction	Stable Oil %	Water %	2 %	3 %	
Nitrogen	0	0	0	0	
Carbon Dioxide	0.00023602	0	0.000644853	4.3138E-05	
Methane	0.0138367	0	0.141163	0.000598204	
Ethane	0.235011	0	0.281157	0.00571337	
Propane	1.41421	0	0.489712	0.0305316	
i-Butane	0.820193	0	0.11253	0.0167297	
n-Butane	3.96499	0	0.401889	0.081234	
i-Pentane	3.12865	0	0.164493	0.0635051	
n-Pentane	6.47645	0	0.284549	0.131325	
Neohexane	0.0899156	0	0.00298856	0.00181939	
2-Methylpentane	4.32795	0	0.124004	0.087569	
3-Methylpentane	2.28307	0	0.0633846	0.0462248	
n-Hexane	8.8109	0	0.230095	0.178239	
Heptane	68.4269	0	1.50406	1.38402	
Water	0.00772376	100	96.1993	97.9724	

Process Streams Report
All Streams
Tabulated by Total Phase

Client Name:	Chevron Appalachia, LLC
Location:	
Flowsheet:	Crow Blowdown

Job: Crow Test Tank

Mass Flow	Stable Oil lb/h	Water lb/h	2 lb/h	3 lb/h
Nitrogen	0	0	0	0
Carbon Dioxide	4.98665E-05	0	0.00686232	0.00045066
Methane	0.00292343	0	1.50221	0.00624941
Ethane	0.0496533	0	2.99198	0.0596873
Propane	0.298796	0	5.21136	0.318961
i-Butane	0.173291	0	1.19751	0.174774
n-Butane	0.837726	0	4.27678	0.848647
i-Pentane	0.661023	0	1.75048	0.663434
n-Pentane	1.36835	0	3.02808	1.37195
Neohexane	0.0189974	0	0.0318033	0.0190071
2-Methylpentane	0.914412	0	1.31961	0.914829
3-Methylpentane	0.482368	0	0.674519	0.482908
n-Hexane	1.86157	0	2.4486	1.86205
Heptane	14.4573	0	16.0057	14.4588
Water	0.00163188	1023.72	1023.72	1023.51

Stream Properties

Property	Units	Stable Oil	Water	2	3
Temperature	°F	72.8985	90 *	90.0375	72.8985
Pressure	psia	14.1	1014.1 *	1014.1	14.1
Mole Fraction Vapor	%	0	0	0	0
Mole Fraction Light Liquid	%	100	100	1.12811	0.414603
Mole Fraction Heavy Liquid	%	0	0	98.8719	99.5854
Molecular Weight	lb/lbmol	89.3228	18.0153	18.5044	18.3115
Mass Density	lb/ft^3	41.3927	62.1238	60.5181	61.6192
Molar Flow	lbmol/h	0.236536	56.8253	57.5088	57.0513
Mass Flow	lb/h	21.1281	1023.72	1064.17	1044.69
Vapor Volumetric Flow	ft^3/h	0.51043	16.4788	17.5843	16.954
Liquid Volumetric Flow	gpm	0.0636381	2.0545	2.19233	2.11375
Std Vapor Volumetric Flow	MMSCFD	0.00215429	0.517543	0.523769	0.519602
Std Liquid Volumetric Flow	sgpm	0.0632875	2.0465 *	2.18792	2.10959
Compressibility		0.00532376	0.0498538	0.0525625	0.00073314
Specific Gravity		0.663674	0.996068	0.970324	0.987977
API Gravity		79.6306	9.89095	13.4938	11.4342
Enthalpy	Btu/h	-20864.3	-6.96749E+06	-7.01137E+06	-7.00703E+06
Mass Enthalpy	Btu/lb	-987.513	-6806.02	-6588.59	-6707.25
Mass Cp	Btu/(lb*°F)	0.514046	0.980196	0.965166	0.973454
Ideal Gas CpCv Ratio		1.06009	1.32489	1.31497	1.31983
Dynamic Viscosity	cP	0.323804	0.793234	0.751623	0.940843
Kinematic Viscosity	cSt	0.488357	0.797118	0.763537	0.948503
Thermal Conductivity	Btu/(h*ft*°F)	0.0697251	0.355983	0.336984	0.34
Surface Tension	lbf/ft	0.00126907 ?	0.00489079	0.0046113 ?	0.00490734 ?
Net Ideal Gas Heating Value	Btu/ft^3	4558.53	0	36.3713	18.9504
Net Liquid Heating Value	Btu/lb	19207.6	-1059.76	-279.397	-648.771
Gross Ideal Gas Heating Value	Btu/ft^3	4921.99	50.31	89.1166	70.562
Gross Liquid Heating Value	Btu/lb	20751.8	0	802.29	420.821

Remarks

Energy Stream Report

Client Name:	Chevron Appalachia, LLC	Job: Crow Test Tank
Location:		
Flowsheet:	Crow Blowdown	

Energy Streams

Energy Stream	Energy Rate	Power	From Block	To Block
Q-1	-17380.5 Btu/h	-6.83078 hp	--	VSSL-100

Remarks

Blocks
MIX-100
Mixer/Splitter Report

Client Name:	Chevron Appalachia, LLC	Job: Crow Test Tank
Location:		Modified: 10:17 AM, 8/14/2013
Flowsheet:	Crow Blowdown	Status: Solved 10:48 AM, 7/17/2014

Connections

Stream	Connection Type	Other Block	Stream	Connection Type	Other Block
Average Condensate	Inlet		Water	Inlet	
2	Outlet	VSSL-100			

Block Parameters

Pressure Drop	0 psi	Fraction to PStream 2	100 %

Remarks

Blocks
MIX-101
Mixer/Splitter Report

Client Name:	Chevron Appalachia, LLC	Job: Crow Test Tank	
Location:		Modified: 10:17 AM, 8/14/2013	
Flowsheet:	Crow Blowdown	Status: Solved 10:48 AM, 7/17/2014	

Connections

Stream	Connection Type	Other Block	Stream	Connection Type	Other Block
Stable Oil	Inlet	VSSL-101	PW	Inlet	VSSL-101
3	Outlet				

Block Parameters

Pressure Drop	0 psi	Fraction to PStream 3	100 %

Remarks

Blocks
VSSL-100
Separator Report

Client Name:	Chevron Appalachia, LLC	Job: Crow Test Tank	
Location:		Modified: 10:17 AM, 8/14/2013	
Flowsheet:	Crow Blowdown	Status: Solved 10:48 AM, 7/17/2014	

Connections

Stream	Connection Type	Other Block	Stream	Connection Type	Other Block
2	Inlet	MIX-100	Flash 1	Vapor Outlet	
Liquid 1	Light Liquid Outlet	VSSL-101	Q-1	Energy	

Block Parameters

Pressure Drop	700	psi	Main Liquid Phase	Light Liquid	
Mole Fraction Vapor	0.0819054	%	Heat Duty	-17380.5	Btu/h
Mole Fraction Light Liquid	1.0594	%	Heat Release Curve Type	Plug Flow	
Mole Fraction Heavy Liquid	98.8587	%	Heat Release Curve Increments	5	

Remarks

Blocks
VSSL-101
Separator Report

Client Name:	Chevron Appalachia, LLC	Job: Crow Test Tank	
Location:		Modified: 10:17 AM, 8/14/2013	
Flowsheet:	Crow Blowdown	Status: Solved 10:48 AM, 7/17/2014	

Connections

Stream	Connection Type	Other Block	Stream	Connection Type	Other Block
Liquid 1	Inlet	VSSL-100	Flash Gas	Vapor Outlet	
Stable Oil	Light Liquid Outlet	MIX-101	PW	Heavy Liquid Outlet	MIX-101

Block Parameters

Pressure Drop	300	psi	Main Liquid Phase	Light Liquid	
Mole Fraction Vapor	0.714176	%	Heat Duty	0	Btu/h
Mole Fraction Light Liquid	0.411642	%	Heat Release Curve Type	Plug Flow	
Mole Fraction Heavy Liquid	98.8742	%	Heat Release Curve Increments	5	

Remarks

Flowsheet Environment
Environment1

Client Name:	Chevron Appalachia, LLC	Job: Crow Test Tank
Location:		
Flowsheet:	Crow Blowdown	

Environment Settings

Number of Poynting Intervals	0	Freeze Out Temperature Threshold Difference	10 °F
Gibbs Excess Model Evaluation Temperature	77 °F	Phase Tolerance	1 %

Components

Component Name	Henry`s Law Component	Phase Initiator	Component Name	Henry`s Law Component	Phase Initiator
Nitrogen	False	False	n-Pentane	False	False
Carbon Dioxide	False	False	Neohexane	False	False
Methane	False	False	2-Methylpentane	False	False
Ethane	False	False	3-Methylpentane	False	False
Propane	False	False	n-Hexane	False	False
i-Butane	False	False	Heptane	False	False
n-Butane	False	False	Water	False	True
i-Pentane	False	False			

Physical Property Method Sets

Liquid Molar Volume	COSTALD	Overall Package	Peng-Robinson
Stability Calculation	Peng-Robinson	Vapor Package	Peng-Robinson
Light Liquid Package	Peng-Robinson	Heavy Liquid Package	Peng-Robinson

Remarks

Environments Report

Client Name:	Chevron Appalachia, LLC	Job: Crow Test Tank
Location:		

Project-Wide Constants

Atmospheric Pressure	14.1 psia	IG Ref Pressure	14.6959 psia
IG Ref Temperature	60 °F	IG Ref Volume	379.485 ft^3/lbmol
Liq Ref Temperature	60 °F		

Environment [Environment1]

Environment Settings

Number of Poynting Intervals	0	Freeze Out Temperature Threshold Difference	10 °F
Gibbs Excess Model Evaluation Temperature	77 °F	Phase Tolerance	1 %

Components

Component Name	Henry`s Law Component	Phase Initiator	Component Name	Henry`s Law Component	Phase Initiator
Nitrogen	False	False	n-Pentane	False	False
Carbon Dioxide	False	False	Neohexane	False	False
Methane	False	False	2-Methylpentane	False	False
Ethane	False	False	3-Methylpentane	False	False
Propane	False	False	n-Hexane	False	False
i-Butane	False	False	Heptane	False	False
n-Butane	False	False	Water	False	True
i-Pentane	False	False			

Physical Property Method Sets

Liquid Molar Volume	COSTALD	Overall Package	Peng-Robinson
Stability Calculation	Peng-Robinson	Vapor Package	Peng-Robinson
Light Liquid Package	Peng-Robinson	Heavy Liquid Package	Peng-Robinson

Remarks

Calculator Report

Client Name:	Chevron Appalachia, LLC	Job: Crow Test Tank
Location:		

Crow_Oil

Source Code

Residual Error (for CV1) = Crow_Oil / 792 - 1

Calculated Variable [CV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Crow Blowdown!PStreams!Average Condensate!Phases!Total!Properties!Std Liquid Volumetric Flow
Value	4.84896
Unit	bbl/d

Measured Variable [Crow_Oil]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Crow Blowdown!PStreams!Stable Oil!Phases!Total!Properties!Std Liquid Volumetric Flow
Value	791.998
Unit	bbl/yr

Solver Properties

Status: Solved

Error	-2.52187E-06		Iterations	4
Calculated Value	0.141428	sgpm	Max Iterations	20
Lower Bound		sgpm	Weighting	1
Upper Bound		sgpm	Priority	0
Step Size		sgpm	Solver Active	Active
Is Minimizer	False		Group	
Algorithm	Default		Skip Dependency Check	False

Remarks

Crow_PW

Source Code

Residual Error (for CV1) = Crow_PW / 25608 - 1

Calculated Variable [CV1]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Crow Blowdown!PStreams!Water!Phases!Total!Properties!Std Liquid Volumetric Flow
Value	25610.4
Unit	bbl/yr

Measured Variable [Crow_PW]

SourceMoniker	ProMax:ProMax!Project!Flowsheets!Crow Blowdown!PStreams!PW!Phases!Total!Properties!Std Liquid Volumetric Flow
Value	25608
Unit	bbl/yr

Solver Properties

Status: Solved

Error	-1.89597E-09		Iterations	4
Calculated Value	2.0465	sgpm	Max Iterations	20
Lower Bound		sgpm	Weighting	1
Upper Bound		sgpm	Priority	0
Step Size		sgpm	Solver Active	Active
Is Minimizer	False		Group	
Algorithm	Default		Skip Dependency Check	False

Remarks

User Value Sets Report

Client Name:	Chevron Appalachia, LLC	Job: Crow Test Tank
Location:		

Cn+ Flow/Frac._Crow

User Value [CnPlusSum]

* Parameter	14.5082	lb/h	Upper Bound	
Lower Bound			* Enforce Bounds	False

Remarks
This User Value Set was programmatically generated. GUID={11539540-81C6-4D44-A840-E5460A460A2B}

Tank Losses_Crow

User Value [ShellLength]

* Parameter	20	ft	Upper Bound	
* Lower Bound	0	ft	* Enforce Bounds	False

User Value [ShellDiam]

* Parameter	15	ft	Upper Bound	
* Lower Bound	0	ft	* Enforce Bounds	False

User Value [BreatherVP]

* Parameter	0.03	psig	Upper Bound	
Lower Bound			* Enforce Bounds	False

User Value [BreatherVacP]

* Parameter	-0.03	psig	Upper Bound	
Lower Bound			* Enforce Bounds	False

User Value [DomeRadius]

Parameter		ft	Upper Bound	ft
Lower Bound		ft	* Enforce Bounds	False

User Value [OpPress]

* Parameter	0	psig	Upper Bound	
Lower Bound			* Enforce Bounds	False

User Value [AvgPercentLiq]

* Parameter	50	%	Upper Bound	
Lower Bound		%	* Enforce Bounds	False

User Value [MaxPercentLiq]

* Parameter	90	%	Upper Bound	
Lower Bound		%	* Enforce Bounds	False

User Value [AnnNetTP]

* Parameter	72.4715	bbl/day	Upper Bound	
* Lower Bound	0	bbl/day	* Enforce Bounds	False

User Value [OREff]

* Parameter	70	%	Upper Bound	
Lower Bound		%	* Enforce Bounds	False

User Value [AtmPressure]

* Parameter	97274.7	Pa	Upper Bound	
Lower Bound			* Enforce Bounds	False

User Value Sets Report

Client Name:	Chevron Appalachia, LLC	Job: Crow Test Tank
Location:		

User Value [MaxLiqSurfaceT]

* Parameter	63.6116 °F	Upper Bound	
Lower Bound		* Enforce Bounds	False

User Value [TotalLosses]

* Parameter	0.355899 lb/h	Upper Bound	
Lower Bound	lb/h	* Enforce Bounds	False

User Value [WorkingLosses]

* Parameter	0.146308 ton/yr	Upper Bound	
Lower Bound	ton/yr	* Enforce Bounds	False

User Value [StandingLosses]

* Parameter	1.41253 ton/yr	Upper Bound	
Lower Bound	ton/yr	* Enforce Bounds	False

User Value [RimSealLosses]

* Parameter	0 ton/yr	Upper Bound	
Lower Bound		* Enforce Bounds	False

User Value [WithdrawalLoss]

* Parameter	0 ton/yr	Upper Bound	
Lower Bound		* Enforce Bounds	False

User Value [LoadingLosses]

* Parameter	0.0107814 lb/h	Upper Bound	
Lower Bound	lb/h	* Enforce Bounds	False

User Value [DeckFittingLosses]

* Parameter	0 ton/yr	Upper Bound	
Lower Bound		* Enforce Bounds	False

User Value [DeckSeamLosses]

* Parameter	0 ton/yr	Upper Bound	
Lower Bound		* Enforce Bounds	False

User Value [FlashingLosses]

* Parameter	0 ton/yr	Upper Bound	
Lower Bound		* Enforce Bounds	False

User Value [GasMoleWeight]

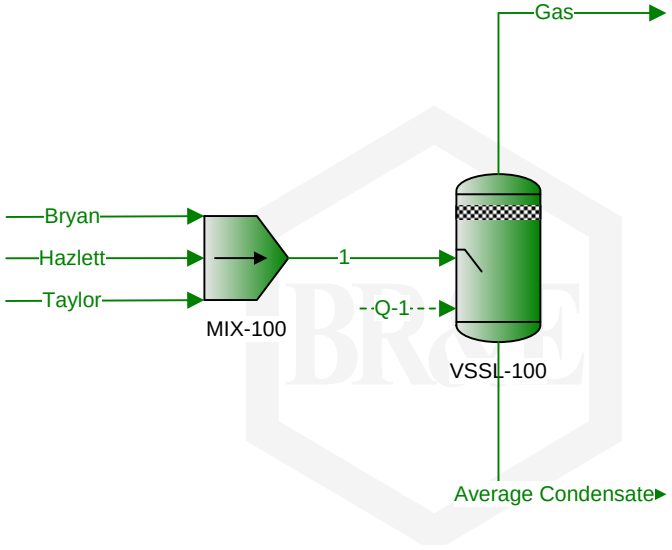
* Parameter	0.0567017 kg/mol	Upper Bound	
Lower Bound		* Enforce Bounds	False

Remarks

This User Value Set was programmatically generated. GUID={7D48A338-91BB-40BD-BAA3-4314E2DB012C}

AMBU Average Condensate Stream Determination

Names	Units	Bryan	Hazlett	Taylor
Temperature	°F	90	90	90
Pressure	psig	1000	1000	1000



Names	Units	Average Condensate
Temperature	°F	90
Pressure	psig	1000
Nitrogen(Mole Fraction)	%	0
Carbon Dioxide(Mole Fraction)	%	0.022811
Methane(Mole Fraction)	%	13.699
Ethane(Mole Fraction)	%	14.557
Propane(Mole Fraction)	%	17.289
i-Butane(Mole Fraction)	%	3.0141
n-Butane(Mole Fraction)	%	10.765
i-Pentane(Mole Fraction)	%	3.5494
n-Pentane(Mole Fraction)	%	6.1399
Neohexane(Mole Fraction)	%	0.05399
2-Methylpentane(Mole Fraction)	%	2.2402
3-Methylpentane(Mole Fraction)	%	1.1451
n-Hexane(Mole Fraction)	%	4.1568
Heptane(Mole Fraction)	%	23.368
Water(Mole Fraction)	%	0

J-W Measurement Company
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Fairfield,TX Oklahoma City,OK Mounds,OK Tulsa,OK
WWW.JWOPERATING.COM
888-226-9110

J-W MC Number:	CUSBA004		***Run Date:*** 05/22/13
Customer Name:	CHEVRON PA		
Station Name:	HAZELETT 1-H		
Station Number:	3470510002	***Sampled by:***	JM
Producer:		***Procure Date:***	05/09/13
Field:	FT. BEELER	***Pressure (lbs.):***	800
Co. or Pr.:	MARSHALL	***Temperature (^{o}F):***	96
State:	PA	***Bottle Number:***	69886

Remarks:

Component	Mole Percent	Liq Vol %	Liq Wgt %
Nitrogen	0.0000	0.0000	0.0000
Carbon Dioxide	0.0000	0.0000	0.0000
Methane	6.3205	3.1214	1.6009
Ethane	15.0320	11.7107	7.1362
Propane	22.1908	17.8092	15.4489
I-Butane	3.0574	2.9144	2.8056
n-Butane	11.4455	10.5113	10.5028
I-Pentane	2.6010	2.7709	2.9628
n-Pentane	5.5906	5.9033	6.3682
Neohexane	0.0072	0.0088	0.0098
2-Methylpentane	1.7929	2.1661	2.4394
3-Methylpentane	0.8647	1.0274	1.1765
n-Hexane	3.8535	4.6161	5.2428
Heptanes+	27.2439	37.4404	44.3063
Hydrogen Sulfide			
TOTAL	100.0000	**100.0000**	**100.0000**

	TOTAL SAMPLE	PENTANES + FRACTION
Specific Gravity (H2O=1)	0.5847	0.6776
API Gravity	110.5132	77.5002
Molecular Weight	63.3390	94.5840
Absolute Density (lbs/gal)	4.8746	5.6624
Heating Value Liq. Idl Gas (btu/gal)	103589	118201
Vapor/Liquid (cu.ft./gal)	29.2051	22.7704
Vapor Pressure (psig)	473.7088	

DISTRIBUTION:
1 CP-CAN

METHOD: GPA 2165-95

Note: Calibration, Standards, and testing procedures are achieved pursuant to GPA Regulations.

J-W ANALYST

J-W Measurement Company
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Fairfield,TX Oklahoma City,OK Mounds,OK Tulsa,OK
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J-W MC Number:	CUSBA007		***Run Date:***
Customer Name:	CHEVRON PA		07/23/13
Station Name:	BRYAN 1-H		
Station Number:	2470510006	***Sampled by:***	JM
Producer:		***Procure Date:***	07/16/13
Field:	FT. BEELER	***Pressure (lbs.):***	450
Co. or Pr.:	MARSHALL	***Temperature (^{o}F):***	65
State:	WV	***Bottle Number:***	69885

Remarks:

Component	Mole Percent	Liq Vol %	Liq Wgt %
Nitrogen	0.0000	0.0000	0.0000
Carbon Dioxide	0.0000	0.0000	0.0000
Methane	4.7851	2.2346	1.0956
Ethane	9.1783	6.7616	3.9388
Propane	14.4113	10.9369	9.0696
I-Butane	3.1468	2.8365	2.6104
n-Butane	13.2599	11.5154	10.9994
I-Pentane	4.9562	4.9929	5.1035
n-Pentane	8.8867	8.8735	9.1508
Neohexane	0.1578	0.1814	0.1941
2-Methylpentane	3.5237	4.0256	4.3339
3-Methylpentane	1.7739	1.9931	2.1818
n-Hexane	6.1822	7.0029	7.6035
Heptanes+	29.7380	38.6456	43.7187
Hydrogen Sulfide			
TOTAL	100.0000	**100.0000**	**100.0000**

	TOTAL SAMPLE	PENTANES + FRACTION
Specific Gravity (H2O=1)	0.6116	0.6728
API Gravity	99.8570	79.0080
Molecular Weight	70.0668	91.9350
Absolute Density (lbs/gal)	5.0991	5.6219
Heating Value Liq. Idl Gas (btu/gal)	107860	117451
Vapor/Liquid (cu.ft./gal)	27.6169	23.2589
Vapor Pressure (psig)	337.7668	

DISTRIBUTION:
1 CP-CAN

METHOD: GPA 2165-95

Note: Calibration, Standards, and testing procedures are achieved pursuant to GPA Regulations.

J-W ANALYST

J-W Measurement Company
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Fairfield,TX Oklahoma City,OK Mounds,OK Tulsa,OK
WWW.JWOPERATING.COM
888-226-9110

J-W MC Number:	CUSBA001		***Run Date:*** 04/03/13
Customer Name:	CHEVRON PA		
Station Name:	TAYLOR # 1-H		
Station Number:	2470510007	***Sampled by:***	JM
Producer:		***Procure Date:***	03/26/13
Field:	OHIO VALLEY MID	***Pressure (lbs.):***	1000
Co. or Pr.:	MARSHALL	***Temperature (°F):***	67
State:		***Bottle Number:***	75564

Remarks:

Component	Mole Percent	Liq Vol %	Liq Wgt %
Nitrogen	0.0000	0.0000	0.0000
Carbon Dioxide	0.0608	0.0354	0.0551
Methane	27.2294	15.7592	9.0020
Ethane	18.5038	16.8939	11.4659
Propane	15.4243	14.5070	14.0162
I-Butane	2.8697	3.2058	3.4372
n-Butane	8.1619	8.7845	9.7760
I-Pentane	3.2222	4.0229	4.7908
n-Pentane	4.3865	5.4282	6.5219
Neohexane	0.0100	0.0143	0.0178
2-Methylpentane	1.5840	2.2427	2.8130
3-Methylpentane	0.8760	1.2198	1.5557
n-Hexane	2.7768	3.8982	4.9312
Heptanes+	14.8945	23.9882	31.6171
Hydrogen Sulfide			
TOTAL	100.0000	**100.0000**	**100.0000**

	TOTAL SAMPLE	PENTANES + FRACTION
Specific Gravity (H2O=1)	0.5250	0.6720
API Gravity	138.0403	79.2477
Molecular Weight	48.5257	91.5741
Absolute Density (lbs/gal)	4.3768	5.6155
Heating Value Liq. Idl Gas (btu/gal)	94204	117331
Vapor/Liquid (cu.ft./gal)	34.2274	23.3241
Vapor Pressure (psig)	1532.0372	

DISTRIBUTION:
1 CP-CAN

METHOD: GPA 2165-95

Note: Calibration, Standards, and testing procedures are achieved pursuant to GPA Regulations.

J-W ANALYST

We appreciate your business

Attachment U

ATTACHMENT U – FACILITY-WIDE CONTROLLED EMISSIONS SUMMARY SHEET

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

Emission Point ID#	NO_x		CO		VOC		SO_2		PM_{10}		$PM_{2.5}$		CH_4		GHG (CO_2e)	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Line Heater (E0110)	0.08	0.33	0.06	0.28	<0.01	0.02	<0.01	<0.01	<0.01	0.03	<0.01	0.03	<0.01	<0.01	117.10	512.89
Flash Gas Compressor (E0050)	0.21	0.91	0.21	0.91	0.01	0.06	<0.01	<0.01	<0.01	0.02	<0.01	0.02	<0.01	<0.01	11.20	49.06
Vapor Destruction Unit (ZZZ-0060)	0.41	1.78	0.34	1.50	0.52	2.28	<0.01	0.01	<0.01	0.03	<0.01	0.03	0.05	0.22	603.41	2,642.93
Tank Truck Loading Activities (VS-1)	<0.01	<0.01	<0.01	<0.01	0.02	0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Uncontrolled Tank Working & Breathing Emissions	<0.01	<0.01	<0.01	<0.01	0.37	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
TOTAL	0.69	3.02	0.61	2.68	0.93	2.50	<0.01	0.01	<0.01	0.08	<0.01	0.08	0.05	0.22	731.71	3,204.88

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

ATTACHMENT U – FACILITY-WIDE HAP CONTROLLED EMISSIONS SUMMARY SHEET

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

Emission Point ID#	Formaldehyde		Benzene		Toluene		Ethylbenzene		Xylenes		Hexane		Total HAPs	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Line Heater (E0110)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Flash Gas Compressor (E0050)	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.045
Vapor Destruction Unit (ZZZ-0060)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.10	0.02	0.095
Tank Truck Loading Activities (VS-1)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Uncontrolled Tank Working & Breathing Emissions	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
TOTAL	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.10	0.03	0.14

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

Attachment V

AIR QUALITY PERMIT NOTICE

Notice of Application

Notice is given that Chevron Appalachia, LLC has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a G70-D General Permit Modification for a natural gas production operation located on Middle Grave Creek Road, Moundsville, Marshall County, West Virginia. The latitude and longitude coordinates are: 39.88644 and -80.65404.

The applicant estimates the maximum potential to discharge the following regulated air pollutants on a facility-wide basis will be:

Particulate Matter (PM) = 55.56 tpy
Sulfur Dioxide (SO_2) = 0.01 tpy
Volatile Organic Compounds (VOC) = 2.74 tpy
Carbon Monoxide (CO) = 2.68 tpy
Nitrogen Oxides (NO_x) = 3.02 tpy
Total Hazardous Air Pollutants = 0.15 tpy
Formaldehyde (HCHO) = 0.04 tpy
Hexane (C_8H_{14}) = 0.10 tpy
Benzene (C_6H_6) = <0.01 tpy
Toluene (C_7H_8) = <0.01 tpy
Ethylbenzene (C_8H_{10}) = <0.01 tpy
Xylene (C_8H_{10}) = <0.01 tpy
Carbon Dioxide Equivalents (CO_2e) = 3,212.64 tpy

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 1250, during normal business hours.

Dated this the 29th day of September 2017.

By: Chevron Appalachia, LLC
Gary Orr - Appalachia Area Manager
700 Cherrington Parkway
Coraopolis, PA 15108