Tracy
PD15-010
051-00312

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David Morris, EIT – Air Quality Manager

JAN 21 2015

January 20, 2015

Beverly McKeone
West Virginia Department of Environmental Protection
Division of Air Quality
601 57th Street
Charleston, WV 25304

RE: Cone Gathering, LLC
Moundsville, WV (Marshall County)
Slug Catcher Site
Request for Permit Determination

Ms. McKeone:

Cone Gathering, LLC (Cone Gathering) is submitting this Permit Determination (PD) request to the West Virginia Department of Environmental Protection (WVDEP), seeking confirmation that proposed addition of a slug catcher site along an existing pipeline near Moundsville, West Virginia is exempt from permitting.

Background

Cone Gathering is proposing to build a site which will act as a liquids collection and separation facility. The materials in the inlet pipeline consist of a mixture of natural gas, condensate and produced water. These streams will be separated into the three components via a slug catcher, 3-phase separator, and surge drum and the natural gas and condensate will flow into separate pipelines leaving the site. The produced water will be stored in storage tanks.

Emission Calculations

Emissions from the proposed operations at Moundsville will result from combustion of natural gas in two (2) small engines (associated with the vapor recovery units [VRUs]), flashing, working and breathing losses in the storage tanks, and fugitive emissions from piping components. One of the engines is used to compress natural gas from the separation process back into the pipeline while the other is used to control emissions from the produced water tanks.

The background of the calculations for the proposed emission sources is as follows:

Compressor Engines – Potential emissions of nitrogen oxides (NO_X), carbon monoxide (CO), volatile organic compounds (VOC), and Greenhouse Gases (GHG) are calculated using vendor specification sheets, where applicable. Emissions of all other criteria pollutants and Hazardous Air Pollutants (HAPs) are calculated using vendor specification sheets and U.S. EPA's AP-42 factors for 4-stroke, rich burn engines.

Produced Water Tanks – Potential emissions of VOC, HAPs and GHG are calculated using the American Petroleum Institute (API) E&P TANKS version 2.0 program. Controlled emission estimates were based on a conservative 5% annual downtime on the VRU operation and a maximum site throughput for liquids and estimated liquids composition.

Fugitives – The equipment component leak emissions are calculated using emission factors obtained from Table 2-4 (Oil & Gas Production Operations) of Protocol for Equipment Leak Emission Estimates, EPA 453/R-95-017, November 1995, as well as 40 CFR 98 Subpart W.

Review of 45 CSR 13

WVDEP requires new stationary sources of air emissions to be permitted through its Rule 13 construction permitting program. The definition in Rule 13 states that a "stationary source" meets one of the following provisions:

45 CSR 13 2.24.a	*Is subject to any substantive requirement of an emission control rule promulgated by the Secretary;*
45 CSR 13 2.24.b	*Discharges or has the potential to discharge more than 6 pounds per hour and 10 tons per year, or has the potential to discharge more than 144 pounds per calendar day, of any regulated air pollutant;*
45 CSR 13 2.24.c	*Discharges or has the potential to discharge more than 2 pounds per hour or 5 tons per year of hazardous air pollutants considered on an aggregated basis;*
45 CSR 13 2.24.d	*Discharges or has the potential to discharge any air pollutant(s) listed in Table 45-13A in the amounts shown in Table 45-13A or greater; or*
45 CSR 13 2.24.e	*An owner or operator voluntarily chooses to be subject to a construction or modification permit pursuant to this rule, even though not otherwise required to do so.*

Equipment with potential emissions below the stationary source thresholds listed above are not required to obtain an air permit. Additionally, Table 45-13B of Rule 13 contains a list of de minimus sources whose emissions are not required to be considered in a stationary source determination. Cone Gathering has evaluated the Rule 13 provisions and has determined that the proposed Moundsville Slug Catcher Site will exceed the emission levels requiring an air permit, and is requesting WVDEP's concurrence that the site will be exempt from obtaining a construction or operating permit. It is important to note even assuming no control of the produced water tanks, emissions from the tanks are both below the emissions thresholds for Rule 13 permitting as well as New Source Performance Standard (NSPS) Subpart OOOO. Attachment E and F document the proposed facility will not exceed the emissions criteria in 45 CSR 13 2.2.4.b, 45 CSR 13 2.2.4.c and 45 CSR 13 2.2.4.d,).

Thank you for your review of the enclosed information. As previously stated, Cone Gathering is requesting that WVDEP provide written concurrence that an air permit is not needed for the proposed operations. If you have any questions or comments about the information presented in this letter, please do not hesitate to contact me at (724) 485-3063 or by email at DavidMorris@consolenergy.com.

Respectfully,

David Morris, EIT
Air Quality Manager

cc: Mr. Tom Muscenti, Trinity Consultants

Attachments

Attachment A
Map

ATTACHMENT A

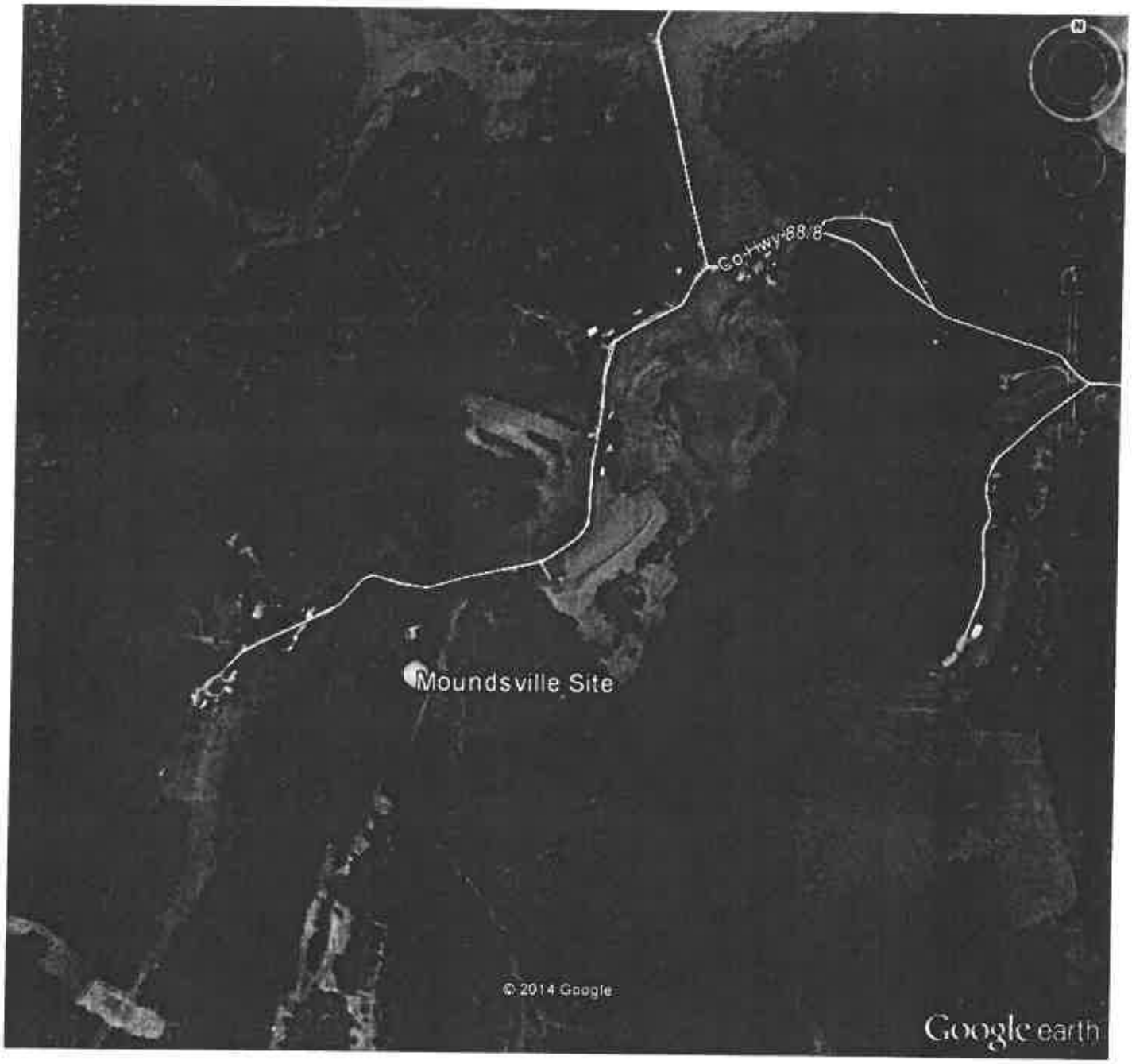
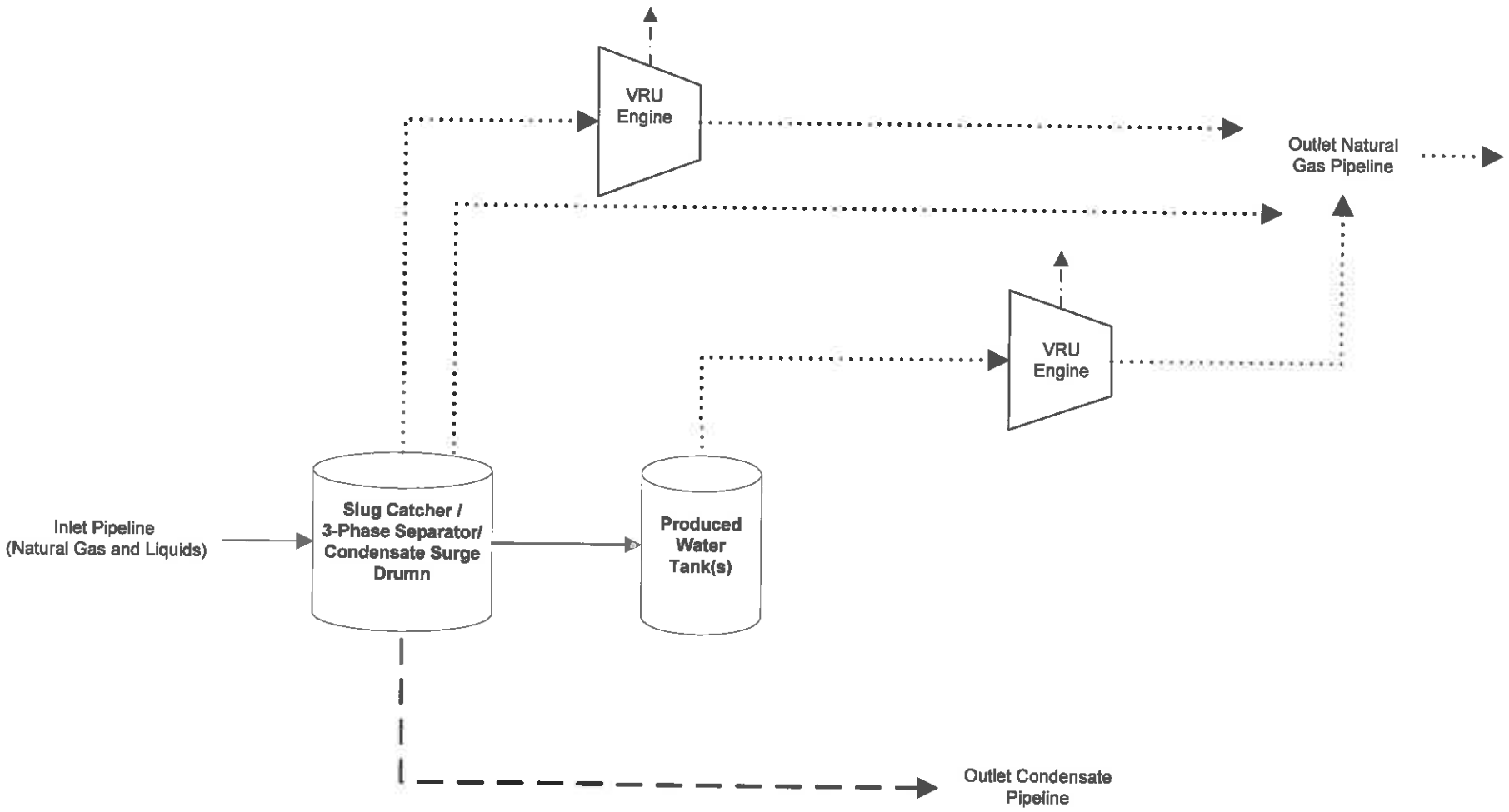


Figure 1 - Map of Moundsville Slug Catcher Site

Attachment B
Process Flow Diagram (PFD)



Flow Legend

- Gas/Water/Condensate Flow
- Gas Flow
- Condensate Flow
- Produced Water Flow
- Stack Emissions

Cone Gathering, LLC

Process Flow Diagram
Moundsville Slug Catcher Site

Trinity Consultants

May 2014
143901.0035

Attachment C
Process Description

The Moundsville Slug Catcher Site is a liquids gathering and separation site. The influent stream consists of natural gas, condensate and produced water, and first enters the Slug Catcher/3-Phase Separator. The Slug Catcher can be visualized as a wide spot along the pipeline, which allows for the separation of gas from liquids. The separation results in three streams – gas, condensate and water. The gas is sent further down a natural gas pipeline, the condensate is sent further down a condensate pipeline, and the produced water is stored on-site in tanks. The engines on-site power the compressors associated with the Vapor Recovery Units (VRUs), which compress gas from the respective tanks (Produced Water Tanks and Condensate Surge Drum) into the outlet natural gas pipeline.

Attachment D
MSDS Sheets (Not Applicable)

Attachment E
Emission Calculations

USA COMPRESSION

USA Compression Unit 1365 Caterpillar G3306NA Engine Emissions

Date of Manufacture	March 21, 1994	Engine Serial Number	07Y04774	Date Modified/Reconstructed	N/A
Driver Rated HP	145	Rated Speed in RPM	1800	Combustion Type	Spark Ignited 4 Stroke
Number of Cylinders	6	Compression Ratio	10.5:1	Combustion Setting	Rich Burn
Displacement, in^3	640	Fuel Delivery Method	Carburetor	Combustion Air Treatment	Naturally Aspirated

Raw Engine Emissions (Customer Supplied Fuel Gas with little to no H2S)

Fuel Consumption *8111 LHV BTU/bhp-hr or 8940 HHV BTU/bhp-hr*
Altitude *1200 ft*
Maximum Air Inlet Temp *90 F*

	g/bhp-hr [1]	lb/MMBTU [2]	lb/hr	TPY
Nitrogen Oxides (NOx)	14.35		4.587	20.092
Carbon Monoxide (CO)	14.35		4.587	20.092
Volatile Organic Compounds (VOC or NMNEHC excluding CH2O)	0.37		0.118	0.518
Formaldehyde (CH2O)	0.27		0.086	0.378
Particulate Matter (PM) Filterable+Condensable		1.94E-02	0.025	0.110
Sulfur Dioxide (SO2)		5.88E-04	0.001	0.003

	g/bhp-hr [1]	lb/MMBTU [2]	lb/hr	Metric Tonne/yr
Carbon Dioxide (CO2)	540	110.0	143	566
Methane (CH4)	1.04	0.23	0.298	1.184

[1] g/bhp-hr are based on Caterpillar Specifications. Note that g/bhp-hr values are based on 100% Load Operation.
It is recommended to add a safety margin to emissions to allow for operational flexibility and fuel gas composition variability.
[2] Emission Factor obtained from EPA's AP-42, Fifth Edition, Volume I, Chapter 3: Stationary Internal Combution Sources (Section 3.2 Natural Gas-Fired Reciprocating Engines, Table 3.2-3).

Catalytic Converter Emissions

Catalytic Converter Make amd Model: *Miratech, VXC-1610-05*
Element Type: *3-way; NSCR Element*
Number of Elements in Housing: *1*
Air/Fuel Ratio Control Compliance Controls, AFR-9 *equipped with* 25mm bore fuel valve.

	% Reduction		lb/hr	TPY
Nitrogen Oxides (NOx)	86.1	or 2 g/bhp-hr	0.64	2.79
Carbon Monoxide (CO)	86	or 2 g/bhp-hr	0.64	2.79
Volatile Organic Compounds (VOC or NMNEHC excluding CH2O)	0		0.12	0.52
Formaldehyde (CH2O)	0		0.09	0.38
Particulate Matter (PM)	0		2.52E-02	1.10E-01
Sulfur Dioxide (SO2)	0		7.62E-04	3.34E-03

	% Reduction	lb/hr	Metric Tonne/yr
Carbon Dioxide (CO2)	0	143	566
Methane (CH4)	0	0.30	1.18

Equipment Specification Report

Proposal Number: MH-14-2815

Engine Data

Number of Engines:	1
Application:	Gas Compression
Engine Manufacturer:	Caterpillar
Model Number:	G 3306 TA LCR
Power Output:	145 bhp
Power Output:	0.6 wt% sulfated ash or less
Type of Fuel:	Natural Gas
Exhaust Flow Rate:	689 acfm (cfm)
Exhaust Temperature:	1114 F

System Details

Housing Model Number:	VXC-1610-05-HSG
Element Model Number:	VX-RE-10XC
Number of Catalyst Layers:	1
Number of Spare Catalyst Layers:	1
System Pressure Loss:	2.0 inches of WC (Clean)
Sound Attenuation:	28-32 dBA insertion loss
Exhaust Temperature Limits:	550 – 1250°F (catalyst inlet); 1350°F (catalyst outlet)

NSCR Housing & Catalyst Details

Model Number:	VXC-1610-05-XC1
Material:	Carbon Steel
Inlet Pipe Size & Connection:	5 inch FF Flange, 150# ANSI standard bolt pattern
Outlet Pipe Size & Connection:	5 inch FF Flange, 150# ANSI standard bolt pattern
Overall Length:	65 inches
Weight Without Catalyst:	191 lbs
Weight Including Catalyst:	205 lbs
Instrumentation Ports:	1 inlet/1 outlet (1/2" NPT)

Emission Requirements

Exhaust Gases	Engine Outputs (g/bhp-hr)	Reduction (%)	Warranted Converter Ouputs (g/bhp-hr)	Requested Emissions Targets
CH_2O	0.27			
CO	14.35	86.1	2	2 g/bhp-hr
NMNEHC*	0.37			
NO_x**	14.35	86.1	2	2 g/bhp-hr
O2	0.5%			
H2O	18%			

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

*MW referenced as CH_4 **MW referenced as NO_2

G3306

GAS COMPRESSION APPLICATION

GAS ENGINE SITE SPECIFIC TECHNICAL DATA
CNX Moundsville VRU USAC 1365 10-13-14

CATERPILLAR®

ENGINE SPEED (rpm):	1800
COMPRESSION RATIO:	10.5:1
JACKET WATER OUTLET (°F):	210
ASPIRATION:	NA
COOLING SYSTEM:	JW+OC
CONTROL SYSTEM:	MAG
EXHAUST MANIFOLD:	WC
COMBUSTION:	CATALYST SETTING
EXHAUST OXYGEN (% O2):	0.5
SET POINT TIMING:	25

RATING STRATEGY:	STANDARD
RATING LEVEL:	CONTINUOUS
FUEL SYSTEM:	LPG IMPCO WITH CUSTOMER SUPPLIED AIR FUEL RATIO CONTROL

SITE CONDITIONS:

FUEL:	Moundsville VRU 1365 10-10-14
FUEL PRESSURE RANGE(psig):	1.5-10.0
FUEL METHANE NUMBER:	51.4
FUEL LHV (Btu/scf):	1153
ALTITUDE(ft):	1200
MAXIMUM INLET AIR TEMPERATURE(°F):	90
STANDARD RATED POWER:	145 bhp@1800rpm

				MAXIMUM RATING	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE		
RATING		**NOTES**	**LOAD**	**100%**	**100%**	**75%**	**53%**
ENGINE POWER	(WITHOUT FAN)	(1)	bhp	145	138	103	72
INLET AIR TEMPERATURE			°F	63	90	90	90
ENGINE DATA							
FUEL CONSUMPTION (LHV)		(2)	Btu/bhp-hr	8111	8224	8861	9924
FUEL CONSUMPTION (HHV)		(2)	Btu/bhp-hr	8940	9064	9766	10938
AIR FLOW (@inlet air temp, 14.7 psia)	(WET)	(3)(4)	ft3/min	206	208	167	130
AIR FLOW	(WET)	(3)(4)	lb/hr	936	900	723	564
FUEL FLOW (60°F, 14.7 psia)			scfm	17	16	13	10
INLET MANIFOLD PRESSURE		(5)	in Hg(abs)	24.9	24.9	20.7	17.0
EXHAUST TEMPERATURE - ENGINE OUTLET		(6)	°F	1114	1107	1076	1050
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(WET)	(7)(4)	ft3/min	689	660	520	399
EXHAUST GAS MASS FLOW	(WET)	(7)(4)	lb/hr	992	954	767	598
EMISSIONS DATA - ENGINE OUT							
NOx (as NO2)		(8)(9)	g/bhp-hr	14.35	14.01	12.51	10.36
CO		(8)(9)	g/bhp-hr	14.35	14.01	11.94	10.25
THC (mol. wt. of 15.84)		(8)(9)	g/bhp-hr	1.84	1.88	2.15	2.69
NMHC (mol. wt. of 15.84)		(8)(9)	g/bhp-hr	0.80	0.82	0.94	1.17
NMNEHC (VOCs) (mol. wt. of 15.84)		(8)(9)(10)	g/bhp-hr	0.37	0.38	0.43	0.54
HCHO (Formaldehyde)		(8)(9)	g/bhp-hr	0.27	0.28	0.31	0.33
CO2		(8)(9)	g/bhp-hr	540	547	592	669
EXHAUST OXYGEN		(8)(11)	% DRY	0.5	0.5	0.5	0.5
HEAT REJECTION							
HEAT REJ. TO JACKET WATER (JW)		(12)	Btu/min	6626	6500	5656	4820
HEAT REJ. TO ATMOSPHERE		(12)	Btu/min	783	756	611	479
HEAT REJ. TO LUBE OIL (OC)		(12)	Btu/min	1084	1063	925	788

COOLING SYSTEM SIZING CRITERIA			
TOTAL JACKET WATER CIRCUIT (JW+OC)	(13)	Btu/min	8589
A cooling system safety factor of 0% has been added to the cooling system sizing criteria.			

CONDITIONS AND DEFINITIONS

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

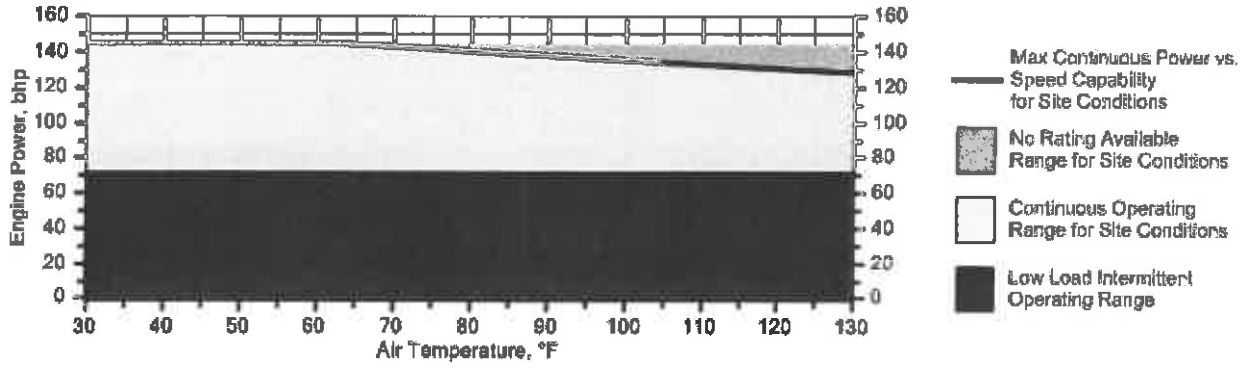
For notes information consult page three.

*****WARNINGS ISSUED FOR THIS RATING CONSULT PAGE 3*****

PREPARED BY:
Data generated by Gas Engine Rating Pro Version 4.07.01
Ref. Data Set DM5053-08-002, Printed 13Oct2014

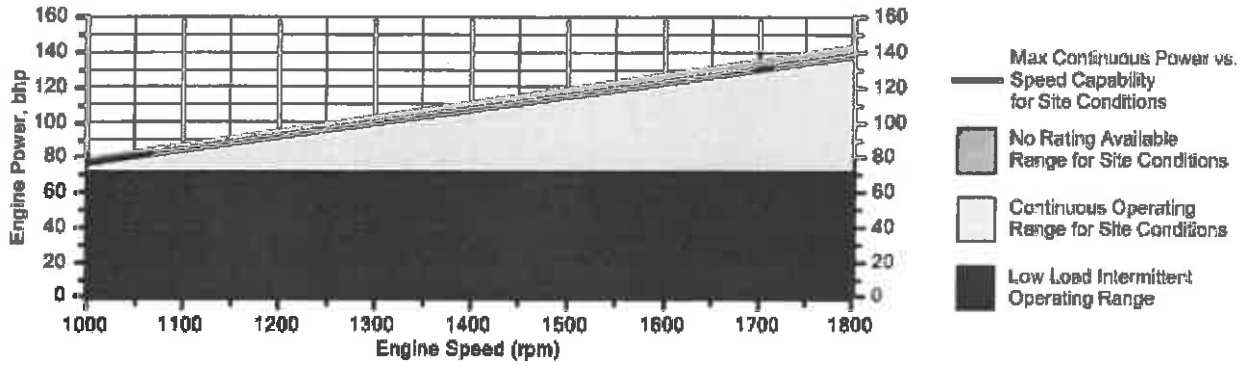
Engine Power vs. Inlet Air Temperature

Data represents temperature sweep at 1200 ft and 1800 rpm



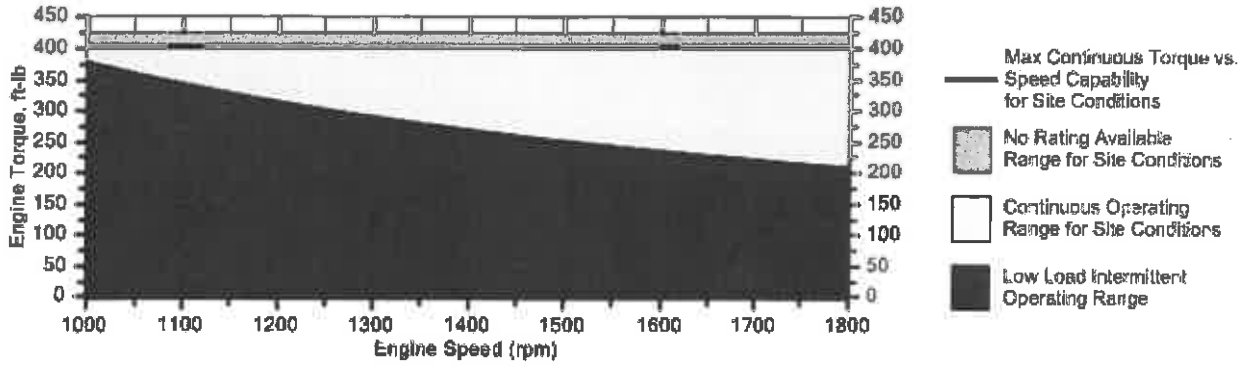
Engine Power vs. Engine Speed

Data represents speed sweep at 1200 ft and 90 °F



Engine Torque vs. Engine Speed

Data represents speed sweep at 1200 ft and 90 °F



Note: At site conditions of 1200 ft and 90°F inlet air temp., constant torque can be maintained down to 1000 rpm. The minimum speed for loading at these conditions is 1000 rpm.

NOTES

1. Engine rating is with one engine driven jacket water pump. Tolerance is ± 3% of full load.

2. Fuel consumption tolerance is ± 5.0% of full load data.

3. Air flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 5 %.

4. Inlet and Exhaust Restrictions must not exceed A&I limits based on full load flow rates from the standard technical data sheet.

5. Inlet manifold pressure is a nominal value with a tolerance of ± 5 %.

6. Exhaust temperature is a nominal value with a tolerance of (+)63°F, (-)54°F.

7. Exhaust flow value is on a "wet" basis. Flow is a nominal value with a tolerance of ± 6 %.

8. Emissions data is at engine exhaust flange prior to any after treatment.

9. Emission values are based on engine operating at steady state conditions. Fuel methane number cannot vary more than ± 3. Values listed are higher than nominal levels to allow for instrumentation, measurement, and engine-to-engine variations. They indicate "Not to Exceed" values. THC, NMHC, and NMNEHC do not include aldehydes. Part Load data requires customer supplied air fuel ratio control.

10. VOCs - Volatile organic compounds as defined in US EPA 40 CFR 60, subpart JJJJ

11. Exhaust Oxygen tolerance is ± 0.2.

12. Heat rejection values are nominal. Tolerances, based on treated water, are ± 10% for jacket water circuit, ± 50% for radiation, ± 20% for lube oil circuit.

13. Cooling system sizing criteria are maximum circuit heat rejection for the site, with applied tolerances.

WARNING(S):
1. The lower heating value of the fuel is higher than or equal to 1050 Btu/scf and lower than 1400 Btu/scf. May require on-site adjustment or tuning of standard fuel system hardware.

Constituent	Abbrev	Mole %	Norm
Water Vapor	H2O	0.0000	0.0000
Methane	CH4	75.8510	75.8510
Ethane	C2H6	15.6200	15.6200
Propane	C3H8	5.2860	5.2860
Isobutane	iso-C4H1O	0.5610	0.5610
Norbutane	nor-C4H1O	1.3170	1.3170
Isopentane	iso-C5H12	0.2590	0.2590
Norpentane	nor-C5H12	0.2670	0.2670
Hexane	C6H14	0.1200	0.1200
Heptane	C7H16	0.0340	0.0340
Nitrogen	N2	0.5040	0.5040
Carbon Dioxide	CO2	0.1660	0.1660
Hydrogen Sulfide	H2S	0.0000	0.0000
Carbon Monoxide	CO	0.0000	0.0000
Hydrogen	H2	0.0000	0.0000
Oxygen	O2	0.0000	0.0000
Helium	HE	0.0000	0.0000
Neopentane	neo-C5H12	0.0000	0.0000
Octane	C8H18	0.0090	0.0090
Nonane	C9H20	0.0060	0.0060
Ethylene	C2H4	0.0000	0.0000
Propylene	C3H6	0.0000	0.0000
TOTAL (Volume %)		100.0000	100.0000

Fuel Makeup:	Moundsville VRU
Unit of Measure:	English

Calculated Fuel Properties

Caterpillar Methane Number:	51.4
Lower Heating Value (Btu/scf):	1153
Higher Heating Value (Btu/scf):	1271
WOBBE Index (Btu/scf):	1353
THC: Free Inert Ratio:	148.25
Total % Inerts (% N2, CO2, He):	0.67%
RPC (%) (To 905 Btu/scf Fuel):	100%
Compressibility Factor:	0.996
Stoich A/F Ratio (Vol/Vol):	11.95
Stoich A/F Ratio (Mass/Mass):	16.46
Specific Gravity (Relative to Air):	0.726
Specific Heat Constant (K):	1.279

CONDITIONS AND DEFINITIONS

Caterpillar Methane Number represents the knock resistance of a gaseous fuel. It should be used with the Caterpillar Fuel Usage Guide for the engine and rating to determine the rating for the fuel specified. A Fuel Usage Guide for each rating is included on page 2 of its standard technical data sheet.

RPC always applies to naturally aspirated (NA) engines, and turbocharged (TA or LE) engines only when they are derated for altitude and ambient site conditions.

Project specific technical data sheets generated by the Caterpillar Gas Engine Rating Pro program take the Caterpillar Methane Number and RPC into account when generating a site rating.

Fuel properties for Btu/scf calculations are at 60F and 14.696 psia.

Caterpillar shall have no liability in law or equity, for damages, consequently or otherwise, arising from use of program and related material or any part thereof.

FUEL LIQUIDS

Field gases, well head gases, and associated gases typically contain liquid water and heavy hydrocarbons entrained in the gas. To prevent detonation and severe damage to the engine, hydrocarbon liquids must not be allowed to enter the engine fuel system. To remove liquids, a liquid separator and coalescing filter are recommended, with an automatic drain and collection tank to prevent contamination of the ground in accordance with local codes and standards.

To avoid water condensation in the engine or fuel lines, limit the relative humidity of water in the fuel to 80% at the minimum fuel operating temperature.

WARNING(S)

1. The lower heating value of the fuel is higher than or equal to 1050 Btu/scf and lower than 1400 Btu/scf. May require on-site adjustment or tuning of standard fuel system hardware.

Moundsville Slug Catcher Site
Facility-Wide Emissions Summary

	Moundsville Equipment				Site TOTAL	
	VRU Engine	VRU Engine	Produced Water Tanks	Station Fugitives - Component Leaks, Loading		
Equipment Status	New	New	New	New		
Fuel Type	Natural Gas	Natural Gas	NA	NA		
Capacity	145	84	400 bbl (each)			
Unit	bhp	bhp	bbl			
# of Emission Units	1	1	4	ALL		
Hours per Year	8,760	8,760	8,760	8,760		
Pollutant	tpy	tpy	tpy	tpy	lb/hr	tpy
PM_{10}	0.11	0.06	---	---	0.04	0.17
$PM_{2.5}$	0.11	0.06	---	---	0.04	0.17
SO_X	0.00	0.00	---	---	0.00	0.01
CO	2.80	1.62	---	---	1.01	4.42
NO_X	2.80	0.81	---	---	0.82	3.61
VOC (incl. HCHO)	0.90	0.2	0.25	3.05	1.01	4.44
CO_2	756	364	0.01	0.03	256	1,120
CH_4	1.46	1.02	0.06	5.87	1.92	8.41
N_2O	0.00	0.00	---	---	0.00	0.00
CO_2e	793	390	1.55	147	304	1,331
Formaldehyde (HCHO)	0.38	0.07	---	---	0.10	0.44
Total HAPs (incl. HCHO)	0.45	0.10	0.00	0.20	0.17	0.75

Individual TAPs (as specified in 45 CSR 27):						
Benzene	0.009	0.005			0.003	0.014
1,3-Butadiene	0.004	0.002			0.001	0.006
Carbon Tetrachloride	0.000	0.000			0.000	0.000
Chloroform	0.000	0.000			0.000	0.000
Methylene Chloride	0.000	0.000			0.000	0.000
Vinyl Chloride	0.000	0.000			0.000	0.000

Moundsville Slug Catcher Site
VRU Engine - 145 hp

Engine Information:

Manufacturer:	Caterpillar
Model No.:	G3306
Stroke Cycle:	4-stroke
Type of Burn:	Rich
Rated Horsepower (bhp):	145
Control Device:	NSCR

Engine Fuel Information:

Fuel Type:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,189
Specific Fuel Consumption (Btu/bhp-hr):	8,940
Maximum Fuel Consumption at 100% Load (scf/hr):	1,091
Heat Input (MMBtu/hr):	1.30
Potential Fuel Consumption (MMBtu/yr):	11,356
Max. Fuel Consumption at 100%(MMscf/hr):	0.0011
Max. Fuel Consumption (MMscf/yr):	9.6
Max. Annual Hours of Operation (hr/yr):	8,760

Engine Emissions Data:

TAP?	Pollutant	Emission Factor	Units	Maximum Potential Emissions		Estimation Basis / Emission Factor Source
				lbs/hr	tpy	
	NO_X	2.00	g/bhp-hr	0.64	2.80	Vendor Spec Sheet
	NMNEHC (excludes HCHO)	0.37	g/bhp-hr	0.12	0.52	Vendor Spec Sheet
	CO	2.00	g/bhp-hr	0.64	2.80	Vendor Spec Sheet
	SO_X	0.001	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	PM_{10}	0.02	lb/MMBtu	0.03	0.11	AP-42, Table 3.2-3 (Aug-2000)
	$PM_{2.5}$	0.02	lb/MMBtu	0.03	0.11	AP-42, Table 3.2-3 (Aug-2000)
Y	Formaldehyde (HCHO)	0.27	g/bhp-hr	0.09	0.38	Vendor Spec Sheet
	GHG (CO_2e)	See Table Below		181	793	Vendor Specs & 40 CFR 98
	Other (Total HAP)	See Table Below		0.10	0.45	AP-42, Table 3.2-3 (Aug-2000)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this source type.

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

	Pollutant	Emission Factor	Units	Maximum Potential Emissions		Estimation Basis / Emission Factor Source
				lbs/hr	tpy	
	GHGs:					
	CO_2	540	g/bhp-hr	173	756	Vendor Spec Sheet
	CH_4	1.04	g/bhp-hr	0.33	1.46	Vendor Spec Sheet
	N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Table C-2
	GHG (CO_2e)			181	793	
	Organic HAPs:					
	1,1,2,2-Tetrachloroethane	2.53E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	1,1,2-Trichloroethane	1.53E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Y	1,3-Butadiene	6.63E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	1,3-Dichloropropene	1.27E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Acetaldehyde	2.79E-03	lb/MMBtu	0.00	0.02	AP-42, Table 3.2-3 (Aug-2000)
	Acrolein	2.63E-03	lb/MMBtu	0.00	0.01	AP-42, Table 3.2-3 (Aug-2000)
Y	Benzene	1.58E-03	lb/MMBtu	0.00	0.01	AP-42, Table 3.2-3 (Aug-2000)
Y	Carbon Tetrachloride	1.77E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Chlorobenzene	1.29E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Y	Chloroform	1.37E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Ethylbenzene	2.48E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Ethylene Dibromide	2.13E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Methanol	3.06E-03	lb/MMBtu	0.00	0.02	AP-42, Table 3.2-3 (Aug-2000)
Y	Methylene Chloride	4.12E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Naphthalene	9.71E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	PAH	1.41E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Styrene	1.19E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Toluene	5.58E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Y	Vinyl Chloride	7.18E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Xylene	1.95E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Total HAP (includes HCHO)			0.10	0.45	

Moundsville Slug Catcher Site
VRU Engine - 84 hp

Engine Information:

Manufacturer:	Cummins
Model No.:	G 5.9
Stroke Cycle:	4-stroke
Type of Burn:	Rich
Rated Horsepower (bhp):	84
Control Device:	3-Way (NSCR)

Engine Fuel Information:

Fuel Type:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,189
Specific Fuel Consumption (Btu/bhp-hr):	8,793
Maximum Fuel Consumption at 100% Load (scf/h	621
Heat Input (MMBtu/hr):	0.74
Potential Fuel Consumption (MMBtu/yr):	6,470
Max. Fuel Consumption at 100%(MMscf/hr):	0.0006
Max. Fuel Consumption (MMscf/yr):	5.4
Max. Annual Hours of Operation (hr/yr):	8,760

Engine Emissions Data:

TAP?	Pollutant	Emission Factor	Units	Maximum Potential Emissions		Estimation Basis / Emission Factor Source
				lbs/hr	tpy	
	NO_X	1.0	g/bhp-hr	0.19	0.81	Vendor Spec Sheet
	VOC (NMHC)	0.22	g/bhp-hr	0.04	0.18	Vendor Spec Sheet
	CO	2.0	g/bhp-hr	0.37	1.62	Vendor Spec Sheet
	SO_X	0.001	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	PM_{10}	0.019	lb/MMBtu	0.01	0.06	AP-42, Table 3.2-3 (Aug-2000)
	$PM_{2.5}$	0.019	lb/MMBtu	0.01	0.06	AP-42, Table 3.2-3 (Aug-2000)
Y	Formaldehyde (HCHO)	0.021	lb/MMBtu	0.02	0.07	AP-42, Table 3.2-3 (Aug-2000)
	GHG (CO_2e)	See Table Below		89	390	Vendor Specs & 40 CFR 98
	Other (Total HAP)	See Table Below		0.02	0.10	AP-42, Table 3.2-3 (Aug-2000)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this source type.
4. Note that VOC is expressed as NMHC (non-methane hydrocarbons) - this is conservative as it includes ethane.

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

	Pollutant	Emission Factor	Units	Maximum Potential Emissions		Estimation Basis / Emission Factor Source
				lbs/hr	tpy	
	GHGs:					
	CO_2	449	g/bhp-hr	83	364	Vendor Spec Sheet
	CH_4	1.26	g/bhp-hr	0.23	1.02	Vendor Spec Sheet (THC-NMHC)
	N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Table C-2
	GHG (CO_2e)			89	390	
	Organic HAPs:					
	1,1,2,2-Tetrachloroethane	2.53E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	1,1,2-Trichloroethane	1.53E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Y	1,3-Butadiene	6.63E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	1,3-Dichloropropene	1.27E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Acetaldehyde	2.79E-03	lb/MMBtu	0.00	0.01	AP-42, Table 3.2-3 (Aug-2000)
	Acrolein	2.63E-03	lb/MMBtu	0.00	0.01	AP-42, Table 3.2-3 (Aug-2000)
Y	Benzene	1.58E-03	lb/MMBtu	0.00	0.01	AP-42, Table 3.2-3 (Aug-2000)
Y	Carbon Tetrachloride	1.77E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Chlorobenzene	1.29E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Y	Chloroform	1.37E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Ethylbenzene	2.48E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Ethylene Dibromide	2.13E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Methanol	3.06E-03	lb/MMBtu	0.00	0.01	AP-42, Table 3.2-3 (Aug-2000)
Y	Methylene Chloride	4.12E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Naphthalene	9.71E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	PAH	1.41E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Styrene	1.19E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Toluene	5.58E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Y	Vinyl Chloride	7.18E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Xylene	1.95E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Total HAP (includes HCHO)			0.02	0.10	

Moundsville Slug Catcher Site
Produced Water Tanks

Storage Tank Information:

Source ID:	**Produced Water Tanks**
Tank Contents:	Produced Water
Total Site Throughput (bbls/day):	230
Assumed Percent Condensate (%):	0.25%
Total Condensate Throughput (bbl/day):	0.6
Control Type:	VRU
Control Efficiency:	95%
Max. Annual Hours of Operation (hr/yr):	8,760

Tank Emissions Data:

Pollutant	Uncontrolled Emissions		Controlled Emissions		Emissions Estimation Method
	lbs/hr	tpy	lbs/hr	tpy	
VOC	1.15	5.05	0.06	0.25	E&P TANKS 2.0
HAPs	0.00	0.00	0.00	0.00	E&P TANKS 2.0
GHG (CO_2e)	7.08	31.01	0.35	1.55	E&P TANKS 2.0

Notes:

1. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).

E&P TANKS Emissions Data:

Pollutant	Total Uncontrolled Emissions (Working + Breathing + Flashing)	
	lbs/hr	tpy
VOC	1.152	5.046
HAPs	0.000	0.000
CO_2	0.003	0.013
CH_4	0.283	1.240

Notes:

1. E&P TANKS 2.0 software estimates working, breathing, and flashing losses and reports as one total.
2. This tank does contain hydrocarbons that could be flashed off at tank operating conditions.

Moundsville Slug Catcher Site
Fugitive Components

Fugitive Component Information:

Component Type	Estimated Component Count	Gas Leak Emission Factor (lb/hr/component)	Gas Leak Emission Factor Factor Source	Average Gas Leak Rate (lb/hr)	Max Gas Leak Rate (tpy)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)
Connectors	200	4.41E-04	EPA Protocol, Table 2-4	0.09	0.46	0.06	0.00
Flanges	50	8.60E-04	EPA Protocol, Table 2-4	0.04	0.23	0.03	0.00
Open-Ended Lines	1	4.41E-03	EPA Protocol, Table 2-4	0.00	0.02	0.00	0.00
Pump Seals	0	5.29E-03	EPA Protocol, Table 2-4	0.00	0.00	0.00	0.00
Valves	250	9.92E-03	EPA Protocol, Table 2-4	2.48	13.04	1.68	0.04
Other	25	1.94E-02	EPA Protocol, Table 2-4	0.49	2.55	0.33	0.01
Total				**3.10**	**16.30**	**2.09**	**0.05**

Notes:
1. "Other" equipment types include compressor seals, relief valves, diaphragms, drains, meters, etc.
2. The component count is conservatively estimated based on the design of the facility.
3. Conservatively assumed that maximum leak rate is 20% greater than measured average leak rate for the purposes of establishing PTE.
4. VOC and HAP emissions are based on fractions of these pollutants in the site-specific gas analysis.

GHG Fugitive Emissions from Component Leaks:

Component Type	Estimated Component Count	GHG Emission Factor (scf/hr/component)	GHG Emission Factor Factor Source	CH_4 Emissions (tpy)	CO_2 Emissions (tpy)	CO_2e Emissions (tpy)
Connectors	200	0.003	40 CFR 98, Table W-1A	0.09	0.00	2.28
Flanges	50	0.003	40 CFR 98, Table W-1A	0.02	0.00	0.57
Open-Ended Lines	1	0.061	40 CFR 98, Table W-1A	0.01	0.00	0.23
Pump Seals	0	13.3	40 CFR 98, Table W-1A	0.00	0.00	0.00
Valves	250	0.027	40 CFR 98, Table W-1A	1.03	0.01	25.70
Other	25	0.04	40 CFR 98, Table W-1A	0.15	0.00	3.81
Total				**1.30**	**0.01**	**32.60**

Notes:
1. The component count is conservatively estimated based on the design of the facility.
2. CH_4 and CO_2 emissions are based on fractions of these pollutants in the site-specific gas analysis.
3. Emissions are calculated in accordance with Equations W-31, W-35 and W-36 in Subpart W of 40 CFR 98.
4. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2(GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).

VOC/GHG Fugitive Emissions from Pneumatic Devices:

Component Type	Estimated Component Count	GHG Emission Factor (scf/hr/component)	VOC Emissions (tpy)	HAP Emissions (tpy)	CH_4 Emissions (tpy)	CO_2 Emissions (tpy)	CO_2e Emissions (tpy)
Pneumatic	5	6	0.27	0.00	4.57	0.02	114.24
Total			**0.27**	**0.00**	**4.57**	**0.02**	**114.24**

Notes:
1. The component count is conservatively estimated based on the design of the facility.
2. CH_4 and CO_2 emissions are based on fractions of these pollutants in the site-specific gas analysis.
3. Emissions are calculated in accordance with Equations W-31, W-35 and W-36 in Subpart W of 40 CFR 98.
4. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2(GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).
5. The GHG Emission Factor for Pneumatic Devices comes from 40 CFR 60, Subpart OOOO.

VOC/GHG Fugitive Emissions from Blowdowns

Fugitive Component Emissions Data:

Pollutant	Atmospheric Emissions lbs/hr	Atmospheric Emissions tpy	Emissions Estimation Method
VOC	0.54	2.36	EPA Protocol, Table 2-4 & Site-Specific Gas Analysis
HAPs	0.01	0.06	EPA Protocol, Table 2-4 and Site-Specific Gas Analysis
GHG (CO_2e)	34	147	40 CFR 98, Table W-1A and Site-Specific Gas Analysis

Moundsville Slug Catcher Site
Produced Water Loading

Liquid Loading Losses:

Uncontrolled Loading Losses: L_L (lb/10^3 gal) = 12.46 (SPM)/T

Controlled Loading Losses: L_L (lb/10^3 gal) = 12.46 (SPM)/T * (1 - collection efficiency * control efficiency)

Parameter	Value	Description
S	1.45	saturation factor for splash loading (AP-42 Table 5.2-1)
Collection Efficiency	0%	Assume no collection
Control Efficiency	0%	Assume no control
P	0.10	max true vapor pressure of liquid loaded (psia) - assume 5% of organic VP (99%+ water)
M	105.53	molecular weight of vapors (lb/lb-mol) - conservatively assume flash liquid
T	511.0	temperature of liquids loaded (deg R)

Description	Loading Losses (lb/10^3 gal)	Maximum Throughput[1] (gal)	VOC Emissions Uncontrolled (tpy)	VOC Emissions Controlled (tpy)
Liquids Hauling	0.4	3,525,900	0.69	0.69

[1] Total produced water

Speciated HAP Emission Potential:

Constituent	mol%[1]	True Vapor Pressure of Organic Components in liquid (psia)[2]	Partial Vapor Pressure (psia)	Mole Fraction	Molecular Weight	VOC Vapor Weight	Speciated Weight Fraction	Speciated Liquid Loading Emissions (tpy)[3]
Methane	0.006	---	---	---	---	---	---	---
Ethane	0.173	---	---	---	---	---	---	---
Propane	1.685	127.310	---	---	---	---	---	---
Isobutane	1.210	46.110	---	---	---	---	---	---
n-Butane	5.887	32.045	---	---	---	---	---	---
Isopentane	5.087	12.530	0.64	0.31	72.15	22.06	0.28	0.19
n-Pentane	9.924	8.433	0.84	0.40	72.15	28.96	0.37	0.26
n-Hexane	16.406	2.436	0.40	0.19	85.67	16.42	0.21	0.14
Other Hexanes	0.000	2.436	0.00	0.00	86.18	0.00	0.00	0.00
Heptanes	16.101	0.735	0.12	0.06	97.88	5.56	0.07	0.05
Benzene	0.000	1.508	0.00	0.00	78.11	0.00	0.00	0.00
Toluene	0.000	0.425	0.00	0.00	92.14	0.00	0.00	0.00
Ethylbenzene	0.000	0.151	0.00	0.00	106.17	0.00	0.00	0.00
Xylenes	0.000	0.180	0.00	0.00	106.17	0.00	0.00	0.00
2,2,4-Trimethylpentane	0.000	0.596	0.00	0.00	114.23	0.00	0.00	0.00
C8+ Heavies	43.521	0.213	0.09	0.04	107.73	4.79	0.06	0.04
	100.0		2.09			77.79	1.00	
Total Emissions:								0.69
Total HAP Emissions:								0.145

[1] An atmospheric analysis of flash liquid

[2] Emission factors from AP-42 Section 7.1 "Liquid Storage Tanks" Tables 7.1-2, 7.1-3 and 7.1-5 (at 70 deg F or ~21 deg C) and Handbook of Chemistry and Physics: 84th Edition (at 295 K)

[3] Speciated emissions (tpy) = Speciated Weight Fraction x Calculated Controlled Liquid Loading Emissions (tpy). As methane through n-butane will flash off prior to loading, the emissions from these constituents are not included in the speciation.

Compositional Analysis of Separator Gas

Date and time sampled: July 18, 2012 at 1200 hours
Sampling Conditions: 569 psia at 79 °F
Opening Conditions: 564 psia at 120 °F
PENCOR ID No. 39414-01

	Component	Mole %	GPM at 14.85 psia	Weight %	Molecular Weight
N_2	Nitrogen	0.504	0.000	0.671	28.013
CO_2	Carbon Dioxide	0.166	0.000	0.346	44.010
H_2S	Hydrogen Sulfide	0.000	0.000	0.000	34.082
C1	Methane	75.851	0.000	57.845	16.043
C2	Ethane	15.620	4.204	22.324	30.070
C3	Propane	5.286	1.468	11.078	44.097
iC4	Iso-Butane	0.561	0.185	1.550	58.123
nC4	N-Butane	1.317	0.418	3.637	58.123
iC5	Iso-Pentane	0.259	0.095	0.887	72.150
nC5	N-Pentane	0.267	0.098	0.916	72.150
C6	Hexanes	0.120	0.050	0.491	86.177
C7	Heptanes	0.034	0.014	0.153	95.334
C8	Octanes	0.009	0.004	0.045	105.038
C9	Nonanes	0.001	0.000	0.004	115.891
C10+	Decanes Plus	0.005	0.005	0.053	220.866
	Total	100.000	6.541	100.000	

Hydrogen Sulfide was detected in the field by stain tube measurement 0.3 ppm.

Calculated Properties of Gas			Data at 14.85 psia	
Gas Specific Gravity (Air = 1.00)		=	0.7287	
Net Heat of Combustion (Btu/Cu.Ft. at 60 °F)	Dry	=	1,165.1	Real
Gross Heat of Combustion (Btu/Cu.Ft. at 60 °F)	Dry	=	1,284.2	Real
Gross Heat of Combustion (Btu/Cu.Ft. at 60 °F)	Wet	=	1,261.8	Water Sat.
Gas Compressibility (1 Atm. at 60 °F)	Z	=	0.9964	

Heat of combustion is the quantity of heat produced when gas is burned completely to carbon dioxide and water.
Wet and dry refer to the condition of the gas prior to combustion.
Wet refers to a gas that is saturated with water vapor, and dry refers to a gas that contains no water vapor prior to combustion.
Net and gross refer to the condition of the water resulting from combustion.
Gross heat is the heat produced in complete combustion under constant pressure with the combustion products cooled to standard conditions and the water of the combustion products condensed to the liquid state.
Net heat is the heat produced in complete combustion under constant pressure with the combustion products cooled to standard conditions and the water of combustion products remains in the vapor phase.

Moundsville Slug Catcher Site
Gas Analysis

HHV (Btu/scf): 1,189

Constituent	Natural Gas Stream Speciation (Vol. %)	Natural Gas Stream Speciation (wt. %)
Carbon Dioxide	0.160%	0.36
Nitrogen	0.702%	0.00
Methane	82.144%	68.13
Ethane	12.001%	18.66
Propane	3.221%	7.34
Isobutane	0.411%	1.23
n-Butane	0.712%	2.14
Isopentane	0.193%	0.72
n-Pentane	0.167%	0.62
Cyclopentane	0.000%	0.00
n-Hexane	0.057%	0.25
Cyclohexane	0.007%	0.03
Other Hexanes	0.039%	0.17
Heptanes	0.020%	0.10
Methylcyclohexane	0.013%	0.07
2,2,4-Trimethylpentane	0.000%	0.00
Benzene	0.002%	0.01
Toluene	0.004%	0.02
Ethylbenzene	0.000%	0.00
Xylenes	0.006%	0.03
C8 + Heavies	0.017%	0.10
Total	100%	

TOC (Total)	99.014%	99.64
VOC (Total)	4.868%	12.85
HAP (Total)	0.069%	0.31

Moundsville Slug Catcher Site
Facility-Wide Emissions Summary

	Moundsville Equipment				Site TOTAL	
	VRU Engine	VRU Engine	Produced Water Tanks	Station Fugitives - Component Leaks, Loading		
Equipment Status	New	New	New	New		
Fuel Type	Natural Gas	Natural Gas	NA	NA		
Capacity	145	84	400 bbl (each)			
Unit	bhp	bhp	bbl			
# of Emission Units	1	1	4	ALL		
Hours per Year	8,760	8,760	8,760	8,760		
Pollutant	tpy	tpy	tpy	tpy	lb/hr	tpy
PM_{10}	0.11	0.06	---	---	0.04	0.2
$PM_{2.5}$	0.11	0.06	---	---	0.04	0.2
SO_X	0.00	0.00	---	---	0.00	0.0
CO	2.24	1.62	---	---	0.88	3.9
NO_X	33.76	0.81	---	---	7.89	34.6
VOC (incl. HCHO)	0.55	0.2	0.25	3.05	0.93	4.1
CO_2	689	364	0.01	0.03	240	1,053
CH_4	1.90	1.02	0.06	5.87	2.02	8.9
N_2O	0.00	0.00	---	---	0.00	0.0
CO_2e	737	390	1.55	147	291	1,275
Formaldehyde (HCHO)	0.32	0.07	---	---	0.09	0.4
Total HAPs (incl. HCHO)	0.39	0.10	0.00	0.20	0.16	0.7
Individual TAPs (as specified in 45 CSR 27):						
Benzene	0.009	0.005			0.003	0.014
1,3-Butadiene	0.004	0.002			0.001	0.006
Carbon Tetrachloride	0.000	0.000			0.000	0.000
Chloroform	0.000	0.000			0.000	0.000
Methylene Chloride	0.000	0.000			0.000	0.000
Vinyl Chloride	0.000	0.000			0.000	0.000

Moundsville Slug Catcher Site
VRU Engine - 145 hp

Engine Information:

Manufacturer:	Caterpillar
Model No.:	G3306
Stroke Cycle:	4-stroke
Type of Burn:	Rich
Rated Horsepower (bhp):	145
Control Device:	None

Engine Fuel Information:

Fuel Type:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,189
Specific Fuel Consumption (Btu/bhp-hr):	8,635
Maximum Fuel Consumption at 100% Load (scf/hr):	1,053
Heat Input (MMBtu/hr):	1.25
Potential Fuel Consumption (MMBtu/yr):	10,968
Max. Fuel Consumption at 100%(MMscf/hr):	0.0011
Max. Fuel Consumption (MMscf/yr):	9.2
Max. Annual Hours of Operation (hr/yr):	8,760

Engine Emissions Data:

TAP?	Pollutant	Emission Factor	Units	Maximum Potential Emissions		Estimation Basis / Emission Factor Source
				lbs/hr	tpy	
	NO_X	24.11	g/bhp-hr	7.71	33.76	Vendor Spec Sheet
	NMNEHC (excludes HCHO)	0.16	g/bhp-hr	0.05	0.22	Vendor Spec Sheet
	CO	1.60	g/bhp-hr	0.51	2.24	Vendor Spec Sheet
	SO_X	0.001	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	PM_{10}	0.02	lb/MMBtu	0.02	0.11	AP-42, Table 3.2-3 (Aug-2000)
	$PM_{2.5}$	0.02	lb/MMBtu	0.02	0.11	AP-42, Table 3.2-3 (Aug-2000)
Y	Formaldehyde (HCHO)	0.23	g/bhp-hr	0.07	0.32	Vendor Spec Sheet
	GHG (CO_2e)	See Table Below		168	737	Vendor Specs & 40 CFR 98
	Other (Total HAP)	See Table Below		0.09	0.39	AP-42, Table 3.2-3 (Aug-2000)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this source type.

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

	Pollutant	Emission Factor	Units	Maximum Potential Emissions		Estimation Basis / Emission Factor Source
				lbs/hr	tpy	
	GHGs:					
	CO_2	492	g/bhp-hr	157	689	Vendor Spec Sheet
	CH_4	1.36	g/bhp-hr	0.43	1.90	Vendor Spec Sheet
	N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Table C-2
	GHG (CO_2e)			168	737	
	Organic HAPs:					
	1,1,2,2-Tetrachloroethane	2.53E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	1,1,2-Trichloroethane	1.53E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Y	1,3-Butadiene	6.63E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	1,3-Dichloropropene	1.27E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Acetaldehyde	2.79E-03	lb/MMBtu	0.00	0.02	AP-42, Table 3.2-3 (Aug-2000)
	Acrolein	2.63E-03	lb/MMBtu	0.00	0.01	AP-42, Table 3.2-3 (Aug-2000)
Y	Benzene	1.58E-03	lb/MMBtu	0.00	0.01	AP-42, Table 3.2-3 (Aug-2000)
Y	Carbon Tetrachloride	1.77E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Chlorobenzene	1.29E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Y	Chloroform	1.37E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Ethylbenzene	2.48E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Ethylene Dibromide	2.13E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Methanol	3.06E-03	lb/MMBtu	0.00	0.02	AP-42, Table 3.2-3 (Aug-2000)
Y	Methylene Chloride	4.12E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Naphthalene	9.71E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	PAH	1.41E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Styrene	1.19E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Toluene	5.58E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Y	Vinyl Chloride	7.18E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Xylene	1.95E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Total HAP (includes HCHO)			0.09	0.39	

Moundsville Slug Catcher Site
VRU Engine - 84 hp

Engine Information:

Manufacturer:	Cummins
Model No.:	G 5.9
Stroke Cycle:	4-stroke
Type of Burn:	Rich
Rated Horsepower (bhp):	84
Control Device:	3-Way (NSCR)

Engine Fuel Information:

Fuel Type:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,189
Specific Fuel Consumption (Btu/bhp-hr):	8,793
Maximum Fuel Consumption at 100% Load (scf/hr	621
Heat Input (MMBtu/hr):	0.74
Potential Fuel Consumption (MMBtu/yr):	6,470
Max. Fuel Consumption at 100%(MMscf/hr):	0.0006
Max. Fuel Consumption (MMscf/yr):	5.4
Max. Annual Hours of Operation (hr/yr):	8,760

Engine Emissions Data:

TAP?	Pollutant	Emission Factor	Units	Maximum Potential Emissions		Estimation Basis / Emission Factor Source
				lbs/hr	tpy	
	NO_X	1.0	g/bhp-hr	0.19	0.81	Vendor Spec Sheet
	VOC (NMHC)	0.22	g/bhp-hr	0.04	0.18	Vendor Spec Sheet
	CO	2.0	g/bhp-hr	0.37	1.62	Vendor Spec Sheet
	SO_X	0.001	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	PM_{10}	0.019	lb/MMBtu	0.01	0.06	AP-42, Table 3.2-3 (Aug-2000)
	$PM_{2.5}$	0.019	lb/MMBtu	0.01	0.06	AP-42, Table 3.2-3 (Aug-2000)
Y	Formaldehyde (HCHO)	0.021	lb/MMBtu	0.02	0.07	AP-42, Table 3.2-3 (Aug-2000)
	GHG (CO_2e)	See Table Below		89	390	Vendor Specs & 40 CFR 98
	Other (Total HAP)	See Table Below		0.02	0.10	AP-42, Table 3.2-3 (Aug-2000)

Notes:

1. PM_{10} and $PM_{2.5}$ are total values (filterable + condensable).
2. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).
3. Total HAP is the summation of all hazardous air pollutants for which there is a published emission factor for this source type.
4. Note that VOC is expressed as NMHC (non-methane hydrocarbons) - this is conservative as it includes ethane.

Greenhouse Gas (GHG) & Hazardous Air Pollutant (HAP) Emissions Calculations:

	Pollutant	Emission Factor	Units	Maximum Potential Emissions		Estimation Basis / Emission Factor Source
				lbs/hr	tpy	
	GHGs:					
	CO_2	449	g/bhp-hr	83	364	Vendor Spec Sheet
	CH_4	1.26	g/bhp-hr	0.23	1.02	Vendor Spec Sheet (THC-NMHC)
	N_2O	0.0001	kg/MMBtu	0.00	0.00	40 CFR 98, Table C-2
	GHG (CO_2e)			**89**	**390**	
	Organic HAPs:					
	1,1,2,2-Tetrachloroethane	2.53E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	1,1,2-Trichloroethane	1.53E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Y	1,3-Butadiene	6.63E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	1,3-Dichloropropene	1.27E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Acetaldehyde	2.79E-03	lb/MMBtu	0.00	0.01	AP-42, Table 3.2-3 (Aug-2000)
	Acrolein	2.63E-03	lb/MMBtu	0.00	0.01	AP-42, Table 3.2-3 (Aug-2000)
Y	Benzene	1.58E-03	lb/MMBtu	0.00	0.01	AP-42, Table 3.2-3 (Aug-2000)
Y	Carbon Tetrachloride	1.77E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Chlorobenzene	1.29E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Y	Chloroform	1.37E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Ethylbenzene	2.48E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Ethylene Dibromide	2.13E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Methanol	3.06E-03	lb/MMBtu	0.00	0.01	AP-42, Table 3.2-3 (Aug-2000)
Y	Methylene Chloride	4.12E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Naphthalene	9.71E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	PAH	1.41E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Styrene	1.19E-05	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Toluene	5.58E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
Y	Vinyl Chloride	7.18E-06	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Xylene	1.95E-04	lb/MMBtu	0.00	0.00	AP-42, Table 3.2-3 (Aug-2000)
	Total HAP (includes HCHO)			**0.02**	**0.10**	

Moundsville Slug Catcher Site
Produced Water Tanks

Storage Tank Information:

Source ID:	**Produced Water Tanks**
Tank Contents:	Produced Water
Total Site Throughput (bbls/day):	230
Assumed Percent Condensate (%):	0.25%
Total Condensate Throughput (bbl/day):	0.6
Control Type:	VRU
Control Efficiency:	95%
Max. Annual Hours of Operation (hr/yr):	8,760

2,300 total bbl/day liquids (Per email from Andres Zapata !
10% percent produced water in liquids (Per email from A

40 CFR 60 Subpart OOOO

Tank Emissions Data:

Pollutant	Uncontrolled Emissions		Controlled Emissions		Emissions Estimation Method
	lbs/hr	tpy	lbs/hr	tpy	
VOC	1.15	5.05	0.06	0.25	E&P TANKS 2.0
HAPs	0.00	0.00	0.00	0.00	E&P TANKS 2.0
GHG (CO_2e)	7.08	31.01	0.35	1.55	E&P TANKS 2.0

Notes:
1. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).

E&P TANKS Emissions Data:

Pollutant	Total Uncontrolled Emissions (Working + Breathing + Flashing)	
	lbs/hr	tpy
VOC	1.152	5.046
HAPs	0.000	0.000
CO_2	0.003	0.013
CH_4	0.283	1.240

Notes:
1. E&P TANKS 2.0 software estimates working, breathing, and flashing losses and reports as one total.
2. This tank does contain hydrocarbons that could be flashed off at tank operating conditions.

Moundsville Slug Catcher Site
Fugitive Components

Fugitive Component Information:

Component Type	Estimated Component Count	Gas Leak Emission Factor (lb/hr/component)	Gas Leak Emission Factor Factor Source	Average Gas Leak Rate (lb/hr)	Max Gas Leak Rate (tpy)	Potential VOC Emissions (tpy)	Potential HAP Emissions (tpy)	
Connectors	200	4.41E-04	EPA Protocol, Table 2-4	0.09	0.46	0.06	0.00	
Flanges	50	8.60E-04	EPA Protocol, Table 2-4	0.04	0.23	0.03	0.00	Per email from Andres Zapata (5/9/2014 at 8:37 am)
Open-Ended Lines	1	4.41E-03	EPA Protocol, Table 2-4	0.00	0.02	0.00	0.00	Per email from Andres Zapata (5/9/2014 at 8:37 am)
Pump Seals	0	5.29E-03	EPA Protocol, Table 2-4	0.00	0.00	0.00	0.00	Per email from Andres Zapata (5/9/2014 at 8:37 am)
Valves	250	9.92E-03	EPA Protocol, Table 2-4	2.48	13.04	1.68	0.04	Per email from Andres Zapata (5/9/2014 at 8:37 am)
Other	25	1.94E-02	EPA Protocol, Table 2-4	0.49	2.55	0.33	0.01	Per email from Andres Zapata (5/9/2014 at 8:37 am)
Total				**3.10**	**16.30**	**2.09**	**0.05**	

Notes:
1. "Other" equipment types include compressor seals, relief valves, diaphragms, drains, meters, etc.
2. The component count is conservatively estimated based on the design of the facility.
3. Conservatively assumed that maximum leak rate is 20% greater than measured average leak rate for the purposes of establishing PTE.
4. VOC and HAP emissions are based on fractions of these pollutants in the site-specific gas analysis.

GHG Fugitive Emissions from Component Leaks:

Component Type	Estimated Component Count	GHG Emission Factor (scf/hr/component)	GHG Emission Factor Factor Source	CH_4 Emissions (tpy)	CO_2 Emissions (tpy)	CO_2e Emissions (tpy)
Connectors	200	0.003	40 CFR 98, Table W-1A	0.09	0.00	2.28
Flanges	50	0.003	40 CFR 98, Table W-1A	0.02	0.00	0.57
Open-Ended Lines	1	0.061	40 CFR 98, Table W-1A	0.01	0.00	0.23
Pump Seals	0	13.3	40 CFR 98, Table W-1A	0.00	0.00	0.00
Valves	250	0.027	40 CFR 98, Table W-1A	1.03	0.01	25.70
Other	25	0.04	40 CFR 98, Table W-1A	0.15	0.00	3.81
Total				**1.30**	**0.01**	**32.60**

Notes:
1. The component count is conservatively estimated based on the design of the facility.
2. CH_4 and CO_2 emissions are based on fractions of these pollutants in the site-specific gas analysis.
3. Emissions are calculated in accordance with Equations W-31, W-35 and W-36 in Subpart W of 40 CFR 98.
4. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).

VOC/GHG Fugitive Emissions from Pneumatic Devices:

Component Type	Estimated Component Count	GHG Emission Factor (scf/hr/component)	VOC Emissions (tpy)	HAP Emissions (tpy)	CH_4 Emissions (tpy)	CO_2 Emissions (tpy)	CO_2e Emissions (tpy)	
Pneumatic	5	6	0.27	0.00	4.57	0.02	114.24	Per email from Andres Zapata (5/9/2014 at 8:37 am)
Total			**0.27**	**0.00**	**4.57**	**0.02**	**114.24**	

Notes:
1. The component count is conservatively estimated based on the design of the facility.
2. CH_4 and CO_2 emissions are based on fractions of these pollutants in the site-specific gas analysis.
3. Emissions are calculated in accordance with Equations W-31, W-35 and W-36 in Subpart W of 40 CFR 98.
4. GHG (CO_2e) is carbon dioxide equivalent, which is the summation of CO_2 (GWP = 1) + CH_4 (GWP = 25) + N_2O (GWP = 298).
5. The GHG Emission Factor for Pneumatic Devices comes from 40 CFR 60, Subpart OOOO.

VOC/GHG Fugitive Emissions from Blowdowns:

Fugitive Component Emissions Data:

Pollutant	Atmospheric Emissions lbs/hr	Atmospheric Emissions tpy	Emissions Estimation Method
VOC	0.54	2.36	EPA Protocol, Table 2-4 & Site-Specific Gas Analysis
HAPs	0.01	0.06	EPA Protocol, Table 2-4 and Site-Specific Gas Analysis
GHG (CO_2e)	34	147	40 CFR 98, Table W-1A and Site-Specific Gas Analysis

Moundsville Slug Catcher Site
Produced Water Loading

Liquid Loading Losses:

Uncontrolled Loading Losses: L_L (lb/10^3 gal) = 12.46 (SPM)/T

Controlled Loading Losses: L_L (lb/10^3 gal) = 12.46 (SPM)/T * (1 - collection efficiency * control efficiency)

Parameter	Value	Description
S	1.45	saturation factor for splash loading (AP-42 Table 5.2-1)
Collection Efficiency	0%	Assume no collection
Control Efficiency	0%	Assume no control
P	0.10	max true vapor pressure of liquid loaded (psia) - assume 5% of organic VP (99%+ water)
M	105.53	molecular weight of vapors (lb/lb-mol) - conservatively assume flash liquid
T	511.0	temperature of liquids loaded (deg R)

Description	Loading Losses (lb/10^3 gal)	Maximum Throughput[1] (gal)	VOC Emissions Uncontrolled (tpy)	VOC Emissions Controlled (tpy)
Liquids Hauling	0.4	3,525,900	0.69	0.69

[1] Total produced water

Speciated HAP Emission Potential:

Constituent	mol%[1]	True Vapor Pressure of Organic Compounds in liquid (psia)[2]	Partial Vapor Pressure (psia)	Mole Fraction	Molecular Weight	VOC Vapor Weight	Speciated Weight Fraction	Speciated Liquid Loading Emissions (tpy)[3]
Methane	0.006	---	---	---	---	---	---	---
Ethane	0.173	---	---	---	---	---	---	---
Propane	1.685	127.310	---	---	---	---	---	---
Isobutane	1.210	46.110	---	---	---	---	---	---
n-Butane	5.887	32.045	---	---	---	---	---	---
Isopentane	5.087	12.530	0.64	0.31	72.15	22.06	0.28	0.19
n-Pentane	9.924	8.433	0.84	0.40	72.15	28.96	0.37	0.26
n-Hexane	16.406	2.436	0.40	0.19	85.67	16.42	0.21	0.14
Other Hexanes	0.000	2.436	0.00	0.00	86.18	0.00	0.00	0.00
Heptanes	16.101	0.735	0.12	0.06	97.88	5.56	0.07	0.05
Benzene	0.000	1.508	0.00	0.00	78.11	0.00	0.00	0.00
Toluene	0.000	0.425	0.00	0.00	92.14	0.00	0.00	0.00
Ethylbenzene	0.000	0.151	0.00	0.00	106.17	0.00	0.00	0.00
Xylenes	0.000	0.180	0.00	0.00	106.17	0.00	0.00	0.00
2,2,4-Trimethylpentane	0.000	0.596	0.00	0.00	114.23	0.00	0.00	0.00
C8+ Heavies	43.521	0.213	0.09	0.04	107.73	4.79	0.06	0.04
	100.0		2.09			77.79	1.00	
Total Emissions:								0.69
Total HAP Emissions:								0.145

[1] An atmospheric analysis of flash liquid

[2] Emission factors from AP-42 Section 7.1 "Liquid Storage Tanks" Tables 7.1-2, 7.1-3 and 7.1-5 (at 70 deg F or ~21 deg C) and Handbook of Chemistry and Physics: 84th Edition (at 295 K)

[3] Speciated emissions (tpy) = Speciated Weight Fraction x Calculated Controlled Liquid Loading Emissions (tpy). As methane through n-butane will flash off prior to loading, the emissions from these constituents are not included in the speciation.

Moundsville Slug Catcher Site
Gas Analysis

HHV (Btu/scf): 1,189

Constituent	Natural Gas Stream Speciation (Vol. %)
Carbon Dioxide	0.160%
Nitrogen	0.702%
Methane	82.144%
Ethane	12.001%
Propane	3.221%
Isobutane	0.411%
n-Butane	0.712%
Isopentane	0.193%
n-Pentane	0.167%
Cyclopentane	0.000%
n-Hexane	0.057%
Cyclohexane	0.007%
Other Hexanes	0.039%
Heptanes	0.020%
Methylcyclohexane	0.013%
2,2,4-Trimethylpentane	0.000%
Benzene	0.002%
Toluene	0.004%
Ethylbenzene	0.000%
Xylenes	0.006%
C8 + Heavies	0.017%
Total	100%

TOC (Total)	99.014%
VOC (Total)	4.868%
HAP (Total)	0.069%

Separator Liquid Composition

PENCOR ID No. 39414-04

Flash Summary (1,800 psia and 76 °F to atmospheric pressure and 60 °F)

Gas-Liquid Ratio	1,130	Scf/Stb	Color	Clear	
Vapor Gravity	1.337	(Air = 1.00)	API Gravity (water free)	56.8	°API at 60 °F
Shrinkage	0.572	Vstd / Vsat	Water content by Karl Fisher	0.04	Weight %
Separator Liquid Density	0.598	g/cc at 550 psia and 76 °F			

Component (Symbol / Name)		Flash Vapor (mole %)	Flash Liquid (mole %)	Flash Liquid (weight %)	Molecular Weight	Specific Gravity (water = 1.0)	Separator Liquid (mole %)	Separator Liquid (weight %)
N_2	Nitrogen	0.124	0.000	0.000	28.01	0.809	0.069	0.028
CO_2	Carbon Dioxide	0.099	0.000	0.000	44.01	0.818	0.055	0.036
H_2S	Hydrogen Sulfide	0.000	0.000	0.000	34.08	0.801	0.000	0.000
C1	Methane	26.771	0.006	0.001	16.04	0.300	14.921	3.518
C2	Ethane	25.495	0.173	0.049	30.07	0.356	14.284	6.312
C3	Propane	23.264	1.685	0.704	44.10	0.507	13.710	8.884
iC4	i-Butane	3.944	1.210	0.667	58.12	0.563	2.734	2.335
nC4	n-Butane	11.040	5.887	3.243	58.12	0.584	8.759	7.481
IC5	i-Pentane	2.999	5.087	3.478	72.15	0.624	3.923	4.160
nC5	n-Pentane	3.282	9.924	6.785	72.15	0.631	6.223	6.597
C6	Hexanes	1.958	16.406	13.399	86.18	0.664	8.355	10.580
C7	Heptanes	0.692	16.101	14.849	97.27	0.700	7.514	10.740
C8	Octanes	0.255	16.654	16.609	105.26	0.751	7.515	11.625
C9	Nonanes	0.043	8.141	9.664	125.23	0.736	3.628	6.677
C10	Decanes	0.034	5.732	7.279	134.31	0.779	2.557	5.046
C11	Undecanes		3.648	5.081	147.00	0.790	1.615	3.489
C12	Dodecanes		2.481	3.785	161.00	0.801	1.098	2.599
C13	Tridecanes		1.842	3.055	175.00	0.812	0.816	2.097
C14	Tetradecanes		1.243	2.239	190.00	0.823	0.550	1.536
C15	Pentadecanes		0.951	1.856	206.00	0.833	0.421	1.275
C16	Hexadecanes		0.659	1.387	222.00	0.840	0.292	0.952
C17	Heptadecanes		0.500	1.122	237.00	0.848	0.221	0.771
C18	Octadecanes		0.389	0.925	251.00	0.853	0.172	0.635
C19	Nonadecanes		0.289	0.720	263.00	0.858	0.128	0.494
C20	Eicosanes		0.216	0.563	275.00	0.863	0.096	0.386
C21	Heneicosanes		0.155	0.427	291.00	0.868	0.069	0.293
C22	Docosanes		0.125	0.361	305.00	0.873	0.055	0.248
C23	Tricosanes		0.101	0.304	318.00	0.878	0.045	0.209
C24	Tetracosanes		0.080	0.251	331.00	0.882	0.035	0.172
C25	Pentacosanes		0.051	0.167	345.00	0.886	0.023	0.114
C26	Hexacosanes		0.056	0.190	359.00	0.890	0.025	0.131
C27	Heptacosanes		0.039	0.139	374.00	0.894	0.017	0.095
C28	Octacosanes		0.034	0.124	388.00	0.897	0.015	0.086
C29	Nonacosanes		0.027	0.102	402.00	0.900	0.012	0.071
C30+	Triacontanes Plus		0.108	0.475	467.73	0.914	0.048	0.329
Total		100.000	100.000	100.000			100.000	100.000
Calculated Mole Weight		38.28	105.53				68.05	
Measured Mole Weight			113.17					

- Compositional groupings based on normal to normal carbon distribution.
- Pristane is included as C_{17} and Phytane is included as C_{18}.

Compositional Groupings of Separator Liquid

Group	Mole %	Weight %	MW	SG
Total Fluid	100.000	100.000	68.05	
C7+	26.967	50.070	126.35	0.761
C10+	8.310	21.028	172.21	0.812
C20+	0.439	2.134	330.72	0.882
C30+	0.048	0.329	467.73	0.914

Attachment F
Permit Determination Form

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

PERMIT DETERMINATION FORM (PDF)

FOR AGENCY USE ONLY: PLANT I.D. # _____

PDF # _____ PERMIT WRITER: _____

1. NAME OF APPLICANT (AS REGISTERED WITH THE WV SECRETARY OF STATE'S OFFICE):

CONE Midstream Partners, LP

2. NAME OF FACILITY (IF DIFFERENT FROM ABOVE):

Moundsville Slug Catcher Site

3. NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM (**NAICS**) CODE:

22121

4A. MAILING ADDRESS:

1000 Consol Energy Dr.
Canonsburg, PA 15317

4B. PHYSICAL ADDRESS:

1100 Kansas Ridge Lane/County Hwy 88/8
Moundsville, WV 26041

5A. DIRECTIONS TO FACILITY (PLEASE PROVIDE **MAP** AS **ATTACHMENT A**):

From Moundsville, WV, follow WV-2 S/Lafayette Ave for 0.9 miles. Turn left onto State Rte 2 Alt and follow for approximately 200 feet. Turn left onto Roberts Ridge Rd and travel 2.8 miles. Continue onto Roberts Ridge St Joseph Rd and travel 1.0 mile. Make a slight right onto Kansas Ridge. After approximately 0.1 miles, make a slight right to stay on Kansas Ridge. Travel approximately 1.0 mile; the site road will be on the left.

5B. NEAREST ROAD:
Kansas Ridge Lane/Co Hwy 88/8

5C. NEAREST CITY OR TOWN:
Moundsville, WV

5D. COUNTY:
Marshall

5E. UTM NORTHING (KM):
4412.0435

5F. UTM EASTING (KM):
519.368

5G. UTM ZONE:
17

6A. INDIVIDUAL TO CONTACT IF MORE INFORMATION IS REQUIRED:
David Morris

6B. TITLE:
Air Quality Manager

6C. TELEPHONE:
(724) 485-3063

6D. FAX:
n/a

6E. E-MAIL:
DavidMorris@consolenergy.com

7A. DAQ PLANT I.D. NO. (FOR AN EXISTING FACILITY ONLY):

n/a

7B. PLEASE LIST ALL CURRENT 45CSR13, 45CSR14, 45CSR19 AND/OR TITLE V (45CSR30) PERMIT NUMBERS ASSOCIATED WITH **THIS** PROCESS (FOR AN EXISTING FACILITY ONLY):

n/a

7C. IS THIS PDF BEING SUBMITTED AS THE RESULT OF AN ENFORCEMENT ACTION? IF YES, PLEASE LIST:

NO

8A. TYPE OF EMISSION SOURCE (CHECK ONE):

☒ **NEW SOURCE** ☐ **ADMINISTRATIVE UPDATE**

☐ **MODIFICATION** ☐ **OTHER** (PLEASE EXPLAIN IN 11B)

8B. IF ADMINISTRATIVE UPDATE, DOES DAQ HAVE THE APPLICANT'S CONSENT TO UPDATE THE EXISTING PERMIT WITH THE INFORMATION CONTAINED HEREIN?

☐ **YES** ☐ **NO**

9. IS *DEMOLITION* OR PHYSICAL *RENOVATION* AT AN EXISTING FACILITY INVOLVED? ☐ **YES** ☒ **NO**

10A. DATE OF ANTICIPATED INSTALLATION OR CHANGE:

Upon Determination by WVDEP

10B. DATE OF ANTICIPATED START-UP:

TBD

11A. PLEASE PROVIDE A **DETAILED PROCESS FLOW DIAGRAM** SHOWING EACH PROPOSED OR MODIFIED PROCESS EMISSION POINT AS **ATTACHMENT B.**

11B. PLEASE PROVIDE A **DETAILED PROCESS DESCRIPTION** AS **ATTACHMENT C.**

12. PLEASE PROVIDE **MATERIAL SAFETY DATA SHEETS (MSDS)** FOR ALL MATERIALS PROCESSED, USED OR PRODUCED AS **ATTACHMENT D.** FOR CHEMICAL PROCESSE, PLEASE PROVIDE A MSDS FOR EACH COMPOUND EMITTED TO AIR.

13A. **REGULATED AIR POLLUTANT EMISSIONS:**

⇒ **FOR A NEW FACILITY,** PLEASE PROVIDE PLANT WIDE EMISSIONS BASED ON THE POTENTIAL TO EMIT (PTE) FOR THE FOLLOWING AIR POLLUTANTS INCLUDING ALL PROCESSES.

⇒ **FOR AN EXISTING FACILITY,** PLEASE PROVIDE THE PROPOSED CHANGE IN EMISSIONS BASED ON THE PTE OF ALL PROCESS CHANGES FOR THE FOLLOWING AIR POLLUTANTS.

PTE FOR A GIVEN POLLUTANT IS TYPICALLY BEFORE AIR POLLUTION CONTROL DEVICES AND IS COLLECTED BASED ON THE MAXIMUM DESIGN CAPACITY OF PROCESS EQUIPMENT.

POLLUTANT	HOURLY PTE (LB/HR)		YEARLY PTE (TON/YR) (HOURLY PTE MULTIPLIED BY 8760 HR/YR) DIVIDED BY 2000 LB/TON	
PM	0.04		0.17	
PM_{10}	0.04		0.17	
VOCs	1.01		4.44	
CO	1.01		4.42	
NO_X	0.82		3.61	
SO_2	0.00		0.01	
Pb	---		---	
HAPs (AGGREGATE AMOUNT)	0.17		0.75	
TAPs (INDIVIDUALLY)*	Benzene 1,3-Butadiene	0.003 0.001	Benzene 1,3-Butadiene	0.014 0.006
OTHER (INDIVIDUALLY)*	---		---	

* ATTACH ADDITIONAL PAGES AS NEEDED

13B. PLEASE PROVIDE ALL **SUPPORTING CALCULATIONS** AS **ATTACHMENT E.**

CALCULATE AN HOURLY AND YEARLY PTE OF EACH PROCESS EMISSION POINT (SHOWN IN YOUR DETAILED PROCESS FLOW DIAGRAM) FOR ALL AIR POLLUTANTS LISTED ABOVE INCLUDING INDIVIDUAL HAP'S (LISTED IN SECTION 112[b] OF THE 1990 CAAA), TAP'S (LISTED IN 45CSR27), AND OTHER AIR POLLUTANTS (E.G. POLLUTANTS LISTED IN TABLE 45-13A OF 45CSR13, MINERAL ACIDS PER 45CSR7, ETC.).

14. **CERTIFICATION OF DATA**

I, JOSEPH FINK (*TYPE NAME*) ATTEST THAT ALL THE REPRESENTATIONS CONTAINED IN THIS APPLICATION, OR APPENDED HERETO, ARE TRUE, ACCURATE, AND COMPLETE TO THE BEST OF MY KNOWLEDGE BASED ON INFORMATION AND BELIEF AFTER REASONABLE INQUIRY, AND THAT I AM A ***RESPONSIBLE OFFICIAL*** (*PRESIDENT, VICE PRESIDENT, SECRETARY OR TREASURER, GENERAL PARTNER OR SOLE PROPRIETOR*) OF THE APPLICANT.

SIGNATURE OF RESPONSIBLE OFFICIAL: _____

TITLE: CHIEF OPERATING OFFICER, CONE MIDSTREAM PARTNERS, LP DATE: 1 / 19 / 15

** THE DEFINITION OF THE PHRASE '***RESPONSIBLE OFFICIAL***' CAN BE FOUND AT 45CSR13, SECTION 2.23.

NOTE: PLEASE CHECK ENCLOSED ATTACHMENTS:

☒ **ATTACHMENT A** ☒ **ATTACHMENT B** ☒ **ATTACHMENT C** ☐ **ATTACHMENT D** ☒ **ATTACHMENT E**

RECORDS ON ALL CHANGES ARE REQUIRED TO BE KEPT AND MAINTAINED ON-SITE FOR TWO (2) YEARS.

THE PERMIT DETERMINATION FORM WITH THE INSTRUCTIONS CAN BE FOUND ON DAQ'S PERMITTING SECTION WEB SITE:

www.dep.wv.gov/daq