

American Energy – Marcellus, LLC
Long 408/409 Well Pad
G70-A Permit Modification Application

Prepared for American Energy - Marcellus, LLC
301 NW 63rd
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Oklahoma City, OK 73116



AMERICAN ENERGY
MARCELLUS

Prepared by CB&I Environmental & Infrastructure, Inc.
2790 Mossy Boulevard
Monroeville, PA 15146

December 2014



Roy
670-A009A
103-00080

**Long 408/409 Well Pad
G70-A Permit Modification Application
Facility ID No. 103-00080**

American Energy – Marcellus, LLC

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WVDEP Application for G70-A Permit

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Introduction

On April 3, 2014, the West Virginia Department of Environmental Protection (WVDEP) issued General Permit G70-A009 to HG Energy, LLC for the construction of the Long 408/409 natural gas production well pad (Facility ID No. 103-00080) located in Wetzel County, West Virginia near Wileyville. As part of a real estate transaction in August 2014, American Energy – Marcellus, LLC (AEM), an affiliate of American Energy Partners, LP (AELP), acquired ownership of the Long 408/409 well pad. AEM is planning to make some modifications to the original permitted process design of this well pad and is filing this modification application to the WVDEP for approval of the planned modifications at the site.

The current General Permit G70-A009 for the Long 408/409 well pad permits construction of the following emission units:

Emission Unit ID	Emission Point ID	Emission Unit Description	Control Device ID	Max. Design Capacity
1S-11S	1E-11E	(11) GPU Burners	N/A	1.5 MMBtu/hr
12S-19S	12E-19E	(8) Condensate Tanks	VRU	210 bbl
20S-27S	20E-27E	(8) Produced Water Tanks	VRU	210 bbl
28S-29S	28E-29E	(2) Flash Separator Heaters	N/A	1.5 MMBtu/hr
31S	31E	Backup Flare	N/A	35.42 MMBtu/hr
32S	32E	Condensate Truck Loading	VRU	600 bbl/day
33S	33E	Produced Water Loading	N/A	600 bbl/day
35S	35E	USA Compressor Engine	NSCR	118 Bhp

The proposed process modification will include the following updates to the permitted emission units:

- Addition of a 1,200 BPD condensate stabilizer with a 0.75 MMBtu/hr burner assembly (36S/36E)
- Modification of the design capacity on the GPU burners (1S/1E through 11S/11E) from 1.5 MMBtu/hr to 1.0 MMBtu/hr
- Modification of the design capacity on the flash separator heaters (28S/28E and 29S/29E) from 1.5 MMBtu/hr to 1.0 MMBtu/hr
- Removal of the backup flare (originally permitted as 31S/31E) and the Vapor Recovery Unit (VRU)

- Addition of an enclosed vapor combustor (31S/31E) for control of the storage tanks
- Removal of flashing emissions from the condensate tanks (12S/12E-20S/20E)

A process description as modified is detailed in Attachment B. A process flow diagram reflecting the proposed facility operations is included in Attachment D. Emissions have been calculated for the new emission units and are included in Attachment I. Finally, an emission unit data sheet has been completed for all new emission sources (included in Attachment G).



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

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

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

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

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

SECTION I. GENERAL INFORMATION

1. Name of applicant (as registered with the WV Secretary of State's Office): American Energy - Marcellus, LLC		2. Federal Employer ID No. (FEIN): 48-5580354	
3. Applicant's mailing address: 301 N.W. 63rd Suite 600, Oklahoma City, OK 73116		4. Applicant's physical address: 1220 Long Ridge Road, Wileyville, WV	
5. If applicant is a subsidiary corporation, please provide the name of parent corporation: American Energy Partners, LP			
6. WV BUSINESS REGISTRATION. Is the applicant a resident of the State of West Virginia? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <ul style="list-style-type: none"> - IF YES, provide a copy of the Certificate of Incorporation/ Organization / Limited Partnership (one page) including any name change amendments or other Business Registration Certificate as Attachment A. - IF NO, provide a copy of the Certificate of Authority / Authority of LLC / Registration (one page) including any name change amendments or other Business Certificate as Attachment A. 			

SECTION II. FACILITY INFORMATION

7. Type of plant or facility (stationary source) to be constructed, modified, relocated or administratively updated (e.g., coal preparation plant, primary crusher, etc.): Oil and natural gas production facility		8a. Standard Industrial Classification (SIC) code: 1311	AND	8b. North American Industry System (NAICS) code: 211111
9. DAQ Plant ID No. (for existing facilities only): 103 - 00080		10. List all current 45CSR13 and other General Permit numbers associated with this process (for existing facilities only): G70-A009		



A: PRIMARY OPERATING SITE INFORMATION

11A. Facility name of primary operating site: Long 408/409	12A. Address of primary operating site: Mailing: 301 N.W. 63rd, Suite 600, Oklahoma City, OK 73116 Physical: 1220 Long Ridge Road, Wileyville, WV	
13A. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO – IF YES, please explain: Lease <hr/> – IF NO, YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.		
14A. – For Modifications or Administrative Updates at an existing facility, please provide directions to the present location of the facility from the nearest state road; – For Construction or Relocation permits, please provide directions to the proposed new site location from the nearest state road. Include a MAP as Attachment F. <p align="center">Route 7 East out of New Martinsville towards Morgantown, Bear right on Route 20 towards Pine Grove, In Pine Grove, left onto North Fork C/R 15/17, left onto Baker Run C/R 17, left onto McKimmie Ridge C/R 17/1, left on C/R 40, right on lease road.</p>		
15A. Nearest city or town: Pine Grove	16A. County: Wetzel	17A. UTM Coordinates: Northing (KM): 14374.7129 Easting (KM): 1731.8607 Zone: 17 North
18A. Briefly describe the proposed new operation or change (s) to the facility: Modify existing process with a new heated stabilizer, an additional heated low pressure flash separator and a new enclosed combustor – a complete revised process description is included in Attachment B		19A. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits): Latitude: 39.584020 Longitude: -80.675261

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

11B. Name of 1 st alternate operating site: _____ _____	12B. Address of 1 st alternate operating site: Mailing: _____ Physical: _____ _____
13B. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? <input type="checkbox"/> YES <input type="checkbox"/> NO – IF YES, please explain: _____ <hr/> – IF NO, YOU ARE NOT ELIGIBLE FOR A PERMIT FOR THIS SOURCE.	
14B. – For Modifications or Administrative Updates at an existing facility, please provide directions to the present location of the facility from the nearest state road; – For Construction or Relocation permits, please provide directions to the proposed new site location from the nearest state road. Include a MAP as Attachment F. _____ _____	

15B. Nearest city or town:	16B. County:	17B. UTM Coordinates: Northing (KM): _____ Easting (KM): _____ Zone: _____
18B. Briefly describe the proposed new operation or change (s) to the facility:		19B. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits): Latitude: _____ Longitude: _____

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

11C. Name of 2 nd alternate operating site: _____	12C. Address of 2 nd alternate operating site: Mailing: _____ Physical: _____
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13C. Does the applicant own, lease, have an option to buy, or otherwise have control of the proposed site? YES NO

— IF YES, please explain: _____

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

14C. — For **Modifications or Administrative Updates** at an existing facility, please provide directions to the present location of the facility from the nearest state road;

— For **Construction or Relocation** permits, please provide directions to the proposed new site location from the nearest state road. Include a **MAP as Attachment F**.

15C. Nearest city or town:	16C. County:	17C. UTM Coordinates: Northing (KM): _____ Easting (KM): _____ Zone: _____
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18C. Briefly describe the proposed new operation or change (s) to the facility:	19C. Latitude & Longitude Coordinates (NAD83, Decimal Degrees to 5 digits): Latitude: _____ Longitude: _____
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20. Provide the date of anticipated installation or change: 12/15/2014 <input type="checkbox"/> If this is an After-The-Fact permit application, provide the date upon which the proposed change did happen: : _____/_____/_____	21. Date of anticipated Start-up if registration is granted: 1/15/2015
---	--

22. Provide maximum projected **Operating Schedule** of activity/activities outlined in this application if other than 8760 hours/year. (Note: anything other than 24/7/52 may result in a restriction to the facility's operation).

Hours per day _____ Days per week _____ Weeks per year _____ Percentage of operation _____

SECTION III. ATTACHMENTS AND SUPPORTING DOCUMENTS

23. Include a check payable to WVDEP – Division of Air Quality with the appropriate **application fee** (per 45CSR22 and 45CSR13).

24. Include a **Table of Contents** as the first page of your application package.

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

25. Please check all attachments included with this permit application. Please refer to the appropriate reference document for an explanation of the attachments listed below.

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

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

SECTION IV. CERTIFICATION OF INFORMATION

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

FOR A CORPORATION (domestic or foreign)

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

FOR A PARTNERSHIP

I certify that I am a General Partner

FOR A LIMITED LIABILITY COMPANY

X I certify that I am a General Partner or General Manager

FOR AN ASSOCIATION

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

FOR A JOINT VENTURE

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

FOR A SOLE PROPRIETORSHIP

I certify that I am the Owner and Proprietor

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

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

Signature _____ Responsible Official Date 12/2/14
(please use blue ink)

Name & Title _____
(please print or type) Tim Cummings, Director - Operations

Signature _____ Authorized Representative (if applicable) Date
(please use blue ink)

Applicant's Name _____
American Energy - Marcellus, LLC

Phone & Fax _____
Phone 405-608-5491 Fax _____

Email _____
tim.cummings@aep-ip.com



Attachment A

Business Registration Certificate

State of West Virginia



Certificate

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

AMERICAN ENERGY-MARCELLUS, LLC

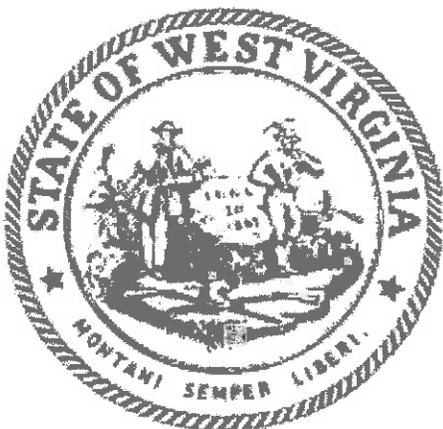
Control Number: 9A5GM

a limited liability company, organized under the laws of the State of Oklahoma has filed its "Application for Certificate of Authority" in my office according to the provisions of West Virginia Code §31B-10-1002. I hereby declare the organization to be registered as a foreign limited liability company from its effective date of May 6, 2014, until a certificate of cancellation is filed with our office.

Therefore, I hereby issue this

CERTIFICATE OF AUTHORITY OF A FOREIGN LIMITED LIABILITY COMPANY

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



*Given under my hand and the
Great Seal of the State of
West Virginia on this day of
May 6, 2014*

Natalie E. Tennant

Secretary of State

Attachment B

Process Description with Aggregation Determination

Process Description

The 408/409 well pad is an oil and natural gas exploration and production facility, responsible for the production of natural gas. Condensate and produced water will also be generated at the site. A description of the facility process is as follows: Condensate, gas and water come from the wellheads(s) to gas production units (GPUs) with 1.0 Million British Thermal Unit per Hour (MMBtu/hr) burners (1S/1E-11S/11E), where the first stage of separation occurs. The GPUs separate the well stream flow into a high pressure gas vapor product, while generating a high pressure natural gas stream and condensed liquid stream. In the second stage of separation, the liquid streams are routed to the heated (1.0 MMBtu/hr) low pressure flash separators (28S/28E and 29S/29E) where condensate and produced water are separated. The flash from the low pressure separators is captured via a flash gas compressor driven by a natural gas-fired engine (35S/35E) and is routed to the sales gas pipeline. Produced water from the separators is sent to eight (8) 210-bbl produced water storage tanks (20S/20E-27S/27E). The condensate from the separators is sent to a 1,200 barrels per day (BPD) condensate stabilizer with a 0.75 MMBtu/hr burner assembly (36S/36E). The condensate stabilizer raises the temperature of the condensate and drives off light hydrocarbons. These light hydrocarbons are then transferred under pressure to a natural gas liquids (NGL) tank on site. The depleted condensate stream is transferred to the eight (8) 210-bbl condensate storage tanks (12S/12E-19S/19E). Note that there are no flash emissions anticipated from the condensate storage tanks due to the depletion of the condensate stream. These tanks will produce only working and breathing losses.

The natural gas stream will exit the facility for transmission via pipeline. Condensate is transported offsite via truck, and produced water will be transported via pipeline to a storage area for subsequent reuse and/or disposal. Working and breathing losses from the 210-bbl condensate storage tanks and 210-bbl produced water storage tanks will be routed to the on-site enclosed combustor (31S/31E) prior to emission to atmosphere. Flashing losses from condensate are not anticipated. Both condensate and produced water loading emissions (32S/32E-33S/33E) will be vented to atmosphere

A process flow diagram reflecting facility operations is included as Attachment D.

This updated process description reflects the following modifications from the original permit application:

- Addition of a 1,200 BPD condensate stabilizer with a 0.75 MMBtu/hr burner assembly (36S/36E)
- Modification of the design capacity on the GPU burners (1S/1E through 11S/11E) from 1.5 MMBtu/hr to 1.0 MMBtu/hr
- Modification of the design capacity on the flash separator heaters from 1.5 MMBtu/hr to 1.0 MMBtu/hr
- Addition of an enclosed vapor combustor (31S/31E) for control of the storage tanks
- Removal of the backup flare (originally permitted as 31S/31E) and the Vapor Recovery Unit (VRU)
- Removal of flashing emissions from the condensate tanks (12S/12E-20S/20E)

Aggregation Determination

Stationary source aggregation asks which pollutant-emitting activities can permissibly be aggregated into a single stationary source for air permitting purposes. Both the EPA and the federal courts have had a hand in developing this analysis. First, a "stationary source" is defined as any "building, structure, facility or installation which emits, or may emit any air pollutant." The D.C. Circuit court expanded on that definition explaining that the scope of a source was limited such that "(1) it must carry out reasonably the purposes of PSD; (2) it must approximate a common sense notion of "plant"; and (3) it must avoid aggregating pollutant emitting activities that as a group would not fit within the ordinary meaning of "building," "structure," "facility," or "installation." Finally, the EPA definitions require that aggregation is appropriate only if a separate emissions sources meet the following three-prong test:

1. The emission sources belong to a single major industrial grouping (same two-digit major SIC code);
2. The emission sources are under the common control of the same person (or persons under common control); and
3. The emission sources are located on one or more "contiguous or adjacent" properties.

Only if all three prongs are met are the air emissions from the aggregated sources evaluated for major source and Title V applicability.

As WVDEP is aware, there have been many attempts to broaden the scope of this definition, especially for oil and gas operations. Specifically, some environmental groups have attempted

to incorporate a functional interdependence analysis into the three-prong test. However, permitting authorities have continually recognized that functional interdependence is not a factor to be considered within the scope of the three-prong test laid out by EPA in the PSD regulations.

When EPA promulgated the PSD regulations, it determined that analyzing functional interdependence would embroil permitting authorities in numerous fine-grained analyses and that any permitting determination based on functional interdependence would be highly subjective. EPA also noted that aggregating individual operations based on function “severely strains” the terms “building, structure, facility, and installation.” In an attempt to create predictability in the permitting process, the EPA chose to incorporate the use of the SIC code in the analysis. In doing so, the EPA found that the SIC code was broad enough to fully encompass an activity, but created clear guidance for the analysis. Therefore, the EPA used the SIC code analysis in lieu of functional interdependence analysis.

The EPA has acknowledged that in some circumstances, operations with different SIC codes would meet the common sense notion of a plant, and in those circumstances, it is appropriate to analyze the functional interdependence of the operations. This analysis, also known as the support facility analysis, is only applicable in situations where operations do not share the same two-digit major SIC code of 13. Since these activities share the same SIC code, this prong of the aggregation analysis is met and there is no need to perform a functional interdependence test.

While functional interdependence is not part of the three-prong aggregation analysis, some environmental groups have attempted to incorporate this concept into the “contiguous or adjacent” prong. While neither the EPA nor the WVDEP have defined what distances require aggregation of sources, both “contiguous” and “adjacent” clearly cannot the concept of distance. The issue for oil and gas source aggregation determinations is how close do operations have to be to be considered “contiguous or adjacent”?

According to the dictionary, contiguous means “being in actual contact; touching along a boundary or at a point.” Adjacent means “not distance; nearby; having a common endpoint or border.” Furthermore, the D.C. circuit pointed out that a single stationary source must fall within the common sense notion of a plant. Oil and gas operations are typically spread across many miles crossing county lines and would not be considered to be touching or to share a common

boundary. Clearly these types of operations spread over great distances are not contiguous or adjacent nor do they meet the common sense notion of a plant.

Finally, common control in the oil and gas exploration and production sector is a complex analysis. While one party may be the operator of a well, that party may not be the sole owner of that well and may be subject to operational criteria established by other owners in the well. Additionally, the party or parties who own and operate the well may or may not take full ownership and control of their share of the gas well. Furthermore, the parties with ownership interests in the well are likely wholly separate companies from those that own and operate the midstream compression operations. Therefore, common control may not be established between any two distinct wells, nor between the wells and the gathering systems that take the gas to market.

Any stationary source aggregation review for the Long 408/409 Pad should follow the same analysis outlined above. Long 408/409 will be located in Wetzel County, WV. Long 408/409 will be operated by American Energy - Marcellus, LLC (AEM).

Several different entities are involved in the production, gathering, and transmission of gas. The Operators are the parties who drill and operate the wells. The shippers are the owners of the gas who may or may not be the same entity as the Operator. There are also the parties who own and operate the gathering system pipelines and compression station called the Gathers. There are parties that own and operate the gas processing plants and finally the FERC regulated sales lines.

AEM specifically looked at the operation of Long 408/409 and determined that the production site should not be aggregated with any other group of wells, specific wells, or other oil and gas operations in the area. Under the three-prong analysis, the surrounding wells share the same two-digit major SIC code of 13 for oil and gas exploration and production. AEM's analysis of the SIC code prong determined that the Long 408/409 will share the same SIC code as the wells in the area.

Under the second prong, the surrounding wells are not under common control with Long 408/409. Long 408/409 is operated by AEM but is owned by more than one company. Through proprietary agreements, AEM's operation of Long 408/409 is controlled by the system owners. The ownership and control of the wells in the area may be distinct for each well. The owners and operators of the wells each may take their gas in kind and consequently affect the operation

of the wells in which they have an ownership interest. Furthermore, no well is dependent on the operation of another well, specifically Long 408/409, to function, nor is Long 408/409 dependent on any specific well to operate. Based on this analysis, AEM concluded that the common control prong of the aggregation analysis was not met.

Finally, under the third prong, AEM determined that Long 408/409 was not located contiguous with or established a distance under which source aggregation is required, but the terms "contiguous" or "adjacent" require analyzing distances between operations. This is generally agreed that to be considered contiguous two operations must share a common fence line. As for adjacent, many permitting authorities have acknowledged that operations located more than a quarter of a mile apart are clearly not adjacent, but operations within a quarter of a mile require a comprehensive analysis to determine if they meet the common sense notion of a plant. The nearest well to Long 408/409 is over a quarter mile away; once up and running. Operations over a quarter mile away are not contiguous or adjacent nor do they meet the common sense notion of a plant. This analysis led AEM to determine that the third prong of the aggregation test was not met.

Attachment C

Description of Fugitive Emissions

G70-A FUGITIVE EMISSIONS SUMMARY SHEET

FUGITIVE EMISSIONS SUMMARY	All Regulated Pollutants Chemical Name/CAS ¹	Maximum Potential Uncontrolled Emissions ²		Maximum Potential Controlled Emissions ³		Est. Method Used ⁴
		lb/hr	ton/yr	lb/hr	ton/yr	
Haul Road/Road Dust Emissions Paved Haul Roads						
Unpaved Haul Roads	PM PM-10	1.16 0.45	5.10 1.97	0.35 0.135	1.53 0.591	EE
Loading/Unloading Operations	VOC	6.14 0.33 0.01 0.04 0.01 0.08 <0.01 0.01 0.12	26.90 1.46 0.03 0.19 0.03 0.36 <0.01 0.02 0.58	1.89 0.10 <0.01 0.01 <0.01 0.02 <0.01 <0.01 0.05	8.29 0.45 0.01 0.06 0.01 0.11 <0.01 0.01 0.22	EE
		n-Hexane/110-54-3 Benzene/71-43-2 Toluene/108-88-3 Ethylbenzene/100-41-4 Xylenes/1330-20-7 Carbon Dioxide/124-38-9 Methane/74-82-8 CO ₂ e				
Equipment Leaks	VOC	Does not apply	13.22 0.72 0.01 0.10 0.01 0.18 0.05 16.31 342.53	Does not apply	13.22 0.72 0.01 0.10 0.01 0.18 0.05 16.31 342.53	EE
	n-Hexane/110-54-3 Benzene/71-43-2 Toluene/108-88-3 Ethylbenzene/100-41-4 Xylenes/1330-20-7 Carbon Dioxide/124-38-9 Methane/74-82-8 CO ₂ e					
Blowdown Emissions						
Other						

¹ List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS₂, VOCs, H₂S, Inorganics, Lead, Organics, O₃, NO, NO₂, SO₂, SO₃, all applicable Greenhouse Gases (including CO₂ and methane), etc. DO NOT LIST H₂, H₂O, N₂, O₂, and Noble Gases.
² Give rate with no control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).
³ Give rate with proposed control equipment operating. If emissions occur for less than 1 hr, then record emissions per batch in minutes (e.g. 5 lb VOC/20 minute batch).
⁴ Indicate method used to determine emission rate as follows: MB = material balance; ST = stack test (give date of test); EE = engineering estimate; M = modeling; O = other (specify).

LEAK SOURCE DATA SHEET

Source Category	Pollutant	Number of Source Components ¹	Number of Components Monitored by Frequency ²	Average Time to Repair (days) ³	Estimated Annual Emission Rate (lb/yr) ⁴
Pumps ⁵	light liquid VOC ^{6,7}				
	heavy liquid VOC ⁸				
	Non-VOC ⁹				
Valves ¹⁰	Gas VOC	283	0	5	2.45
	Light Liquid VOC				
	Heavy Liquid VOC				
	Non-VOC				
Safety Relief Valves ¹¹	Gas VOC	32	0	5	0.54
	Non VOC				
Open-ended Lines ¹²	VOC	171	0	5	0.66
	Non-VOC				
Sampling Connections ¹³	VOC				
	Non-VOC				
Compressors	VOC				
	Non-VOC				
	VOC				
Flanges	VOC	1188	0	5	0.89
	Non-VOC				
Connectors	VOC	760	0	5	0.29
	Non-VOC				
Other	VOC	52	0	5	0.88
	Non-VOC				

1-13 See notes on the following page.

Notes for Leak Source Data Sheet

1. For VOC sources include components on streams and equipment that contain greater than 10% w/w VOC, including feed streams, reaction/separation facilities, and product/by-product delivery lines. Do not include certain leakless equipment as defined below by category.
2. By monitoring frequency, give the number of sources routinely monitored for leaks, using a portable detection device that measures concentration in ppm. Do not include monitoring by visual or soap-bubble leak detection methods. "M/Q(M)/Q/SA/A/O" means the time period between inspections as follows:

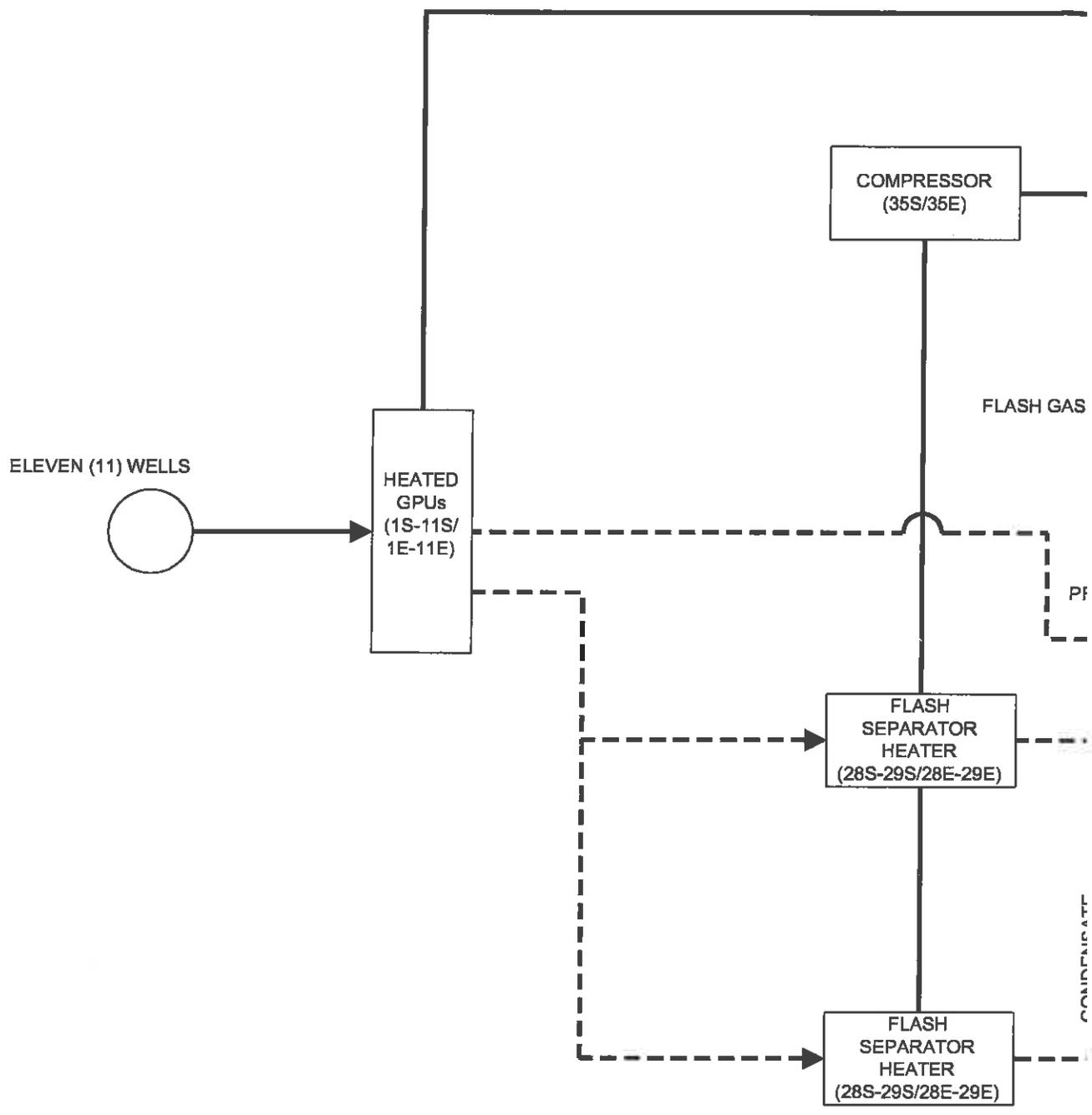
Monthly/Quarterly, with Monthly follow-up of repaired leakers/Quarterly/Semi-annual/Annually/Other (specify time period)

If source category is not monitored, a single zero in the space will suffice. For example, if 50 gas-service valves are monitored quarterly, with monthly follow-up of those repaired, 75 are monitored semi-annually, and 50 are checked bimonthly (alternate months), with non checked at any other frequency, you would put in the category "valves, gas service:" 0/50/0/75/0/50 (bimonthly).
3. Give the average number of days, after a leak is discovered, that an attempt will be made to repair the leak.
4. Note the method used: MB - material balance; EE - engineering estimate; EPA - emission factors established by EPA (cite document used); O - other method, such as in-house emission factor (specify).
5. Do not include in the equipment count sealless pumps (canned motor or diaphragm) or those with enclosed venting to a control device. (Emissions from vented equipment should be included in the estimates given in the Emission Points Data Sheet.)
6. Volatile organic compounds (VOC) means the term as defined in 40 CFR 51.100 (s).
7. A light liquid is defined as a fluid with vapor pressure equal to or greater than 0.04 psi (0.3 Kpa) at 20°C. For mixtures, if 20% w/w or more of the stream is composed of fluids with vapor pressures greater than 0.04 psi (0.3 Kpa) at 20 °C, then the fluid is defined as a light liquid.
8. A heavy liquid is defined as a fluid with a vapor pressure less than 0.04 psi (0.3 Kpa) at 20°C. For mixtures, if less than 20% w/w of the stream is composed of fluids with vapor pressures greater than 0.04 psi (0.3 Kpa) at 20 °C, then the fluid is defined as a heavy liquid.
9. LIST CO, H₂S, mineral acids, NO, NO₂, SO₃, etc. DO NOT LIST CO₂, H₂, H₂O, N₂, O₂, and Noble Gases.
10. Include all process valves whether in-line or on an open-ended line such as sample, drain and purge valves. Do not include safety-relief valves, or leakless valves such as check, diaphragm, and bellows seal valves.
11. Do not include a safety-relief valve if there is a rupture disk in place upstream of the valve, or if the valve vents to a control device.
12. Open-ended lines include purge, drain and vent lines. Do not include sampling connections, or lines sealed by plugs, caps, blinds or second valves.
13. Do not include closed-purge sampling connections.

Attachment D

Process Flow Diagram

OFFICE	DATE	DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
Pittsburgh, PA	11/19/14	--	E. Schlegel	--	--	153430-B2



LEGEND:

- GAS/VAPOR
- - - - - LIQUIDS (CONDENSATE AND PRODUCED WATER)

NOTE:

DRAWING IS A DESCRIPTIO
FACILITY PROCESS AND IS
REPRESENT FACILITY AND
LAYOUT.

REFERENCE:

DRAWING MODIFIED FROM HG ENERGY LLC DRAWING TITLED "PAD
408/409 - FIGURE 3: PROCESS FLOW DIAGRAM", DATED 12/18/2013.

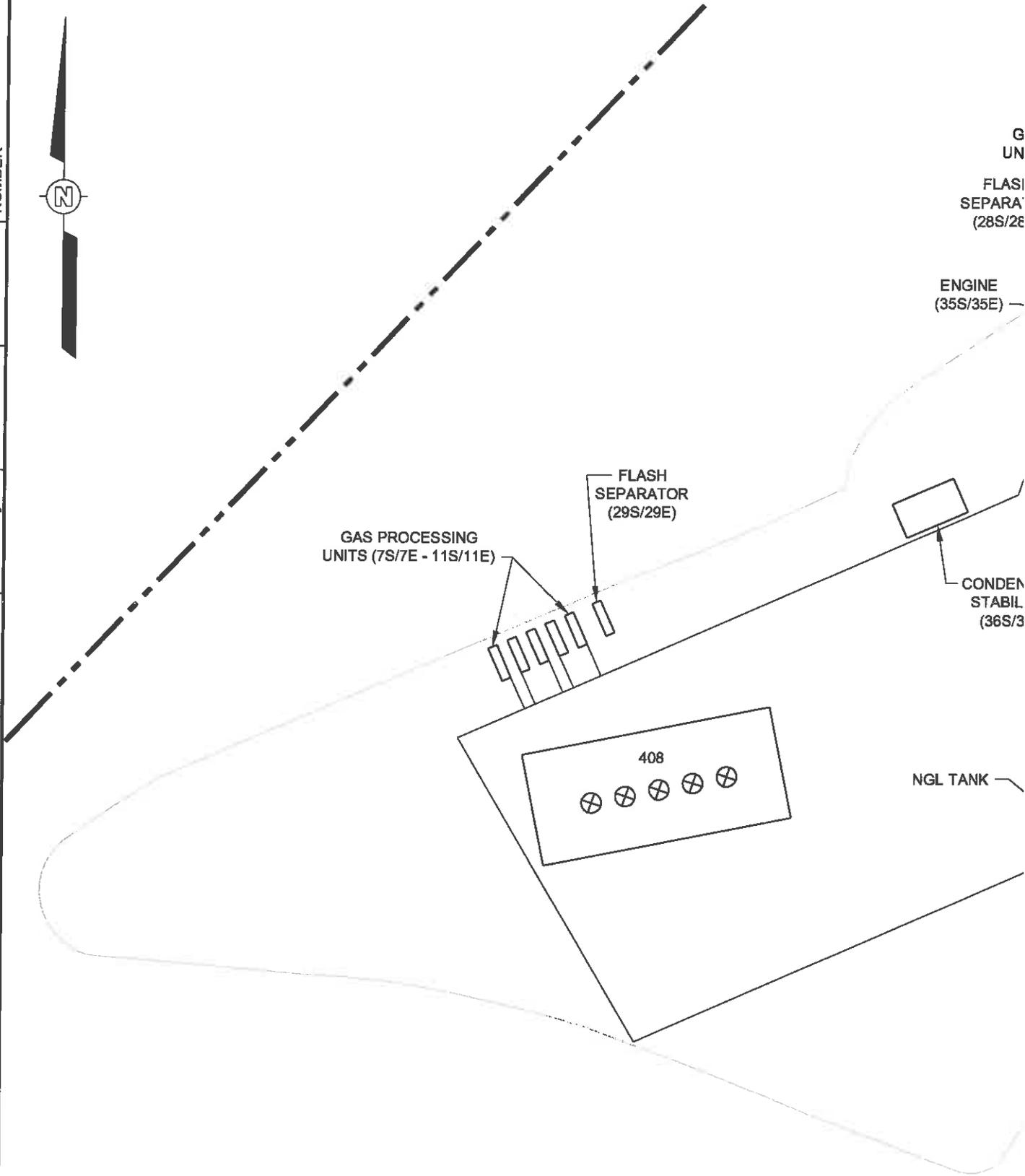
Attachment E

Plot Plan

File: O:\Project\153430\153430-B1.dwg
 Plot Date/Time: Nov 20, 2014 -- 2:22pm
 Plotted By: Evan.Schlegel

Xref:
 Image

OFFICE	DATE	DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
Pittsburgh, PA	11/14/14	--	E. Schlegel	--	--	153430-B1



G
 UN
 FLAS
 SEPARA
 (28S/2E)

ENGINE
 (35S/35E)

FLASH
 SEPARATOR
 (29S/29E)

GAS PROCESSING
 UNITS (7S/7E - 11S/11E)

CONDENS
 STABIL
 (36S/3)

NGL TANK

408

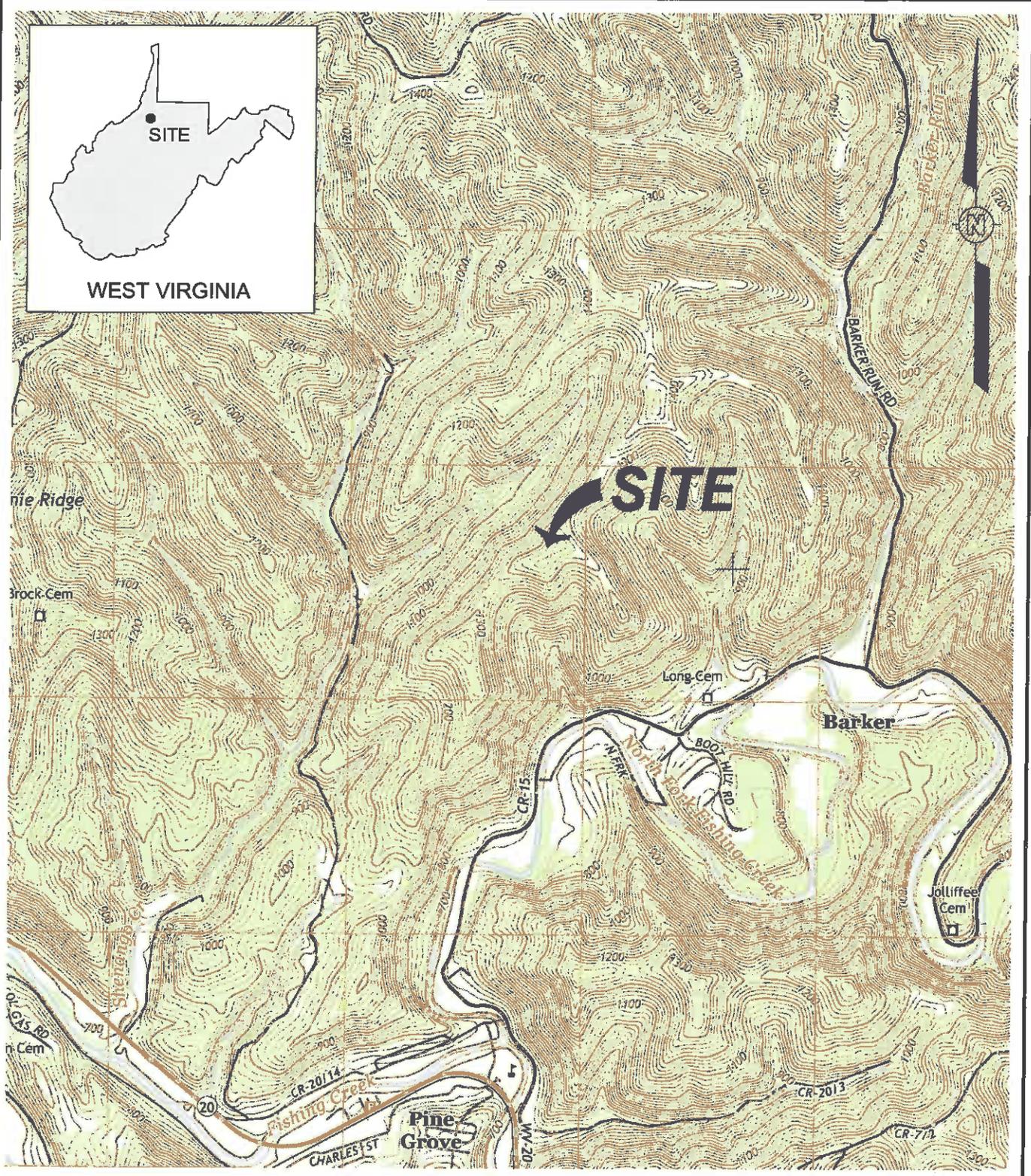
REFERENCE:

DRAWING MODIFIED FROM PENN ENVIRONMENTAL AND
 REMEDIATION, INC., DRAWING NO. PA006042-01, "AIR PERMIT
 APPLICATION - WELL UNIT 408/409", DATED 12/06/2013.

Attachment F

Area Map

OFFICE: Pittsburgh, PA
 DESIGNED BY: --
 DRAWN BY: E. Schlegel
 CHECKED BY: --
 APPROVED BY: --
 DRAWING NUMBER: 153430-A1



REFERENCE:
 U.S.G.S. TOPOGRAPHIC MAP, 7.5 MINUTE SERIES,
 PINE GROVE, WEST VIRGINIA QUADRANGLE, DATED 2014.



CB&I
 Environmental & Infrastructure, Inc.
 2790 Mosside Boulevard
 Monroeville, PA 15146-2792



AMERICAN ENERGY
 MARCELLUS, LLC

ATTACHMENT F
SITE LOCATION MAP
 WELL UNIT 408/409
 WILEYVILLE TOWNSHIP
 WETZEL COUNTY, WEST VIRGINIA

File: O:\Project\153430\153430-A1.dwg
 Plot Date/Time: Nov 20, 2014 - 2:04pm
 Plotted By: Evan.Schlegel

Xref:
 Image

Attachment G

Equipment Data Sheets and Registration Section Applicability Form

General Permit G70-A Registration Section Applicability Form

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

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

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

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

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

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

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

Emission Unit ID ¹	Emission Point ID ²	Emission Unit Description	Year Installed/ Modified	Design Capacity	Type ³ and Date of Change	Control Device ⁴
1S-11S	1E-11E	Eleven (11) GPU Burners	2014	1.0 MMBtu/hr each	Construction / 2014	N/A
12S-19S	12E-19E	Eight (8) Condensate Tanks	2014	210 bbl each	Construction / 2014	Enclosed Vapor Combustor
20S-27S	20E-27E	Eight (8) Produced Water Tanks	2014	210 bbl each	Construction / 2014	Enclosed Vapor Combustor
28S-29S	28E-29E	Two (2) Flash Separator Heaters	2014	1.0 MMBtu/hr each	Modified / 2014	NA
30S	30E	Fugitive Emissions	2014	N/A	Construction / 2014	NA
31S	31E	Enclosed Vapor Combustor	2014	35.42 MMBtu/hr	New / 2014	NA
32S	32E	Condensate Truck Loading	2014	600 BBL/Day	Construction / 2014	NA
33S	33E	Produced Water Truck Loading	2014	600 BBL/Day	Construction / 2014	NA
34S	34E	Haul Roads	2013	N/A	Construction / 2013	Dust Control / Water / Chip Seal
35S	35E	USA Compressor Engine	2014	118 Bhp	Construction / 2014	NSCR
36S	36E	Condensate Stabilizer Heater	2014	0.75 MMBtu/hr	New / 2014	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 New, modification, removal

Control Devices use the following numbering system: 1C, 2C, 3C,... or other appropriate designation.

⁴ For

NATURAL GAS WELL AFFECTED FACILITY DATA SHEET

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

Please provide the API number(s) for each NG well at this facility:	
47-103-02887	47-103-02880
47-103-02888	47-103-02881
47-103-02889	47-103-02882
47-103-02890	47-103-02883
47-103-02891	
47-103-02878	
47-103-02879	

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

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

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

*Where,
 047 = State code. The state code for WV is 047.
 001 = County Code. County codes are odd numbers, beginning with 001 (Barbour) and continuing to 109 (Wyoming).
 00001 = Well number. Each well will have a unique well number.*

NATURAL GAS FIRED FUEL BURNING UNITS EMISSION DATA SHEET

Complete the information on this data for each Gas Producing Unit(s), Heater Treater(s), and in-line heater(s) at the production pad. Reboiler information should be entered on the Glycol Dehydration Emission Unit Data Sheet.

Emission Unit ID # ¹	Emission Point ID# ²	Emission Unit Description (Manufacturer / Model #)	Year Installed/Modified	Type ³ and Date of Change	Control Device ⁴	Design Heat Input (mmBtu/hr) ⁵	Fuel Heating Value (Btu/scf) ⁶
1S-11S	1E-11E	GPU Burners	2014	Modified / 2014	NA	1.0	1,285
28S-29S	28E-29E	Flash Separator Heaters	2014	Modified / 2014	NA	1.0	1,285
36S	36E	Condensate Stabilizer Heater	2014	New / 2014	N/A	0.75	1,285

¹ Enter the appropriate Emission Unit (or Sources) 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 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 Complete appropriate air pollution control device sheet for any control device.

⁵ Enter design heat input capacity in mmBtu/hr.

⁶ Enter the fuel heating value in Btu/standard cubic foot.

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

Complete this section for any natural gas-fired reciprocating internal combustion engine.

Emission Unit (Source) ID No. ¹		35S					
Emission Point ID No. ²		35E					
Engine Manufacturer and Model		USA Compressor Engine/ 5161 G8.3/H302					
Manufacturer's Rated bhp/rpm		118 HP / 1800 RPM					
Source Status ³		New					
Date Installed/Modified/Removed ⁴		2014					
Engine Manufactured/Reconstruction Date ⁵		11/03/2008					
Is this engine subject to 40CFR60, Subpart JJJJ?		Yes					
Is this a Certified Stationary Spark Ignition Engine according to 40CFR60, Subpart JJJJ? (Yes or No) ⁶		No					
Is this engine subject to 40CFR63, Subpart ZZZZ? (yes or no)		Yes (JJJJ only)					
Engine, Fuel and Combustion Data	Engine Type ⁷	RB4S					
	APCD Type ⁸	NSCR					
	Fuel Type ⁹	PQ					
	H ₂ S (gr/100 scf)	N/A					
	Operating bhp/rpm	118 HP / 1800 RPM					
	BSFC (Btu/bhp-hr)	8,924					
	Fuel throughput (ft ³ /hr)	819.48					
	Fuel throughput (MMft ³ /yr)	7.18					
	Operation (hrs/yr)	8,760					
Reference ¹⁰	Potential Emissions ¹¹	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
MD	NO _x	0.52	2.28				
MD	CO	1.04	4.56				
MD	VOC	0.26	1.14				
AP	SO ₂	<0.01	<0.01				
AP	PM ₁₀	0.02	0.09				
AP	Formaldehyde	0.02	0.09				
MRR¹²	Proposed Monitoring:						
	Proposed Recordkeeping:						
	Proposed Reporting:						

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

Attachment H
Air Pollution Control Device Sheet

AIR POLLUTION CONTROL DEVICE

Vapor Combustion Control Device Sheet

Complete this vapor combustion control device sheet for each enclosed combustion device, flare, thermal oxidizer, or completion combustion device that is located at the natural gas production pad for the purpose of thermally destructing waste gas to control emissions of regulated pollutants to the atmosphere.

IMPORTANT: READ THE INSTRUCTIONS ACCOMPANYING THIS FORM BEFORE COMPLETING.			
General Information			
1. Control Device ID#: 31S		2. Installation Date: 2014 <input checked="" type="checkbox"/> New	
3. Maximum Rated Total Flow Capacity: 200,000 scfd	4. Maximum Design Heat Input: 18.42 MMBtu/hr	5. Design Heat Content: 2,200 BTU/scf	
Control Device Information			
6. Select the type of vapor combustion control device being used: <input checked="" type="checkbox"/> Enclosed Combustion Device <input type="checkbox"/> Elevated Flare <input type="checkbox"/> Ground Flare <input type="checkbox"/> Thermal Oxidizer <input type="checkbox"/> Completion Combustion Device			
7. Manufacturer: National Oilwell Varco Model No.: MEVC200		8. Hours of operation per year: 8,760	
9. List the emission units whose emissions are controlled by this vapor combustion control device: (Emission Point ID#: <u>12E-27E</u>)			
10. Emission Unit ID#	Emission Source Description:	Emission Unit ID#	Emission Source Description:
12E-19E	Eight Condensate Tanks		
20E-27E	Eight Produced Water Tanks		
<i>If this vapor combustor controls emissions from more than six emission units, please attach additional pages.</i>			
11. Assist Type		12. Flare Height	13. Tip Diameter
<input type="checkbox"/> Steam - <input type="checkbox"/> Air - <input type="checkbox"/> Pressure - <input checked="" type="checkbox"/> Non -		23 ft	N/A ft
14. Was the design per §60.18? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			
Waste Gas Information			
15. Maximum waste gas flow rate (scfm):	16. Heat value of waste gas stream (BTU/ft3)	17. Temperature of the emissions stream (°F)	18. Exit Velocity of the emissions stream (ft/s)
139.6	1,285	@1,400-2,100	NA
19. Provide an attachment with the characteristics of the waste gas stream to be burned.			

Pilot Information

20. Type/Grade of pilot fuel:	21. Number of pilot lights:	22. Fuel flow rate to pilot flame per pilot (scf/hr):	23. Heat input per pilot (BTU/hr):	24. Will automatic re-ignition be used?
Natural gas	Continuous pilot			<input type="checkbox"/> Yes <input type="checkbox"/> No
25. If automatic re-ignition will be used, describe the method:				
26. Describe the method of controlling flame:				
27. Is pilot flame equipped with a monitor to detect the presence of the flame? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		28. If yes, what type? <input type="checkbox"/> Thermocouple <input type="checkbox"/> Infra-Red <input type="checkbox"/> Ultra Violet <input type="checkbox"/> Camera with monitoring control room <input type="checkbox"/> Other, describe:		

29. Pollutant(s) Controlled	30. % Capture Efficiency	31. Manufacturer's Guaranteed Control Efficiency (%)
VOC	98	98
VOC	98	98
32. Has the control device been tested by the manufacturer and certified?		
33. Describe all operating ranges and maintenance procedures required by the manufacturer to maintain warranty:		
34. Additional Information Attached? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		
<i>Please attach a copy of manufacturer's data sheet.</i> <i>Please attach a copy of manufacturer's drawing.</i> <i>Please attach a copy of the manufacturer's performance testing.</i>		

If any of the requested information is not available, please contact the manufacturer.



QUOTATION

CLIENT: American Energy Partners, LP

SUBJECT: Mission Enclosed Vapor Combustor (MEVC200)

NOV PROPOSAL: H-14100-14-200 Rev.2

REV	DATE	BY	CHECKED	APPROVED	COMMENTS
0	5/19/14	TW	RC	PM	Quotation

NOV
10011 MEADOWGLEN LANE, 2ND FLOOR
HOUSTON, TX 77042
TEL: 1-713-395-5000 FAX: 1-713-395-5001

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1.3 Technical Summary 5

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1.7 Service 7

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1 COMMERCIAL AND TECHNICAL

1.1 Introduction

In response to your inquiry, NOV is pleased to offer the following proposal for a NOV Mission Enclosed Vapor Combustor (MEVC). The model MEVC200 is capable of 18.42 MMBTU/HR, Medium Temperature Flares (MTF). NOV Mission offers a full line of reliable enclosed combustors for the ever changing requirements of today's regulation filled oil and gas industry. Mission's MEVC design incorporates years of experience with tank vapors with a combustor design which is highly effective, tested and certified "99%" for destruction of vent emissions from oil and condensate tank batteries, loading operations and storage facilities. NOV's stainless steel enclosed flare design is capable of meeting industry regulations while offering significant cost savings. Scalable to customer application, this flare is proven throughout the world. The following items will show the advantages and benefits to incorporating this equipment into the Storage Tank facility:

APPLICATIONS

- Associated gas
- Dehydrators
- Pipeline blow down
- Oil and condensate loading facilities
- Equipment maintenance
- Oil and condensate storage tanks

FEATURES AND BENEFITS:

- Meets EPA 40 CFR 60.00 regulations
- Remote location solar panel option available
- 98%+ destruction efficiency (independent 3rd party tested)
- Flexible & fully automated and programmable system (additional parameters optional)
- Quad O compliant ready
- Special custom application larger units available
- Low capital and operating costs
- Very high turndown ratio
- Scalable flow rates
- Field proven design
- Only requires 300 btu/ft³ gas to maintain combustion
- High Temperature Flares (HTF) with 99.99% DRE are also available

Thank you for this opportunity to quote on your combustor needs. Should you have any questions or concerns regarding the commercial terms, the scope of supply offered, or any technical points which may need clarification, please feel free to contact NOV at:

Contact : Pete Magnani
Email : pete.magnani@nov.com
Telephone : 1-713-395-5000
Fax : 1-713-395-5001
Address : 10011 Meadowglen Lane, 2nd Floor
Houston, TX 77042
USA

1.2 Prices
Base Unit Price

Item	Description	Quantity	Unit Price (USD)	Total Price (USD)
1	MEVC200, Enclosed Vapor Combustor Flow \geq 40-200MSCFD. Inlet Pressure from 2oz/in2 minimum. 20ft height, 47" OD diameter, and 3" 150#RF connection. Includes the Data logging, pressure transmitter in lieu of pressure switch, and continuous pilot. This includes 14 25" stack extension. This is a DC Control Panel unit. All as described in 1.3 below.	1	\$22,795.00	\$22,795.00

Accessories

Part No.	Description	Unit Price (USD)
MEVC200-BP	Stainless Steel Bird Screen for MEVC200	\$913.00
MEVC200-KOP	Stainless Steel Condensate Knock Out Pot for MEVC200	\$1,500.00
MEVC200-WG	Galvanized Steel Wind Guard for MEVC200 Air Intake	\$417.00
MEVC200-SP	Skid mounted solar panel and battery backup for MEVC200	\$3,920.00

Spare Parts

Part No.	Description	Unit Price (USD)
MEVC-CP	Replacement Control Panel for MEVC100	\$3,485.00
MEVC-PT	Replacement Pressure Transmitter for MEVC200	\$535.00
MEVC-TC	Replacement Thermocouple for MEVC200	\$115.00
MEVC-IC	Replacement Ignition Transformer for MEVC200	\$360.00
MEVC-IE	Replacement Ignition Electrode for MEVC200	\$25.00

All prices are quoted Ex-Works manufacturing facility and exclude all taxes, import duties, freight and/or insurance charges.

1.3 Technical Summary

- **Flare Gas Stream: 5.4 MW MTF:**
 - Type: Enclosed Tank Battery Flare
 - Composition: 2200 btu/ft³ gas
 - Temperature: Ambient to 100°F +/- 20 deg°F
 - Flow Rate: up to 200,000 scfd (based on 2200 BTU /ft³ gas) or 139.6 scfm
 - Auxiliary Fuel Requirements N/A
 - Burner Size 18.42 million BTU/hr (5.4 MW)
 - Inlet Pressure Requirements 2-4 oz/in² (3.5-7.0 “w.c.)
 - Turndown Ratio 5:1
 - Data points recorded include combustion temperature, operation pressure, and run time
- **Mechanical:**
 - Design Wind Speed 100 mph
 - Ambient Temperature -20 deg F up to 110 deg F
 - Electrical Area Classification General Area Classification (non-hazardous)
 - Elevation Up to 3,000 ft ASL – please advise if higher elevation
- **Process:**
 - Smokeless Capacity 100% Sdf
 - Operating Temperature 1400 deg F to 2100 deg F (1500 deg F Nominal); Retention Time 0.3 sec.
 - Flare Inlet Pressure 2-4 oz/in² (3.5-7.0 “w.c.)
- **Utilities:**
 - Pilot Gas Process Gas
 - Electricity 24VDC Panel/ 10A (Solar Option) Auxiliary Fuel N/A
 - Instrument air/gas 80 psig for valve actuation.
- **Emissions:**
 - Destruction Efficiency: 98% DRE

1.4 Delivery

The delivery for the Equipment listed in NOV Scope of Supply is as follows:

- Delivery:
 - 2-3 weeks ARO, Ex-Works Chattanooga, TN

1.5 Commercial Clarifications/Exceptions

- 1.5.1 Terms are net 30 days:
 - 100% - Upon notice of readiness to ship.
- 1.5.2 Quoted prices exclude all taxes, import duties, freight and/or insurance charges.
- 1.5.3 Delivery to be confirmed upon acceptance of purchase order.
- 1.5.4 NOV Worldwide Terms and Conditions shall apply.

1.5.7 NOV standard documentation will apply.

1.6 Quotation Validity

Validity is 30 days from the date of this proposal.

1.7 Service

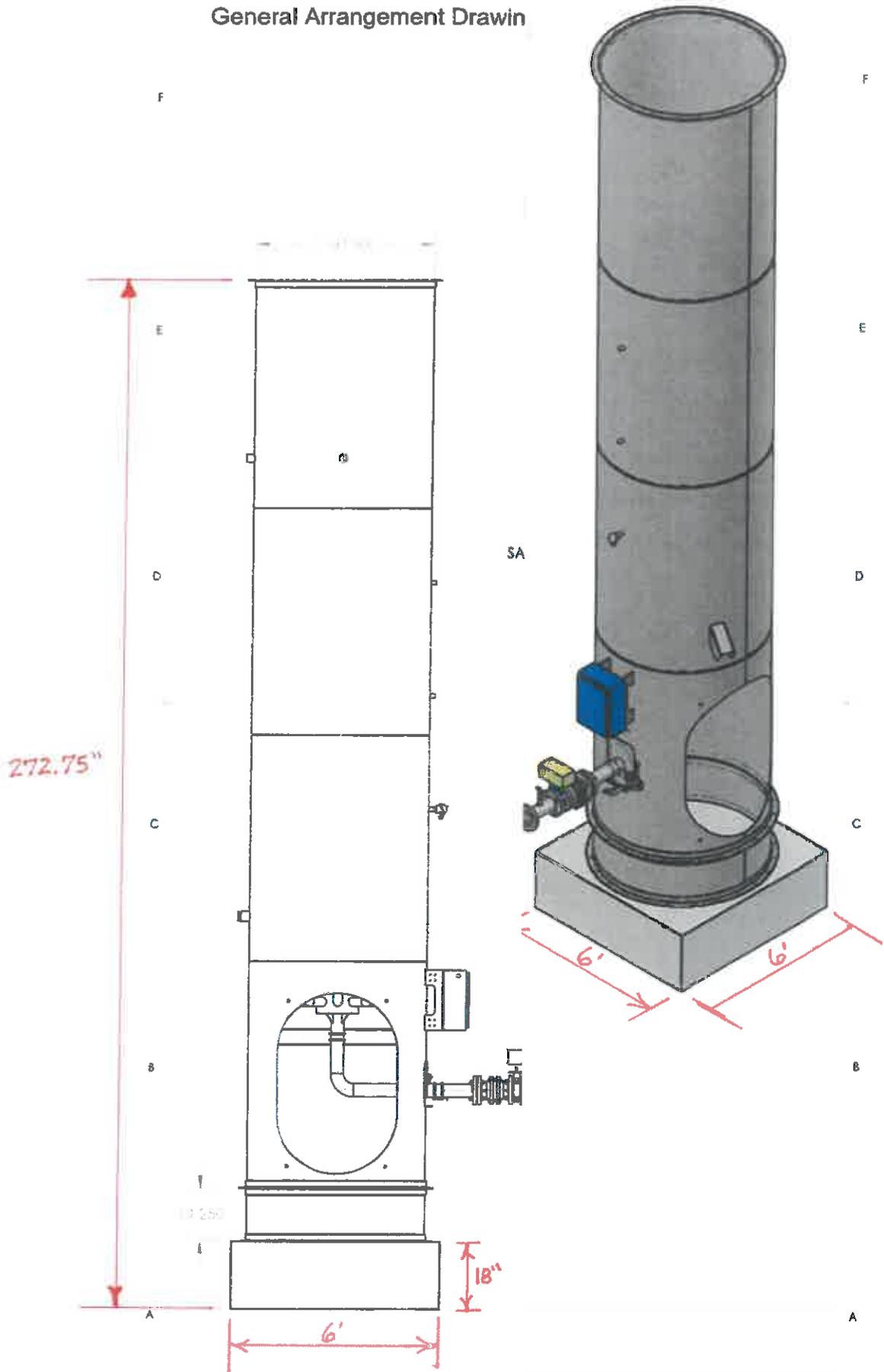
Available upon request.

2 ATTACHMENTS

2.1 NOV Documents

- NOV Terms and Conditions

General Arrangement Drawin

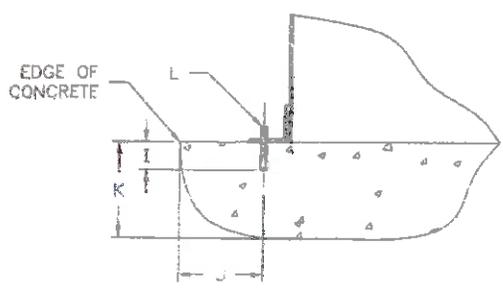


NO. **MEVC200 GAD** REV
 24 WEIGHT: 6551.88 SHEET 1 OF 1
 7 1

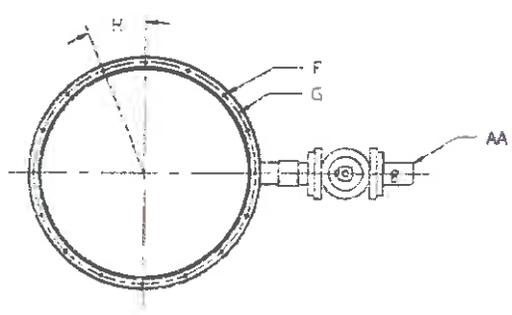
MEVC	CONNECTION (AA)	HEIGHT (A)	RING OD (B)	VESSEL OD (C)	(D)	(E)	(HOLE QTY)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
20	1 1/2" FNPT	143 1/4"	22.13"	19" OD	32.03"	18.650"	12	ø.438"	20.75"	30"	3 1/2" MIN.	6" MIN.	12" MIN.	3/8" ANCHOR
100	3" MNPT	196 1/2"	37.13"	33" OD	42.715"	19.375"	16	ø.438"	35.37"	22.5"	3 1/2" MIN.	6" MIN.	12" MIN.	3/8" ANCHOR
200	3"-150# RF	240 1/2"	51.13"	47" OD	49.350"	26.000"	24	ø.438"	51.13"	7.5"	3 1/2" MIN.	6" MIN.	12" MIN.	3/8" ANCHOR

272.75"

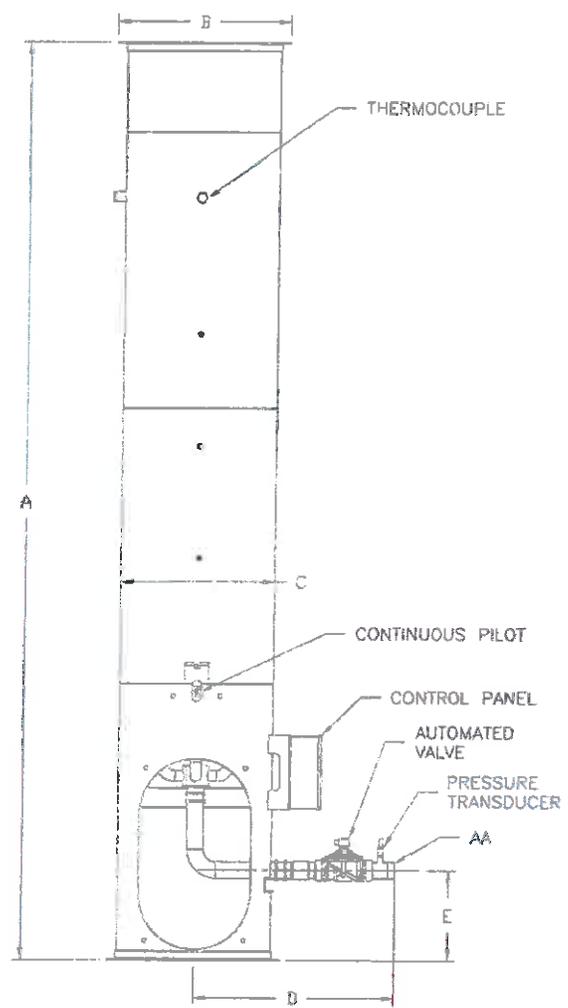
?



CONCRETE FOOTING DETAIL



MOUNTING RING DETAIL



ELEVATION DETAIL

GENERAL NOTES

1. GENERAL REPRESENTATION SHOWN, EXACT DETAILS MAY DIFFER SLIGHTLY.

3RD ANGLE PROJECTION DO NOT SCALE, IF IN DOUBT ASK		ENGINEER	---	JOB NO.	---
		DRAWN BY	D. L.E.	USED ON	---
LINEAR TOLERANCES (U.S.)					
DEC. PLACE -- NONE		± 1/8" [3]			
-- X		± N/A			
-- XX		± N/A			
-- XXX		± N/A			
SCALE		NFS			
DIMENSIONS IN		INCHES [mm]			
INSPECTION DETAILS		01 FOR REVIEW	12/11/2013	DL	RC RR
DIMENSIONAL/VISUAL	100%	REV DESCRIPTION	DATE	DRG	CHK APP



10611 Meadowglen Ln, 2nd floor
Houston, TX 77042 U.S.A.
TEL: 1(713)395-5000 FAX: 1(713)395-5001
WWW.NOVC.COM/MISSION

TITLE
ENCLOSED VAPOR COMBUSTOR
MEVC20 / MEVC100 / MEVC200

DRAWING NO	MEVC-A-100	?	OF	1	REV	01
------------	------------	---	----	---	-----	----

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Anchor Analysis

272.75" ¹²⁰ Worst Case Wind Speed 140mph
240.5" Tall Combustion Utility Flare

Wind, F =	$qz \cdot G \cdot Cf \cdot Af =$	2290.0 lb (ASCE 6-28)
qz =		42.9 psf
Kz =		0.9
Kzt =		1.0
Kd =		1.0
V =		140.0 mph
G =		0.85
Cf =		0.8
Af =		78.5 ft ²
Weight =		1600.0 lb
Ps height =		15.00 ft
Moverturning =		34350 ft*lb
Base =		2.83 ft, sqr
.9*Mresisting =		2037.6 ft*lb
Uplift =		11418.0 lb
Down Force =		12218.0 lb
Vmax =		2290.0 lb
Bolt C.L. Diameter =		4.0 ft
# Bolts =		24.0
Tbolt =		1431.3 lb LRFD
Vbolt =		95.4 lb LRFD

From Simpson Anchor Designer use (24) 3/8" x 2-1/2" Embed Strong Bolt 2
OR 3/8" SET XP epoxy bolts w/ 4" min. embed

*CONCRETE FOOTING BY OTHERS.

Attachment I
Emissions Calculations

American Energy Partners
Permit# 103-00080 Modification
Long 408/409 Well Pad
Emissions Summary

Pollutant	Original Permit Ad	New Emissions	Difference for Ad
	(tpy)	(tpy)	(tpy)
NOx	8	13.24	5.24
CO	12.95	13.77	0.82
SO2	0.05	0.07	0.02
PM Total	1.56	0.92	-0.64
VOC	29.42	23.22	-6.20
GHG (CO2e)	11,113	14116.20	3003.20
Total HAPs	1.89	0.32	-1.57

American Energy - Marcellus, LLC.
 Long 408/409 Well Pad
 External Combustion Emissions

Input Data:
 1,285
 8,760

Natural Gas HHV (BTU/scf):
 Hours of Operation (hrs):

Emission Point ID No.	Emission Unit ID No.	Description	Emission Unit Capacity	Capacity Units	No. of Units	Pollutant	Emission Factor (lb/MMscf)	Emission Factor Units	Maximum Potential Emissions		Calculation Method	
									Uncontrolled Emissions (lb/hr)	Controlled Emissions (tpy)		
1E-11E	1S-11S	GPU Burners	1.0	MMBTU/hr	11	NOx	100	lb/MMscf	0.86	3.75		
						CO	84	lb/MMscf	0.72	3.15		
						SO2	0.6	lb/MMscf	0.01	0.02		
						PM Total	7.6	lb/MMscf	0.07	0.28		
						VOC	5.5	lb/MMscf	0.05	0.21		
						Lead	0.0005	lb/MMscf	4.28E-06	1.87E-05		
						CO2	120,000	lb/MMscf	1026.88	4497.72		
						Methane	2.3	lb/MMscf	0.02	0.09		N/A
						N2O	2.2	lb/MMscf	0.02	0.08		
						n-Hexane	1.8	lb/MMscf	0.02	0.07		
						Benzene	2.10E-03	lb/MMscf	1.80E-05	7.87E-05		
						Toluene	3.40E-03	lb/MMscf	2.91E-05	1.27E-04		
						Formaldehyde	7.50E-02	lb/MMscf	6.42E-04	2.81E-03		
						Total GHG (CO ₂ e)	--	--	--	4.52E+03		
						Total HAPs	--	--	--	0.02	0.07	
28E-29E	28S-29S	Flash Separator Heaters	1.0	MMBTU/hr	2	NOx	100	lb/MMscf	0.16	0.68		
						CO	84	lb/MMscf	0.13	0.57		
						SO2	0.6	lb/MMscf	9.34E-04	0.00		
						PM Total	7.6	lb/MMscf	0.01	0.05		
						VOC	5.5	lb/MMscf	0.01	0.04		
						Lead	0.0005	lb/MMscf	7.78E-07	3.41E-06		
						CO2	120,000	lb/MMscf	186.71	817.77		
						Methane	2.3	lb/MMscf	0.00	0.02		N/A
						N2O	2.2	lb/MMscf	0.00	0.01		
						n-Hexane	1.8	lb/MMscf	2.80E-03	0.01		
						Benzene	2.10E-03	lb/MMscf	3.27E-06	1.43E-05		
						Toluene	3.40E-03	lb/MMscf	5.29E-06	2.32E-05		
						Formaldehyde	7.50E-02	lb/MMscf	1.17E-04	5.11E-04		
						Total GHG (CO ₂ e)	--	--	--	8.23E+02		
						Total HAPs	--	--	--	2.93E-03	0.01	

American Energy - Marcellus, LLC.
 Long 408/409 Well Pad
 External Combustion Emissions

Input Data:
 1,285
 8,760

Natural Gas HHV (BTU/scf):
 Hours of Operation (hrs):

Emission Point ID No.	Emission Unit ID No.	Description	Emission Unit Capacity	Capacity Units	No. of Units	Pollutant	Emission Factor (lb/MMscf)	Emission Factor Units	Maximum Potential Emissions		Calculation Method	
									Uncontrolled Emissions (lb/hr)	Controlled Emissions (lb/hr)		
31E	31S	Enclosed Vapor Combustor	18.42	MMBTU/hr	1	NOx	100	lb/MMscf	1.43	6.28	N/A	AP-42, Section 1.4
						CO	84	lb/MMscf	1.20	5.27		
						SO2	0.6	lb/MMscf	0.01	0.04		
						PM Total	7.6	lb/MMscf	0.11	0.48		
						VOC	5.5	lb/MMscf	0.08	0.35		
						Lead	0.0005	lb/MMscf	0.00	0.00		
						CO2	120,000	lb/MMscf	1719.55	7531.64		
						Methane	2.3	lb/MMscf	0.03	0.14		
						N2O	2.2	lb/MMscf	0.03	0.14		
						n-Hexane	1.8	lb/MMscf	0.03	0.11		
						Benzene	2.10E-03	lb/MMscf	0.00	0.00		
						Toluene	3.40E-03	lb/MMscf	0.00	0.00		
						Formaldehyde	7.50E-02	lb/MMscf	0.00	0.00		
						Total GHG (CO2e)	--	--	--	7.58E+03		
Total HAPs	--	--	--	0.03								
36E	36S	Condensate Stabilizer Heater	0.75	MMBTU/hr	1	NOx	100	lb/MMscf	0.06	0.26	N/A	AP-42, Section 1.4
						CO	84	lb/MMscf	0.05	0.21		
						SO2	0.6	lb/MMscf	0.00	0.00		
						PM Total	7.6	lb/MMscf	0.00	0.02		
						VOC	5.5	lb/MMscf	0.00	0.01		
						Lead	0.0005	lb/MMscf	0.00	0.00		
						CO2	120,000	lb/MMscf	70.01	306.66		
						Methane	2.3	lb/MMscf	0.00	0.01		
						N2O	2.2	lb/MMscf	0.00	0.01		
						n-Hexane	1.8	lb/MMscf	0.00	0.00		
						Benzene	2.10E-03	lb/MMscf	0.00	0.00		
						Toluene	3.40E-03	lb/MMscf	0.00	0.00		
						Formaldehyde	7.50E-02	lb/MMscf	0.00	0.00		
						Total GHG (CO2e)	--	--	--	3.08E+02		
Total HAPs	--	--	--	0.00								

American Energy - Marcellus, LLC
 Long 408/499 Well Pad
 Internal Combustion Emissions

Parameters:
 1,285
 8,760

Natural Gas HHV (BTU/scf):
 Hours of Operation (hrs):

Emission Point ID No.	Emission Unit No.	Description	Emission Unit Capacity	Capacity Units	No. of Units	Pollutant	Uncontrolled Emission Factor	Uncontrolled Emission Units	Controlled Emission Factor	Controlled Emission Units	Emission Factor Reference	Maximum Potential Emissions	
												(lb/hr)	(tpy)
35E	35S	USA Compressor Engine	118	bhp	1	NOx	13	g/bhp-hr	2	g/bhp-hr	Manufacturer Guarantee	3.982	14.813
						CO	8.6	g/bhp-hr	4	g/bhp-hr	Manufacturer Guarantee	2.237	9.799
						SO2	0.000588	lb/MMBtu	--	--	AP-42, Ch. 3.2	0.001	0.003
						PM Total	0.0194	lb/MMBtu	--	--	AP-42, Ch. 3.2	0.020	0.089
						VOC	0.03	lb/MMBtu	1	g/bhp-hr	AP-42, Ch. 3.2/ Manufacturer Guarantee	0.092	0.138
						Lead	--	--	--	--	--	--	--
						CO2	452	g/bhp-hr	--	--	Manufacturer Guarantee	117.586	515.028
						Methane	0.23	lb/MMBtu	--	--	AP-42, Ch. 3.2	0.242	1.061
						N2O	--	--	--	--	--	--	--
						n-Hexane	--	--	--	--	--	--	--
						Benzene	0.00138	lb/MMBtu	--	--	AP-42, Ch. 3.2	0.002	0.007
						Toluene	0.000558	lb/MMBtu	--	--	AP-42, Ch. 3.2	0.001	0.003
						Formaldehyde	0.02	lb/MMBtu	--	--	AP-42, Ch. 3.2	0.021	0.092
Total GHG (CO ₂ e)	--	--	--	--	--	0.023	5.42E+02						
Total HAPs	--	--	--	--	--	0.102	--						

American Energy - Marcellus, LLC
Long 408/409 Well Pad

Condensate Storage Tanks (12S-19S) and Produced Water Tanks (20S-27S) Emissions

Input Data:

Emission Unit ID	Description	Number of Tanks	Capacity per Tank (bb)	Capacity per Tank (gallons)	Annual Throughput (gal/yr)
12S-19S	Eight condensate tanks	8	210	8,820	10,960,950
20S-27S	Eight produced water tanks	8	210	8,820	10,960,950

VOC Emission Calculations:

Unit ID	Description	Maximum Potential Uncontrolled Emissions ¹						Maximum Potential Controlled Emissions ²							
		Working Losses		Breathing Losses		Total Losses		Working Losses		Breathing Losses		Total Losses			
		lbs/hr	lbs/yr	lbs/hr	TPY	lbs/yr	TPY	lbs/hr	TPY	lbs/yr	TPY	lbs/hr	TPY	lbs/yr	TPY
12S-19S	Eight condensate tanks	2.08	18248.47	0.08	742.05	0.37	2.17	18990.52	9.50	0.18	0.18	0.04	14.84	0.01	0.19
20S-27S	Eight produced water tanks	0.02	170.02	0.00	5.27	0.00	0.02	175.29	0.09	0.00	0.00	0.00	0.11	0.00	0.00

HAP Emission Calculations:

Estimated HAP Composition (% by Weight)³

HAP	Wt%
n-Hexane	5.43%
Benzene	0.10%
Toluene	0.73%
Ethylbenzene	0.11%
Xylenes	1.36%

Unit ID	Description	Maximum Potential Uncontrolled Emissions ⁴						Maximum Potential Controlled Emissions ⁴													
		n-Hexane		Benzene		Toluene		Ethylbenzene		Xylenes		n-Hexane		Benzene		Toluene		Ethylbenzene		Xylenes	
		lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY	lbs/hr	TPY
12S-19S	Eight condensate tanks	0.12	0.52	0.00	0.00	0.02	0.07	0.00	0.00	0.01	0.03	0.13	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20S-27S	Eight produced water tanks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes:

- Maximum potential uncontrolled emissions were calculated using EPA Tanks 4.0.9d software for working and breathing losses. Flash emissions are not anticipated.
- Maximum potential controlled emissions were calculated using the control efficiency of the enclosed vapor combustor: 99%
- HAP composition is from the speciated liquid analysis included with this application.
- HAP emissions were calculated by multiplying the VOC emissions by the HAP composition.

American Energy Partners
 Permit# 103-00080 Modification
 Long 408/409 Well Pad
 Fugitive Emissions

Source	Pollutant	Maximum Potential Uncontrolled Emissions		Maximum Potential Controlled Emissions		Calculation Method
		(lb/hr)	(tpy)	(lb/hr)	(tpy)	
Unpaved Haul Roads	PM	1.16	5.08	0.35	1.53	EE
	PM-10	0.45	1.97	0.14	0.59	
Loading/Unloading Operations	VOC	6.14	26.89	1.84	8.07	EE
	n-Hexane	0.33	1.45	0.10	0.43	
	Benzene	0.01	0.04	0.00	0.01	
	Toluene	0.04	0.18	0.01	0.05	
	Ethylbenzene	0.01	0.04	0.00	0.01	
	Xylene	0.08	0.35	0.02	0.11	
	CO2	0.01	0.04	0.00	0.01	
	CH4	0.01	0.04	0.00	0.01	
	CO2e	0.12	0.53	0.04	0.16	
	Equipment Leaks	VOC	N/A	13.22	N/A	
n-Hexane		0.72				
Benzene		0.01				
Toluene		0.10				
Ethylbenzene		0.01				
Xylene		0.18				
CO2		0.05				
CH4		16.31				
CO2e		342.53				

Company Name: HG Energy, LLC
 Field Name: Wileyville
 Facility Name: Long 408/409

Anticipated Gas Analysis Calculation Sheet

Based on: 402 Pad Analysis

Component	Mole %	Mole Frac.	Lb/Lb mole	MW	VOC Weight	HAP Weight	GHG Weight %	LHV Content		HHV Content	
								Btu/scf	Btu/scf ^m Mole Frac	Btu/scf	Btu/scf ^m Mole Frac
Carbon Dioxide	0.0910	0.0009	44.01	0.04			0.0019	0.0	0.00	0.0	0.00
Hydrogen Sulfide	0.0000	0.0000	34.08	0.00				586.8	0.00	637.1	0.00
Nitrogen	0.3100	0.0031	28.02	0.09				0.0	0.00	0.0	0.00
Methane	75.5000	0.7550	16.04	12.11			0.5686	909.4	686.60	1010.0	762.55
Ethane	16.0300	0.1603	30.07	4.82				1618.7	259.48	1769.6	283.67
Propane	5.1400	0.0514	44.09	2.27	0.10641			2314.9	118.99	2516.1	129.33
Isobutane	0.6654	0.0067	58.12	0.39	0.01816			3000.4	19.97	3251.9	21.64
n-butane	1.2000	0.0120	58.12	0.70	0.03275			3010.8	36.13	3282.3	39.15
Isopentane	0.3200	0.0032	72.15	0.23	0.01084			3699.0	11.84	4000.9	12.80
n-pentane	0.2600	0.0026	72.15	0.19	0.00681			3706.9	9.64	4008.9	10.42
Cyclopentane	0.0000	0.0000	70.08	0.00	0.00000			3512.2	0.00	3763.4	0.00
Oxygen	0.0000	0.0000	32.00	0.00	0.00000			0.0	0.00	0.0	0.00
n-hexane	0.0000	0.0000	86.18	0.00	0.00000	0.00000		4404.1	0.00	4750.2	0.00
Cyclohexane	0.0000	0.0000	84.18	0.00	0.00000			4178.9	0.00	4481.2	0.00
Other Hexanes	0.4100	0.0041	86.18	0.35	0.01659			4382.7	18.01	4744.5	19.45
Heptanes	0.0600	0.0006	100.21	0.06	0.00282			5100.3	3.06	5500.4	3.30
2-2 Dimethylpropane	0.0100	0.0001	72.15	0.01	0.00034			4863.9	0.49	5215.7	0.52
2 Methylpentane	0.0300	0.0003	114.22	0.03	0.00161	0.00161		5779.1	1.73	6231.5	1.87
3 Methylpentane	0.0200	0.0002	78.11	0.02	0.00073	0.00073		3591.1	0.72	3741.5	0.75
Benzene	0.0000	0.0000	78.11	0.000	0.00000	0.00000		4863.9	0.00	5215.7	0.00
Toluene	0.0000	0.0000	92.14	0.00	0.00000	0.00000		4278.7	0.00	4474.5	0.00
Ethylbenzene	0.0000	0.0000	106.17	0.00	0.00000	0.00000		4970.7	0.00	5221.7	0.00
Xylenes	0.0000	0.0000	106.17	0.00	0.00000	0.00000		4957.4	0.00	5208.4	0.00
C8+Heavies	0.0000	0.0000	315.00	0.00	0.00000	0.00000	0.0000	5796.3	0.00	5794.1	0.00
Totals	100.0	1.0005		21.2968	0.1991	0.0023			1166.64		1285.45

Weight Fraction of Vapors that are VOC: 0.1991
 Weight Fraction of Vapors that are HAP: 0.0023
 Gas Specific Gravity: 0.7351

Company Name: HG Energy, LLC
 Field Name: Wileyville
 Facility Name: Long 408/409

Anticipated Speciated Liquid Analysis Calculation Sheet

Based on: *402-1H Production Analysis*

Component	Mole %	Mole Frac.	Lb/Lb mole	MW	VOC Weight %	HAP Weight %	GHG Weight %	LHV Content		HHV Content	
								BTU/scf	Btu/scf*Mole Frac	BTU/scf	Btu/scf*Mole Frac
Carbon Dioxide	0.0210	0.0002	44.01	0.009			0.0001	0.0	0.00	0.0	0.00
Hydrogen Sulfide	0.0000	0.0000	34.08	0.000				586.8	0.00	637.1	0.00
Nitrogen	0.0000	0.0000	28.02	0.000				0.0	0.00	0.0	0.00
Methane	1.3620	0.0136	16.04	0.218			0.0027	909.4	12.39	1010.0	13.76
Ethane	4.5580	0.0456	30.07	1.371				1618.7	73.78	1769.6	80.66
Propane	9.4940	0.0949	44.09	4.186	0.0509			2314.9	219.78	2516.1	238.88
Isobutane	4.2840	0.0428	58.12	2.490	0.0303			3000.4	128.54	3251.9	139.31
n-butane	12.7520	0.1275	58.12	7.411	0.0901			3010.8	383.94	3262.3	416.01
Isopentane	9.1970	0.0920	72.15	6.636	0.0906			3699.0	340.20	4000.9	367.96
n-pentane	10.8350	0.1084	72.15	7.817	0.0950			3706.9	401.64	4008.9	434.36
Decanes (as n-Decane)	8.4590	0.0846	142.28	12.035	0.1463			3512.2	297.10	3763.4	318.35
Oxygen	0.0000	0.0000	32.00	0.000	0.0000			0.0	0.00	0.0	0.00
n-hexane	5.1830	0.0518	86.18	4.467	0.0543	0.0543		4404.1	228.26	4750.2	246.20
Cyclohexane	0.8080	0.0081	84.18	0.680	0.0083			4179.9	33.77	4481.2	36.21
Other Hexanes	6.3020	0.0630	86.18	5.431	0.0660			4392.7	276.83	4744.5	299.00
Heptanes	9.6080	0.0961	100.21	9.628	0.1170			5100.3	490.04	5500.4	528.48
Benzene	0.1090	0.0011	78.11	0.085	0.0010	0.0010		4863.9	5.30	5215.7	5.69
Toluene	0.6520	0.0065	92.14	0.601	0.0073	0.0073		4273.7	27.86	4474.5	29.17
Ethylbenzene	0.0890	0.0009	106.17	0.094	0.0011	0.0011		4970.7	4.42	5221.7	4.65
Xylenes	1.0530	0.0105	106.17	1.118	0.0136	0.0136		4957.4	52.20	5208.4	54.84
2,2,4-Trimethylpentane	0.0000	0.0000	114.22	0.000	0.0000	0.0000		4970.7	0.00	5221.7	0.00
Octanes (as n-Octane)	10.9510	0.1095	114.23	12.509	0.1520			4957.4	542.88	5208.4	570.37
Nonanes (as n-Nonane)	4.2830	0.0428	128.25	5.493	0.0668			5796.3	248.26	5794.1	248.16
Totals	100.00	1.0000		82.2797	0.9806	0.0763	0.0000		3767.18		4032.05

0.9806
 0.0763
 2.8402

Weight Fraction of Vapors that are VOC:
 Weight Fraction of Vapors that are HAP:
 Gas Specific Gravity:



Gas Analytical Services
 Chuck Honaker
 PO Box 1028

CERTIFICATE OF ANALYSIS

Number : 2013020191-001A

LAFAYETTE AREA LABORATORY
 4790 N.E. EVANGELINE THRUWAY
 CARENCRO, LA 70520
 PHONE (337) 896-3055
 FAX (337) 896-3077

Bridgeport, WV 26330

Field: HG Energy
 Station: Production Unit 402
 Station No.:
 Sample Point: Wellhead
 Cylinder #: GAS

Report Date: 02/26/13
 Sample Of: Condensate
 Sample Date: 02/14/2013 15:00
 Sample Conditions: 0.00 psi @ N.G.
 PO / Ref. No.:

Comments:

ANALYTICAL DATA

Components	Mol %	Wt%	LV%	Method	Lab Tech.	Date Analyzed
				GPA-2186	CC	02/26/13
				(MC10)		
Nitrogen	NIL	NIL	NIL			
Methane	1.362	0.264	0.579			
Carbon Dioxide	0.021	0.011	0.009			
Ethane	4.558	1.661	3.065			
Propane	9.494	5.070	6.572			
iso Butane	4.284	3.016	3.523			
n-Butane	12.752	8.977	10.102			
iso Pentane	9.197	8.037	8.452			
n-Pentane	10.835	9.468	9.869			
i-Hexanes	6.302	6.547	6.590			
n-Hexane	5.183	5.447	5.508			
Benzene	0.109	0.105	0.078			
Cyclohexane	0.808	0.830	0.711			
i-Heptanes	6.531	6.653	6.375			
n-Heptane	4.077	4.974	4.851			
Toluene	0.652	0.731	0.562			
i-Octanes	8.782	11.633	10.630			
n-Octane	2.169	3.020	2.868			
*e-Benzene	0.089	0.113	0.085			
*m,o,&p-Xylene	1.053	1.360	1.048			
i-Nonanes	3.225	4.878	4.347			
n-Nonane	1.058	1.653	1.535			
i-Decanes	2.610	4.289	3.716			
N-Decanes	0.584	1.010	0.924			
i-Undecanes +	5.265	10.253	8.001			
Totals	100.000	100.000	100.000			

Calculated Values	TOTAL	C10+
Molecular Weight	82.564	118.409
BTU / Lb.	20799	20440
BTU / Gal.	113997	128930
Cu. Ft. / Gal. At 14.73 Psia, 60°F	25.135	14.984
Lbs. / Gal. (Absolute Density)	5.4812	6.3119
Lbs. / Gal. (Weight In Air)	5.4752	6.3049
Specific Gravity at 60°F (Water = 1)	0.6574	0.7571
API Gravity at 60°F	83.729	55.403

Brian Staspaud
 Data Reviewer



Gas Analytical Services
 Chuck Honaker
 PO Box 1028

CERTIFICATE OF ANALYSIS

Number : 2013020191-001A

LAFAYETTE AREA LABORATORY

4790 N.E. EVANGELINE THRUWAY
 CARENCRO, LA 70620
 PHONE (337) 898-3055
 FAX (337) 898-3077

Bridgeport, WV 26330

Field: HG Energy
 Station: Production Unit 402
 Station No.:
 Sample Point: Wellhead
 Cylinder #: GAS

Report Date: 02/26/13
 Sample Of: Condensate
 Sample Date: 02/14/2013 15:00
 Sample Conditions: 0.00 psi @ N.G.
 PO / Ref. No.:

Comments:

ANALYTICAL DATA

Components	Mol %	Wt%	LV%	Method	Lab Tech.	Date Analyzed
Nitrogen	NIL	NIL	NIL	GPA-2186 (MC10)	CG	02/26/13
Carbon Dioxide	0.021	0.011	0.009			
Methane	1.362	0.264	0.579			
Ethane	4.558	1.661	3.065			
Propane	9.494	5.070	6.572			
Iso Butane	4.284	3.016	3.523			
n-Butane	12.752	8.977	10.102			
iso Pentane	9.197	8.037	8.452			
n-Pentane	10.835	9.468	9.869			
Hexanes Plus	47.497	63.496	57.829			
	100.000	100.000	100.000			

	Total	Hexanes Plus
Molecular Weight -----	82.564	110.375
BTU / Lb. -----	20799	20516
BTU / Gal. -----	113997	123461
Cu. Ft. / Gal. @ 14.73 Psia, 60°F -----	25.135	20.693
Lbs. / Gal. (Absolute Density) -----	5.4812	6.0184
Lbs. / Gal. (Weight In Air) -----	5.4752	6.0118
Specific Gravity at 60°F (Water = 1) -----	0.8574	0.7219
API Gravity at 60°F -----	83.729	64.516

Brian Harford
 Data Reviewer



Gas Analytical Services
Chuck Honaker
PO Box 1028

Bridgeport, WV 26330

CERTIFICATE OF ANALYSIS

Number : 2013020191-001A

LAFAYETTE AREA LABORATORY

4790 N.E. EVANGELINE THRUWAY
 CARENCRO, LA 70520
 PHONE (337) 896-3055
 FAX (337) 896-3077

Field:	HG Energy	Report Date:	02/26/13
Station:	Production Unit 402	Sample Of:	Condensate
Station No.:		Sample Date:	02/14/2013 15:00
Sample Point:	Wellhead	Sample Conditions:	0.00 psi @ N.G.
Cylinder # :	GAS	PO / Ref. No.:	

Comments:

ANALYTICAL DATA

Components	Mol %	Wt%	LV%	Method	Lab Tech	Date Analyzed
Nitrogen	0.000	NIL	NIL	GPA-2186 (MC10)	CC	02/26/13
Carbon Dioxide	0.021	0.011	0.009			
Methane	1.362	0.264	0.579			
Ethane	4.558	1.661	3.065			
Propane	9.494	5.070	6.572			
iso Butane	4.284	3.016	3.523			
n-Butane	12.752	8.977	10.102			
iso Pentane	9.197	8.037	8.452			
n-Pentane	10.835	9.468	9.860			
Hexanes	11.485	11.994	12.098			
Heptanes Plus	<u>36.012</u>	<u>51.502</u>	<u>45.731</u>			
	100.000	100.000	100.000			

	Total	Heptanes Plus
Molecular Weight -----	82.564	118.409
BTU / Lb. -----	20799	20424
BTU / Gal. -----	113997	126431
Cu. Ft. / Gal. @ 14.73 Psia, 60°F -----	25.135	19.687
Lbs. / Gal. (Absolute Density) -----	5.4812	6.1426
Lbs. / Gal. (Weight in Air) -----	5.4752	6.1358
Specific Gravity at 60°F (Water = 1) -----	0.6574	0.7308
API Gravity at 60°F -----	83.729	60.554

Brian Harpold
 Data Reviewer



CERTIFICATE OF ANALYSIS

Number : 2013020191-001A

LAFAYETTE AREA LABORATORY
4790 N.E. EVANGELINE THRUWAY
CARENCRO, LA 70520
PHONE (337) 898-3055
FAX (337) 898-3077

Bridgeport, WV 26330

Field:	HG Energy	Report Date:	02/26/13
Station:	Production Unit 402	Sample Of:	Condensate
Station No.:		Sample Date:	02/14/2013 15:00
Sample Point:	Wellhead	Sample Conditions:	0.00 psi @ N.G.
Cylinder #:	GAS	PO / Ref. No.:	

Comments:

Components	Mol %	Wt%	LV%	Method	Lab Tech.	Date Analyzed
				GPA-2186 (MC10)	CC	02/26/13
Nitrogen	0.000	0.000	0.000			
Methane	1.362	0.264	0.579			
Carbon Dioxide	0.021	0.011	0.009			
Ethane	4.558	1.661	3.065			
Propane	9.494	5.070	6.572			
i-butane	4.284	3.016	3.523			
n-Butane	12.752	8.977	10.102			
i-Pentane	9.197	8.037	8.452			
n-Pentane	10.835	9.468	9.869			
2,2-dimethylbutane	0.005	0.004	0.003			
2,3-dimethylbutane	0.297	0.313	0.316			
Cyclopentane	0.365	0.313	0.280			
2-methylpentane	3.305	3.469	3.536			
3-methylpentane	2.330	2.448	2.455			
N-Hexane	5.183	5.447	5.508			
2,2-dimethylpentane	0.245	0.297	0.295			
Methylcyclopentane	0.443	0.456	0.405			
2,4-dimethylpentane	0.375	0.460	0.455			
2,2,3-trimethylbutane	0.089	0.110	0.106			
Benzene	0.109	0.105	0.078			
3,3-dimethylpentane	0.182	0.224	0.217			
Cyclohexane	0.808	0.830	0.711			
2-methylhexane	2.476	3.024	2.967			
2,3-dimethylpentane	0.792	0.969	0.931			
1,1-dimethylcyclopentane	0.125	0.150	0.131			
3-methylhexane	0.000	0.000	0.000			
1,1,3-dimethylcyclopentane	0.167	0.198	0.178			
1,c3-dimethylcyclopentane	0.339	0.404	0.363			
3-ethylpentane	0.037	0.045	0.043			
1,1,2-dimethylcyclopentane	0.240	0.284	0.252			
2,2,4-trimethylpentane	0.021	0.032	0.032			
N-Heptane	4.077	4.974	4.851			
Methylcyclohexane	2.388	2.857	2.477			
1,1,3-trimethylpentane	0.162	0.222	0.199			
2,2-dimethylhexane	0.068	0.095	0.093			
1,c2-dimethylcyclopentane	0.209	0.251	0.217			
2,5-dimethylhexane	0.297	0.413	0.398			
2,4-dimethylhexane	0.151	0.213	0.202			
ethylcyclopentane	0.501	0.597	0.519			
2,2,3-trimethylpentane	0.031	0.043	0.039			
1,1,2,c4-trimethylcyclopentane	0.214	0.289	0.260			
3,3-dimethylhexane	0.010	0.015	0.014			
1,1,2,c3-trimethylcyclopentane	0.042	0.057	0.050			
2,3,4-trimethylpentane	0.037	0.051	0.046			



CERTIFICATE OF ANALYSIS

LAFAYETTE AREA LABORATORY

4790 N.E. EVANGELINE THRUWAY
CARENCRO, LA 70520
PHONE (337) 896-3055
FAX (337) 896-3077

Number : 2013020191-001A

Gas Analytical Services
Chuck Honaker
PO Box 1028

Bridgeport, WV 26330

Field: HG Energy
Station: Production Unit 402
Station No.:
Sample Point: Wellhead
Cylinder #: GAS

Report Date: 02/26/13
Sample Of: Condensate
Sample Date: 02/14/2013 15:00
Sample Conditions: 0.00 psi @ N.G.
PO / Ref. No.:

Comments:

Components	Mol %	Wt%	LV%	Method	Lab Tech.	Date Analyzed
				GPA-2186 (MC10)	CC	02/26/13
Toluene	0.652	0.731	0.562			
2,3-dimethylhexane	0.084	0.117	0.110			
1,1,2-trimethylcyclopentane	0.000	0.000	0.000			
2-methylheptane	1.407	1.959	1.873			
4-methylheptane	0.240	0.336	0.316			
3,4-dimethylhexane	0.000	0.000	0.000			
3-methylheptane	1.908	2.657	2.509			
3-ethylhexane	0.000	0.000	0.000			
1,c3-dimethylcyclohexane	0.000	0.000	0.000			
1,c2,t3-trimethylcyclopentane	0.000	0.000	0.000			
1,c2,t4-trimethylcyclopentane	0.000	0.000	0.000			
1,t4-dimethylcyclohexane	0.615	0.843	0.739			
2,2,5-trimethylhexane	0.271	0.420	0.398			
1,1-dimethylcyclohexane	0.042	0.060	0.050			
1-methyl,t3-ethylcyclopentane	0.031	0.040	0.035			
1-methyl,c3-ethylcyclopentane	0.000	0.000	0.000			
1-methyl,t2-ethylcyclopentane	0.021	0.027	0.025			
2,2,4-trimethylhexane	0.016	0.027	0.025			
1-methyl,1-ethylcyclopentane	0.016	0.022	0.018			
Cycloheptane	0.021	0.022	0.018			
N-Octane	2.169	3.020	2.868			
1,t2-dimethylcyclohexane	0.115	0.159	0.135			
Unknown C9 paraffin	0.068	0.105	0.096			
1,t3-dimethylcyclohexane	0.000	0.000	0.000			
1,c4-dimethylcyclohexane	0.000	0.000	0.000			
1,c2,c3-trimethylcyclopentane	0.000	0.000	0.000			
Isopropylcyclopentane	0.209	0.286	0.245			
2,3,5-trimethylhexane	0.005	0.006	0.003			
2,2-dimethylheptane	0.000	0.000	0.000			
2,4-dimethylheptane	0.010	0.017	0.018			
1-methyl,c2-ethylcyclopentane	0.010	0.017	0.014			
2,2,3-trimethylhexane	0.000	0.000	0.000			
1,c2-dimethylcyclohexane	0.073	0.098	0.082			
2,6-dimethylheptane	0.016	0.025	0.025			
N-Propylcyclopentane	0.000	0.000	0.000			
1,c3,c5-trimethylcyclohexane	0.000	0.000	0.000			
2,5-dimethylheptane	0.026	0.040	0.035			
3,5-dimethylheptane	0.026	0.040	0.035			
Ethylcyclohexane	0.287	0.392	0.330			
1,1,3-trimethylcyclohexane	0.073	0.116	0.099			
2,3,3-trimethylhexane	0.047	0.077	0.071			
3,3-dimethylheptane	0.125	0.192	0.178			
1,1,4-trimethylcyclohexane	0.167	0.253	0.220			



CERTIFICATE OF ANALYSIS

LAFAYETTE AREA LABORATORY
4780 N.E. EVANGELINE THRUWAY
CARENCRO, LA 70520
PHONE (337) 898-3056
FAX (337) 898-3077

Number: 2013020191-001A

Gas Analytical Services
Chuck Honaker
PO Box 1028

Bridgeport, WV 26330

Field: HG Energy
Station: Production Unit 402
Station No.:
Sample Point: Wellhead
Cylinder #: GAS

Report Date: 02/26/13
Sample Of: Condensate
Sample Date: 02/14/2013 15:00
Sample Conditions: 0.00 psi @ N.G.
PO / Ref. No.:

Comments:

Components	Mol %	Wt%	LV%	Method	Lab Tech.	Date Analyzed
				GPA-2186 (MC10)	CC	02/26/13
Unknown C9 paraffin	0.000	0.000	0.000			
2,3,4-trimethylhexane	0.000	0.000	0.000			
Ethylbenzene	0.089	0.113	0.085			
1,1,2,4-trimethylcyclohexane	0.099	0.149	0.128			
2,3-dimethylheptane	0.125	0.194	0.178			
1,1,3,1,5-trimethylcyclohexane	0.016	0.022	0.018			
m-Xylene	0.464	0.598	0.462			
p-Xylene	0.464	0.598	0.462			
3,4-dimethylheptane	0.016	0.024	0.021			
2-methyloctane	0.599	0.940	0.878			
4-methyloctane	0.599	0.940	0.871			
Unknown C9 naphthene	0.078	0.118	0.099			
3-methyloctane	0.000	0.000	0.000			
Unknown C9 naphthene	0.058	0.092	0.078			
Unknown C9 naphthene	0.105	0.157	0.135			
1,1,2,3-trimethylcyclohexane	0.000	0.000	0.000			
1,1,2,4-trimethylcyclohexane	0.000	0.000	0.000			
o-Xylene	0.125	0.164	0.124			
1,1,2-trimethylcyclohexane	0.105	0.157	0.131			
Unknown C9 naphthene	0.105	0.164	0.139			
Unknown C9 naphthene	0.063	0.098	0.085			
N-Nonane	1.058	1.653	1.535			
Unknown C10 paraffin	0.026	0.043	0.039			
Unknown C10 paraffin	0.000	0.000	0.000			
Unknown C9 naphthene	0.084	0.128	0.110			
1,1,2,3-trimethylcyclohexane	0.016	0.020	0.018			
1,1,2,3-trimethylcyclohexane	0.016	0.020	0.018			
Unknown C10 paraffin	0.026	0.043	0.039			
Unknown C10 paraffin	0.063	0.105	0.096			
Isopropylbenzene	0.089	0.128	0.099			
2,2-dimethyloctane	0.016	0.029	0.025			
Isopropylcyclohexane	0.089	0.136	0.114			
Cyclooctane	0.099	0.136	0.110			
Unknown C10 paraffin	0.203	0.356	0.323			
Unknown C10 paraffin	0.068	0.114	0.103			
N-Butylcyclopentane	0.000	0.000	0.000			
N-Propylcyclohexane	0.000	0.000	0.000			
3,3-dimethyloctane	0.245	0.422	0.381			
Unknown C10 paraffin	0.000	0.000	0.000			
Unknown C10 paraffin	0.073	0.126	0.114			
N-Propylbenzene	0.000	0.000	0.000			
Unknown C10 paraffin	0.068	0.119	0.106			
m-Ethyltoluene	0.026	0.038	0.028			



CERTIFICATE OF ANALYSIS

LAFAYETTE AREA LABORATORY
4780 N.E. EVANGELINE THRUWAY
CARENCRO, LA 70520
PHONE (337) 896-3055
FAX (337) 896-3077

Number : 2013020191-001A

Gas Analytical Services
Chuck Honaker
PO Box 1028

Bridgeport, WV 26330

Field: HG Energy
Station: Production Unit 402
Station No.:
Sample Point: Wellhead
Cylinder #: GAS
Report Date: 02/26/13
Sample Of: Condensate
Sample Date: 02/14/2013 15:00
Sample Conditions: 0.00 psi @ N.G.
PO / Ref. No.:

Comments:

Table with 7 columns: Components, Mol %, Wt%, LV%, Method, Lab Tech., Date Analyzed. Lists various hydrocarbons and their percentages.

Brian Gaspard
Data Reviewer



LAFAYETTE AREA LABORATORY
 4790 N.E. EVANGELINE THRUWAY
 CARENCRO, LA 70520
 PHONE (337) 896-3055
 FAX (337) 896-3077

Certificate of Analysis

Number: 2030-2013020191-001A

Chuck Honaker
 Gas Analytical Services
 PO Box 1028
 Bridgeport WV 26330

February 25, 2013

Sample ID:		Sampled By:	BV - GAS
Station Name:	Production Unit 402	Sample Of:	Condensate
Station Number :		Sample Date:	2/14/2013
Location:	HG Energy	Sample Condition:	
Sample Point:	Wellhead	PO / Ref. No:	
Cylinder No.:	GAS		

ANALYTICAL DATA

Test	Method	Result	Unit	Lab Tech.	Date Analyzed
API Gravity @ 60° F	ASTM-D-5002	71.4	°	AR	02/25/2013
S & W Determination	ASTM-D-4007		Vol%		
Color	VISUAL	DARK STRAW			
Shrinkage Factor	ASTM-SHRINK	0.9289			
Flash Factor		71.4016	Ft. ³ / S.T.Bbl.		

Comments:

Laboratory Manager

Quality Assurance: The above analyses are performed in accordance with ASTM, UOP or GPA guidelines for quality assurance, unless otherwise stated

2013020191

Gas Analytical Services, Inc.



P.O. Box 1028, Bridgeport, WV 26330
205 Water Street, Stonewood, WV 26301
(304) 623-0020 fax: (304) 624-8076
-email: lab@gasana.com

Referred to: Southern Petroleum Labs
4790 NE Evangeline Thruway
Carencro, LA 70520
attn: Patti Petro

Date: 2/15/2013

Testing Requested

** SCF Base Conditions: P_b 14.73 psia / T_b: 60 Df

LONG FORM

Client	Location	Date of Collection	Sulfur Speciation (GPA-2199)	Total Sulfur (GPA-2199)	Extended		Gas Temperature
					Hydrocarbon	C1-C10 (GPA-2286)	
HG Energy	Condensate-Production Unit 402	2/14/2013				X	
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

Please email results to:
lab@gasana.com

Chuck Honaker

Submitted by:
Chuck Honaker, Manager
Laboratory Services

[Signature]

Received by:

2/20/13

Gas Analytical Services

Telephone: 804-623-0020
208 Water Street
Stone Wood, NY 24301

Date of Collection: 2/14/13

Time of Collection: 3:00 PM

Meter ID Number: _____

Company Name: H.G. Energy

Sample Source: Condensate from production unit 402
1H

Sample Pressure: 0.00 ~~psi~~
Unknown psi.

Sample Type: Submeter Master Meter Alternative Fuel Source Analysis

Sampled By: Brent Vanderhoff
Who declares that this sample was obtained from the source indicated above.

Comments: Liquid condensate

2013020191-001A

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Identification and Physical Characteristics

Identification

User Identification: 408/409 - 12S-19S
City: Near Wileyville
State: West Virginia
Company: AEP
Type of Tank: Vertical Fixed Roof Tank
Description: Each of Eight, 210 bbl Condensate Tanks, Contents estimated using Gasoline values in software

Tank Dimensions

Shell Height (ft):	15.00
Diameter (ft):	10.00
Liquid Height (ft) :	14.00
Avg. Liquid Height (ft):	7.50
Volume (gallons):	8,225.29
Turnovers:	1,332.59
Net Throughput(gal/yr):	10,960,950.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition:	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Dome
Height (ft)	0.00
Radius (ft) (Dome Roof)	10.00

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meteorological Data used in Emissions Calculations: Pittsburgh, Pennsylvania (Avg Atmospheric Pressure = 14.11 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

408/409 - 12S-19S - Vertical Fixed Roof Tank
Near Wileyville, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Gasoline (RVP 13)	All	51.94	47.06	58.81	50.33	5.9818	5.4218	8.5434	62.0000			92.00	Option 4: RVP=13, ASTM Slope=3

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

408/409 - 12S-19S - Vertical Fixed Roof Tank
Near Wileyville, West Virginia

Annual Emission Calculations	
Standing Losses (lb):	742.0529
Vapor Space Volume (cu ft):	642.9194
Vapor Density (lb/cu ft):	0.0673
Vapor Space Expansion Factor:	0.1685
Vented Vapor Saturation Factor:	0.2788
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	642.9194
Tank Diameter (ft):	10.0000
Vapor Space Outage (ft):	8.1859
Tank Shell Height (ft):	15.0000
Average Liquid Height (ft):	7.5000
Roof Outage (ft):	0.6659
Roof Outage (Dome Roof)	
Roof Outage (ft):	0.6659
Dome Radius (ft):	10.0000
Shell Radius (ft):	5.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0673
Vapor Molecular Weight (lb/lb-mole):	62.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia)	
Daily Avg. Liquid Surface Temp. (deg. R):	5.9616
Daily Average Ambient Temp. (deg. F):	511.6051
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	50.3583
Liquid Bulk Temperature (deg. R):	10.731
Tank Paint Solar Absorptance (Shell):	509.9983
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insolation Factor (Btu/sqft day):	0.1700
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	1,202.8556
Daily Vapor Temperature Range (deg. R):	0.1685
Daily Vapor Pressure Range (psia):	19.5141
Breather Vent Press. Setting Range (psia):	1.1216
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0600
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	5.9616
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	5.4218
Daily Avg. Liquid Surface Temp. (deg R):	6.5434
Daily Min. Liquid Surface Temp. (deg R):	511.6051
Daily Max. Liquid Surface Temp. (deg R):	506.7265
Daily Ambient Temp. Range (deg. R):	516.4895
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	19.1500
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.2788
Vapor Space Outage (ft):	5.9616
Working Losses (lb)	
Vapor Molecular Weight (lb/lb-mole):	16,245.4886
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	62.0000
Annual Net Throughput (gal/yr.):	5.9616
Annual Turnovers:	10,950,850.0000
Turnover Factor:	1,332.5916
Maximum Liquid Volume (gal):	0.1852
Maximum Liquid Height (ft):	6,225.2680
Tank Diameter (ft):	14.0000
Working Loss Product Factor:	10.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	18,980.5215

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

408/409 - 12S-19S - Vertical Fixed Roof Tank
Near Wileyville, West Virginia

Components	Losses(lbs)		Total Emissions
	Working Loss	Breathing Loss	
Gasoline (RVP 13)	18,248.47	742.05	18,990.52

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Identification and Physical Characteristics

Identification

User Identification: 408/409 20s-27s
 City: Near Wileyville
 State: West Virginia
 Company: AEP
 Type of Tank: Vertical Fixed Roof Tank
 Description: Eight, 210 bbl produced water tanks modeled with 1% of contents as gasoline

Tank Dimensions

Shell Height (ft):	15.00
Diameter (ft):	10.00
Liquid Height (ft) :	14.00
Avg. Liquid Height (ft):	7.50
Volume (gallons):	8,225.29
Turnovers:	1,332.59
Net Throughput(gal/yr):	10,960,950.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition:	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Dome
Height (ft)	0.00
Radius (ft) (Dome Roof)	10.00

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meteorological Data used in Emissions Calculations: Pittsburgh, Pennsylvania (Avg Atmospheric Pressure = 14.11 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

408/409 20s-27s - Vertical Fixed Roof Tank
Near Wileyville, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Produced Water	All	51.84	47.06	56.81	50.33	0.1911	0.1592	0.2284	18.0200			18.02	Option 4: RVP=13, ASTM Slope=3
Gasoline (RVP 13)						5.9816	5.4218	6.5434	82.0000	0.0476	0.2394	82.00	
Unidentified Components						0.1782	0.1648	0.1769	14.7310	0.9524	0.7606	17.85	

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

408/409 20s-27s - Vertical Fixed Roof Tank
Near Wileyville, West Virginia

<u>Annual Emission Calculations</u>	
Standing Losses (lb):	5.2744
Vapor Space Volume (cu ft):	642.9194
Vapor Density (lb/cu ft):	0.0005
Vapor Space Expansion Factor:	0.0388
Vented Vapor Saturation Factor:	0.9234
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	642.9194
Tank Diameter (ft):	10.0000
Vapor Space Outage (ft):	8.1859
Tank Shell Height (ft):	15.0000
Average Liquid Height (ft):	7.5000
Roof Outage (ft):	0.6859
Roof Outage (Dome Roof)	
Roof Outage (ft):	0.6859
Dome Radius (ft):	10.0000
Shell Radius (ft):	5.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0006
Vapor Molecular Weight (lb/lb-mole):	18.0200
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	
Daily Avg. Liquid Surface Temp. (deg. R):	511.6051
Daily Average Ambient Temp. (deg. F):	50.3083
Ideal Gas Constant R (psia cu ft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	509.9983
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,202.9556
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0388
Daily Vapor Temperature Range (deg. R):	18.5141
Daily Vapor Pressure Range (psia):	0.0692
Breather Vent Press. Setting Range (psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.1911
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.1592
Daily Avg. Liquid Surface Temp. (deg R):	511.6051
Daily Min. Liquid Surface Temp. (deg R):	506.7266
Daily Max. Liquid Surface Temp. (deg R):	518.4836
Daily Ambient Temp. Range (deg. R):	19.1500
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9234
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	
Vapor Space Outage (ft):	8.1859
Working Losses (lb):	
Vapor Molecular Weight (lb/lb-mole):	170.0152
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	18.0200
Annual Net Throughput (gal/yr.):	10,960,950.0000
Annual Turnovers:	1,332.5816
Turnover Factor:	0.1892
Maximum Liquid Volume (gal):	8,225,286.0
Maximum Liquid Height (ft):	14.0000
Tank Diameter (ft):	10.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	175.2696

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

408/409 20s-27s - Vertical Fixed Roof Tank
Near Wileyville, West Virginia

Components	Losses(lbs)		
	Working Loss	Breathing Loss	Total Emissions
Produced Water	170.02	5.27	175.29
Gasoline (RVP 13)	40.70	1.26	41.96
Unidentified Components	129.31	4.01	133.33

TANKS 4.0.9d
Emissions Report - Detail Format
Total Emissions Summaries - All Tanks in Report

Emissions Report for: Annual

Tank Identification				Losses (lbs)
400/400 - 120-190	AEP	Vertical Fixed Roof Tank	Near Wileyville, West Virginia	10,000.52
400/400 200-270	AEP	Vertical Fixed Roof Tank	Near Wileyville, West Virginia	175.29
Total Emissions for all Tanks:				10,175.81

USA Compression Unit 5161 G8.3/H302

Engine Serial Number :	46930956	Engine Manufactured Date :	11/03/2008
Max HP :	118	Max RPM :	1800
Number of Engine Cylinders :	6	Total Displacement (in3) :	505
Combustion Type & Setting :	4 Stroke Rich Burn	Fuel Delivery Method:	Carburetor
Compression Ratio :	10.5:1	Combustion Air Treatment :	Naturally Aspirated
Engine Modified/Reconstructed? :	Tier 1 - EMD after 7/1/2008		
Compressor Frame Serial # :		Unit Packaged Date :	11/24/2008
Compressor Frame Max RPM :	1800	# of Compressor Throws :	2

AIR ENVIRONMENTAL REGULATIONS

County and State Selected for Quote:	Wetzel	WV							
NSPS JJJJ	NOx 2.00 g/hp-hr	CO 4.0 g/hp-hr	VOC 1.0 g/hp-hr						
Ozone Non-Attainment / General Permit	NOx g/hp-hr	CO g/hp-hr	VOC g/hp-hr	CH2O g/hp-hr					

RAW ENGINE EMISSIONS

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

Fuel Consumption : 8,924 HHV BTU/bhp-hr

	<u>g/bhp-hr</u>	<u>lb/MMBTU</u>	<u>lb/hr</u>	<u>TPY</u>
Nitrogen Oxides (NOx) :	13.00		3.382	14.813
Carbon Monoxide (CO) :	8.60		2.237	9.798
Volatile Organic Compounds (NMNEHC excluding CH2O) :		0.03	0.031	0.136
Formaldehyde (CH2O) :		0.02	0.022	0.096
Particulate Matter (PM) Filterable+Condensable :		0.0194	0.020	0.090
Sulfur Dioxide (SO2) :		0.0006	0.001	0.003
	<u>g/bhp-hr</u>	<u>lb/MMBTU</u>	<u>lb/hr</u>	<u>Metric Tonne/yr</u>
Carbon Dioxide (CO2) :	452.00		117.58	467.14
Methane (CH4) :		0.23	0.24	0.96

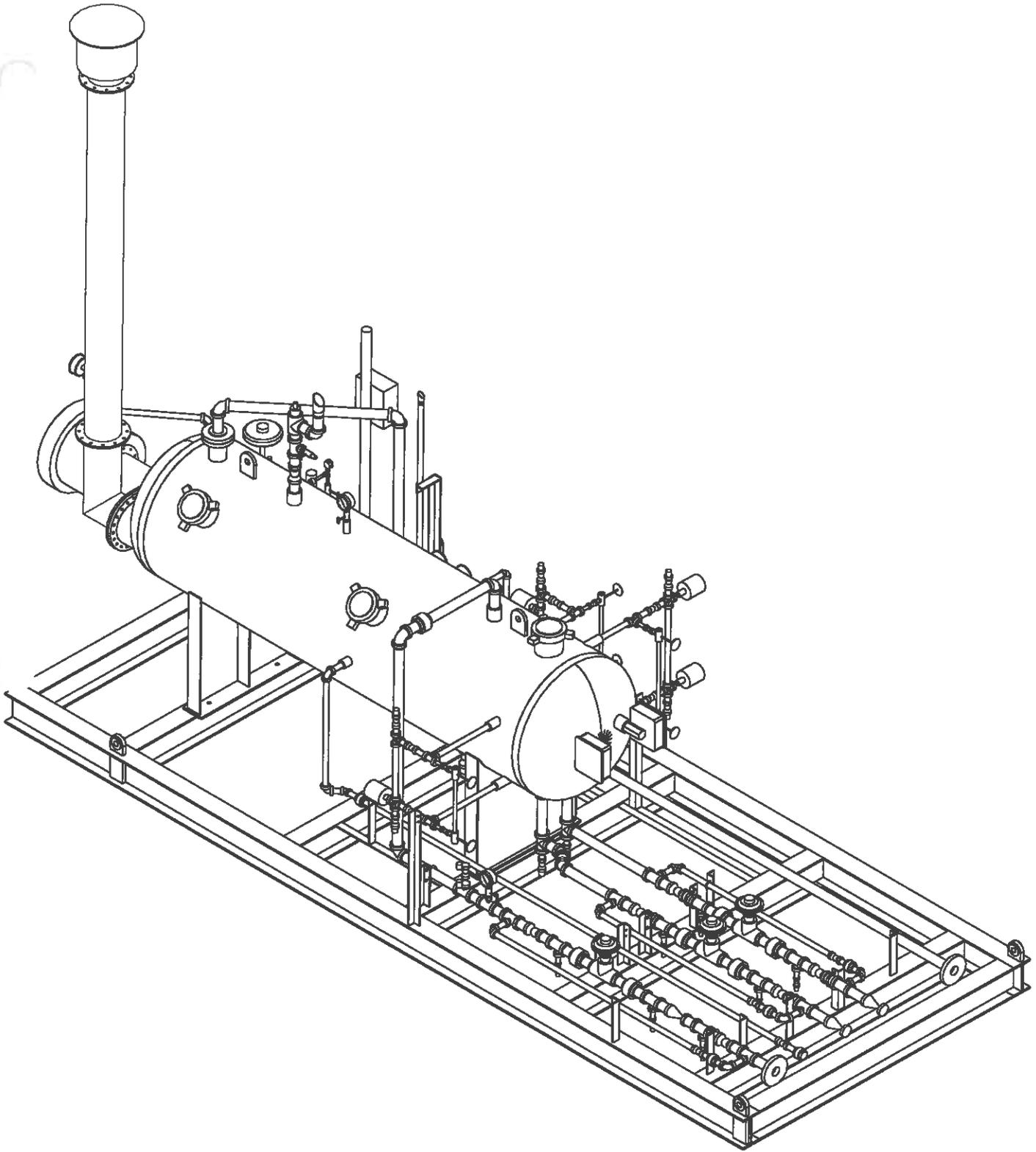
CONTROLLED EMISSIONS

Catalytic Converter Make and Model:	VXC-1408-04-HSG
Catalyst Element Type:	3-Way
Number of Catalyst Elements currently in Housing:	1
Air/Fuel Ratio Control :	Yes
Other Engine Emissions Control Equipment :	

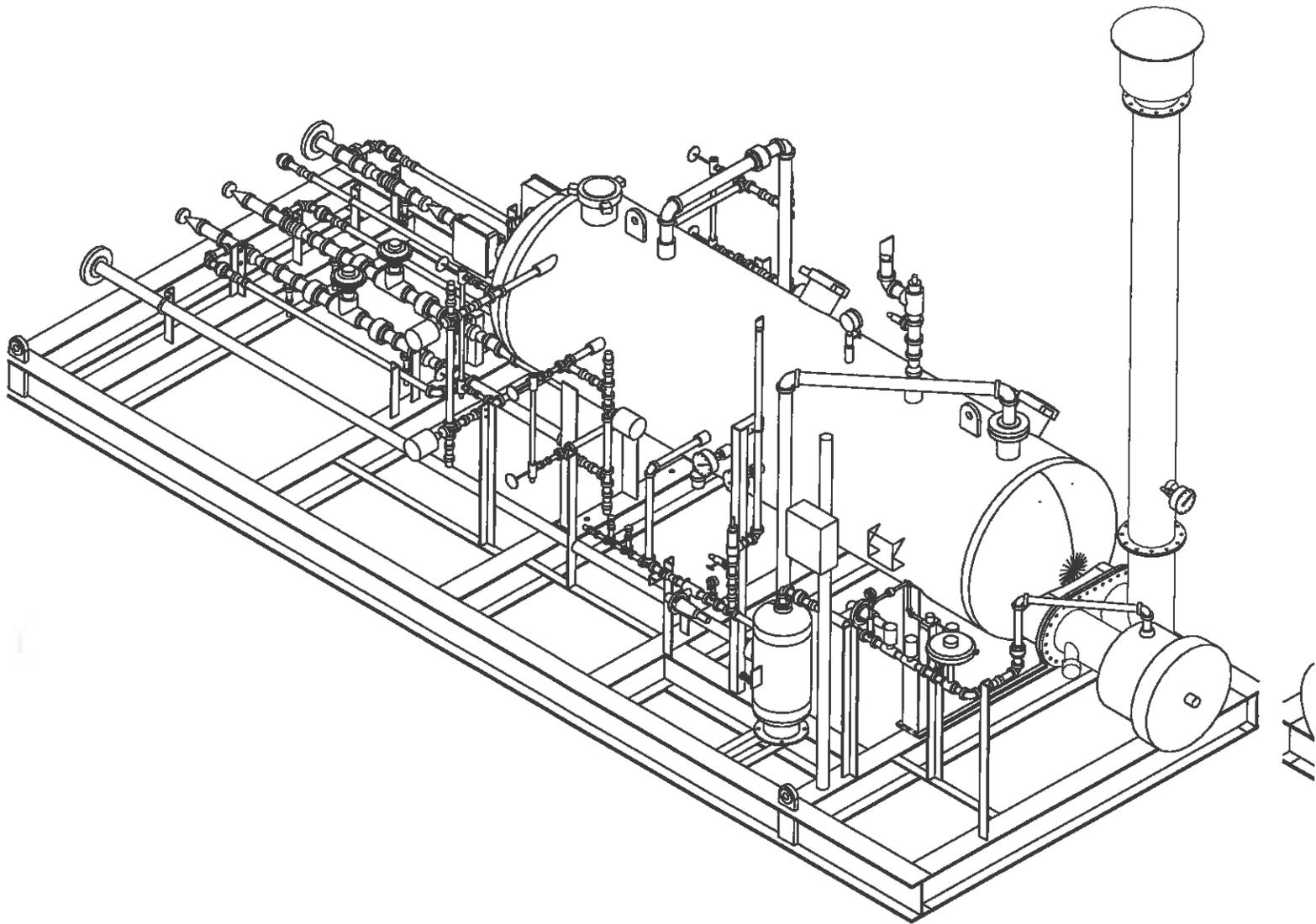
	% Reduction Required to Comply with <u>JJJJ & Non-Attainment / General Permit Limits</u>		<u>lb/hr</u>	<u>TPY</u>
Nitrogen Oxides (NOx) :	85		0.520	2.279
Carbon Monoxide (CO) :	53		1.041	4.558
Volatile Organic Compounds (NMNEHC excluding CH2O) :	0		0.031	0.136
Formaldehyde (CH2O) :	0		0.022	0.096
Particulate Matter (PM) Filterable+Condensable :	0		0.020	0.090
Sulfur Dioxide (SO2) :	0		0.001	0.003
	% Reduction Required to Comply with <u>JJJJ & Non-Attainment / General Permit Limits</u>		<u>lb/hr</u>	<u>Metric Tonne/yr</u>
Carbon Dioxide (CO2) :	0		117.58	467.14
Methane (CH4) :	0		0.24	0.96

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

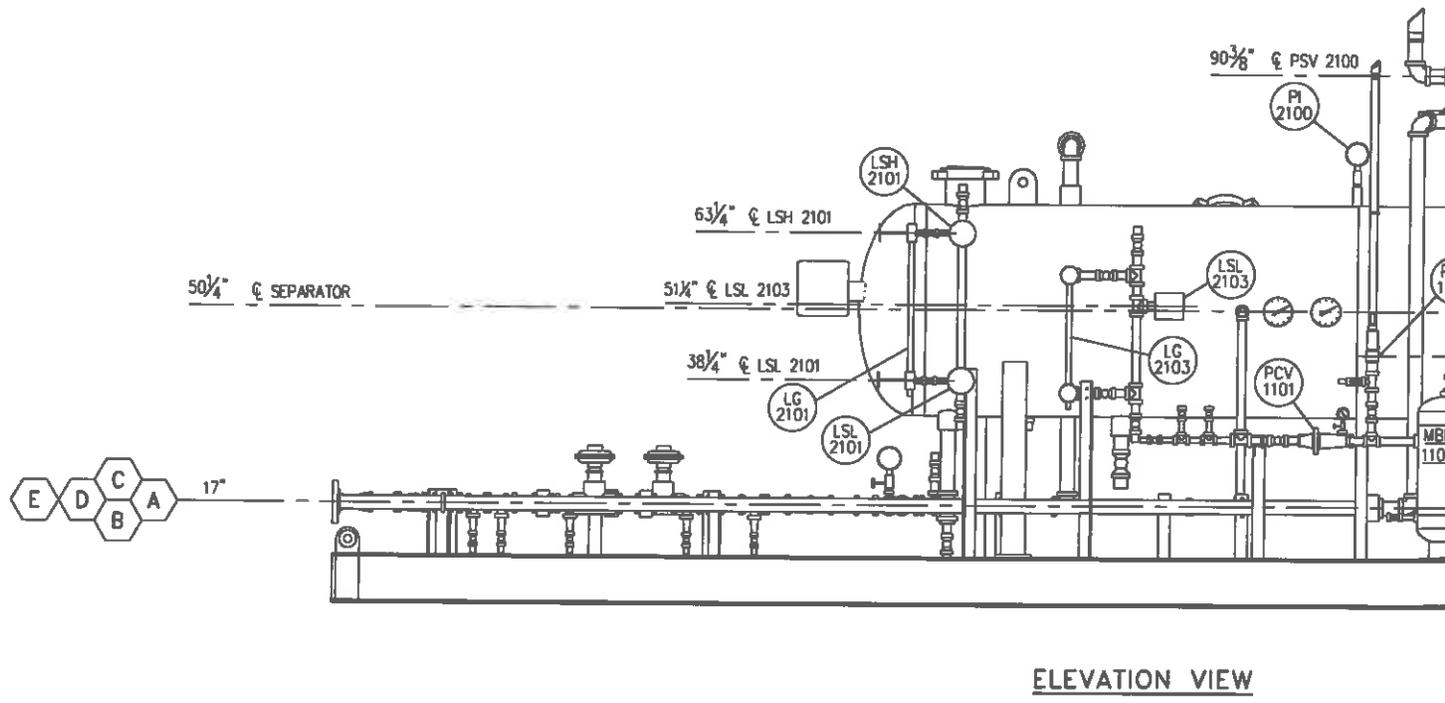
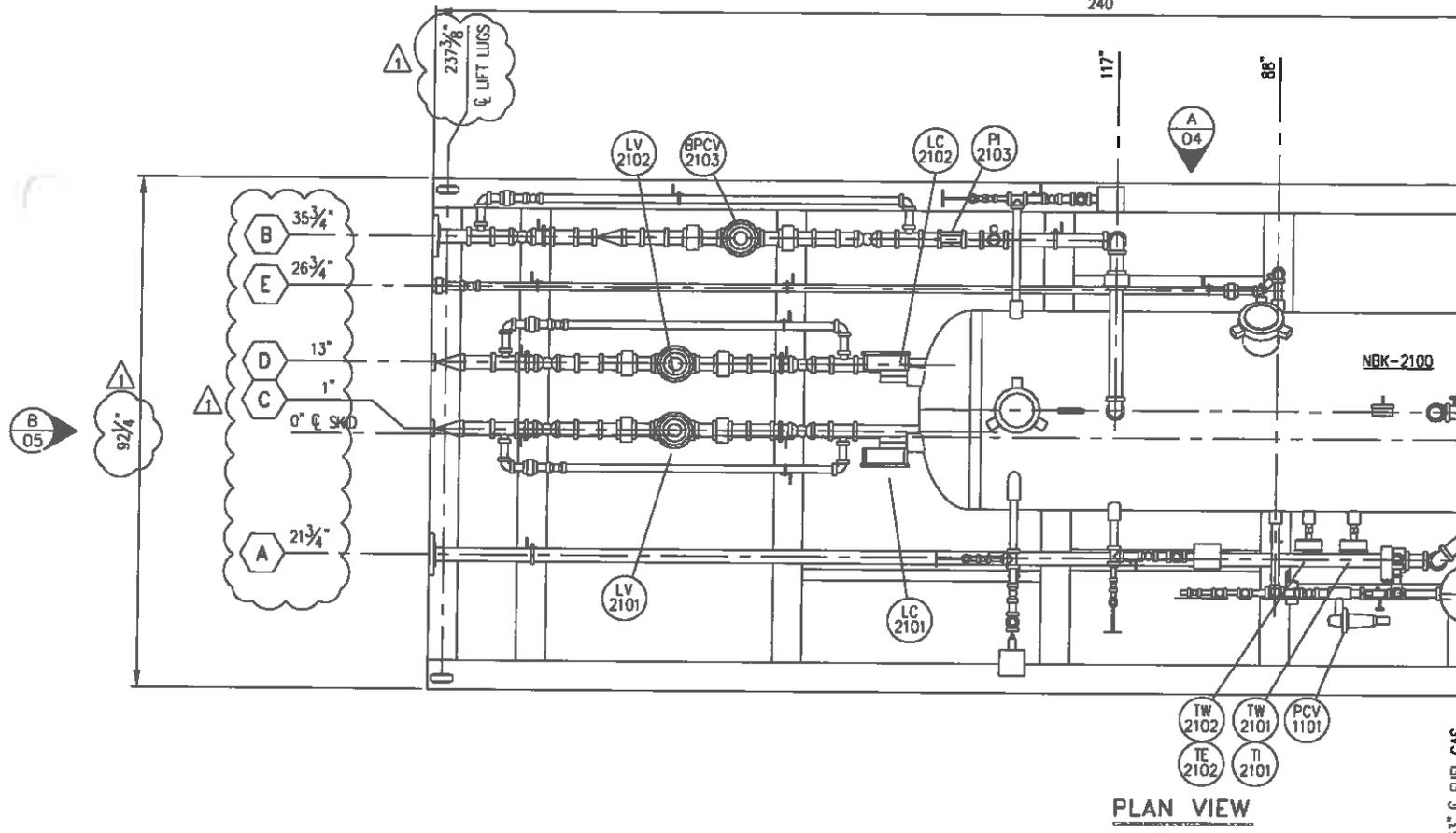
2) lb/MMBTU emission Factors are based on EPA's AP-42, Fifth Edition, Volume I, Chapter 3: Stationary Internal Combustion Sources (Section 3.2 Natural Gas-Fired Reciprocating Engines).



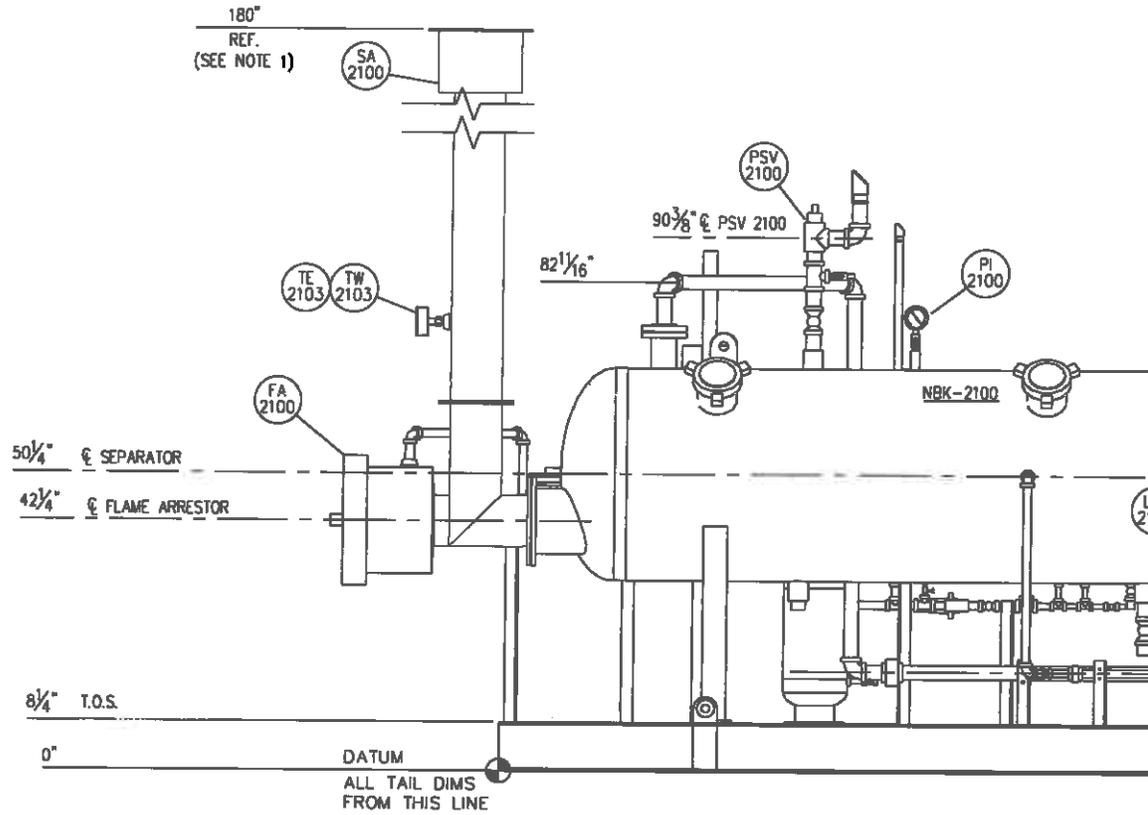
NW ISOMETRIC VIEW
SCALE N.T.S.



SE ISOMETRIC VIEW
SCALE N.T.S.



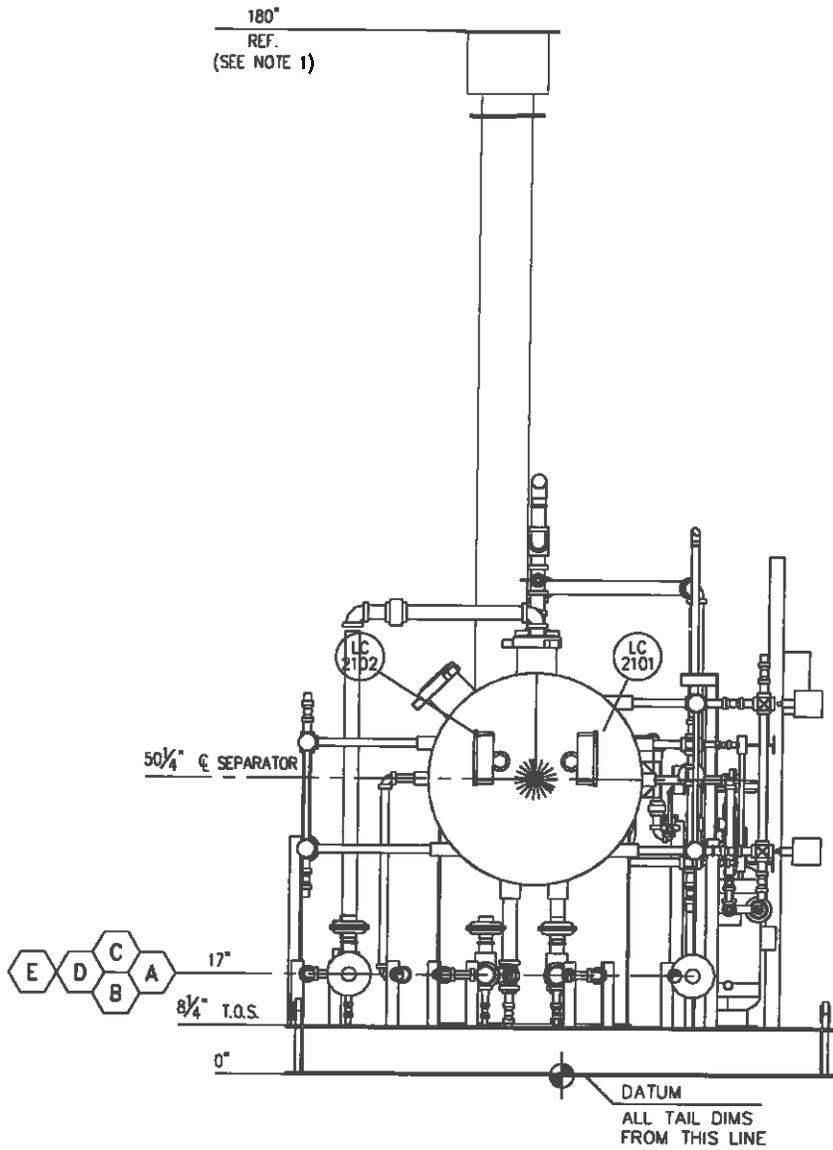
QTY	SIZE	RATING	TYPE	SERVICE
1	1"	3000#	NPT	FUEL GAS INLET
1	2"	3000#	NPT	WATER OUTLET
1	2"	3000#	NPT	OIL OUTLET
1	3"	150#	RF	GAS OUTLET
1	3"	150#	RF	INLET



VIEW A
03

		1"	3000#	NPT	FUEL GAS INLET
	1	2"	3000#	NPT	WATER OUTLET
	1	2"	3000#	NPT	OIL OUTLET
	1	3"	150#	RF	GAS OUTLET
	1	3"	150#	RF	INLET
K	QTY	SIZE	RATING	TYPE	SERVICE



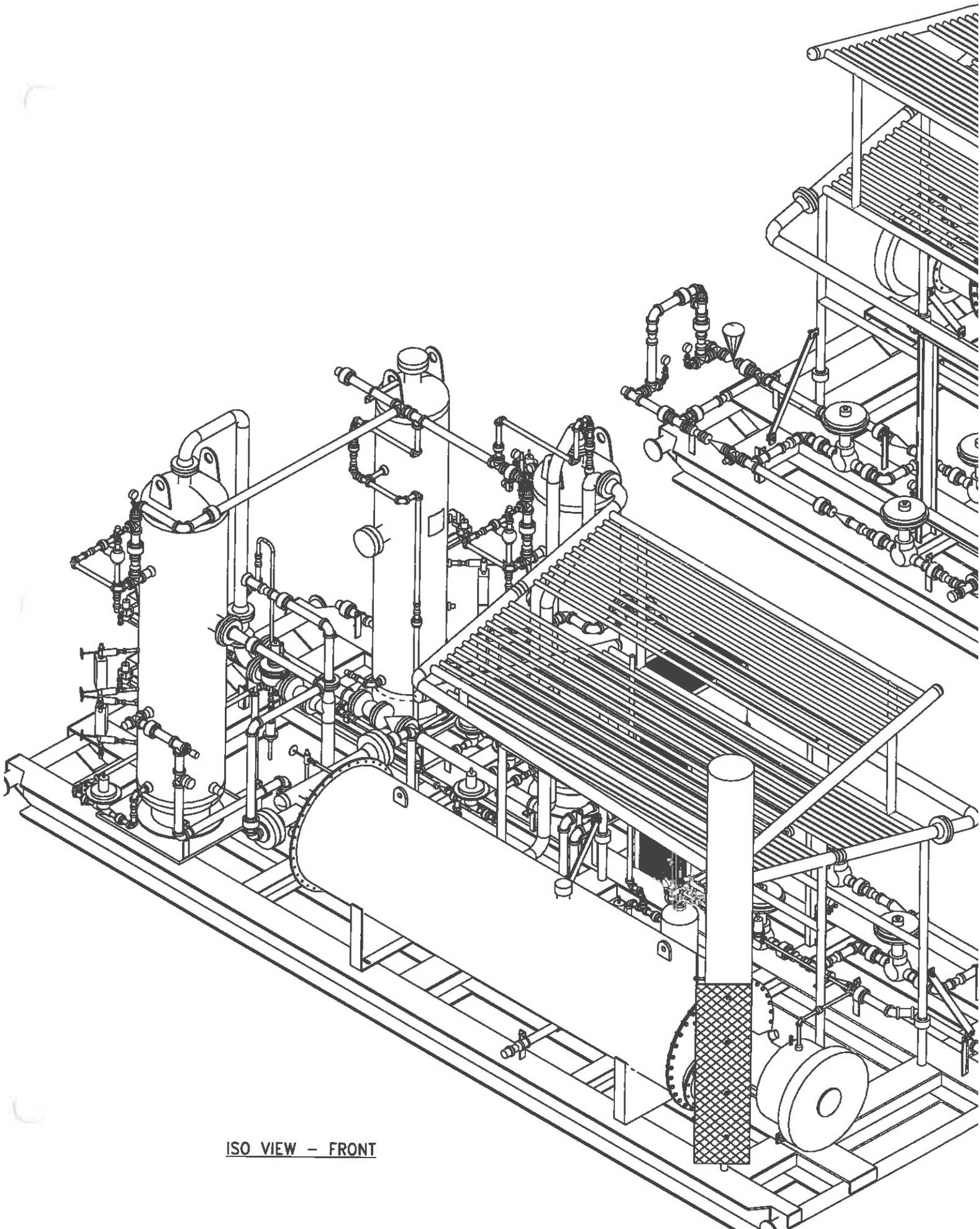


42 1/4" ϕ SI
FLAM

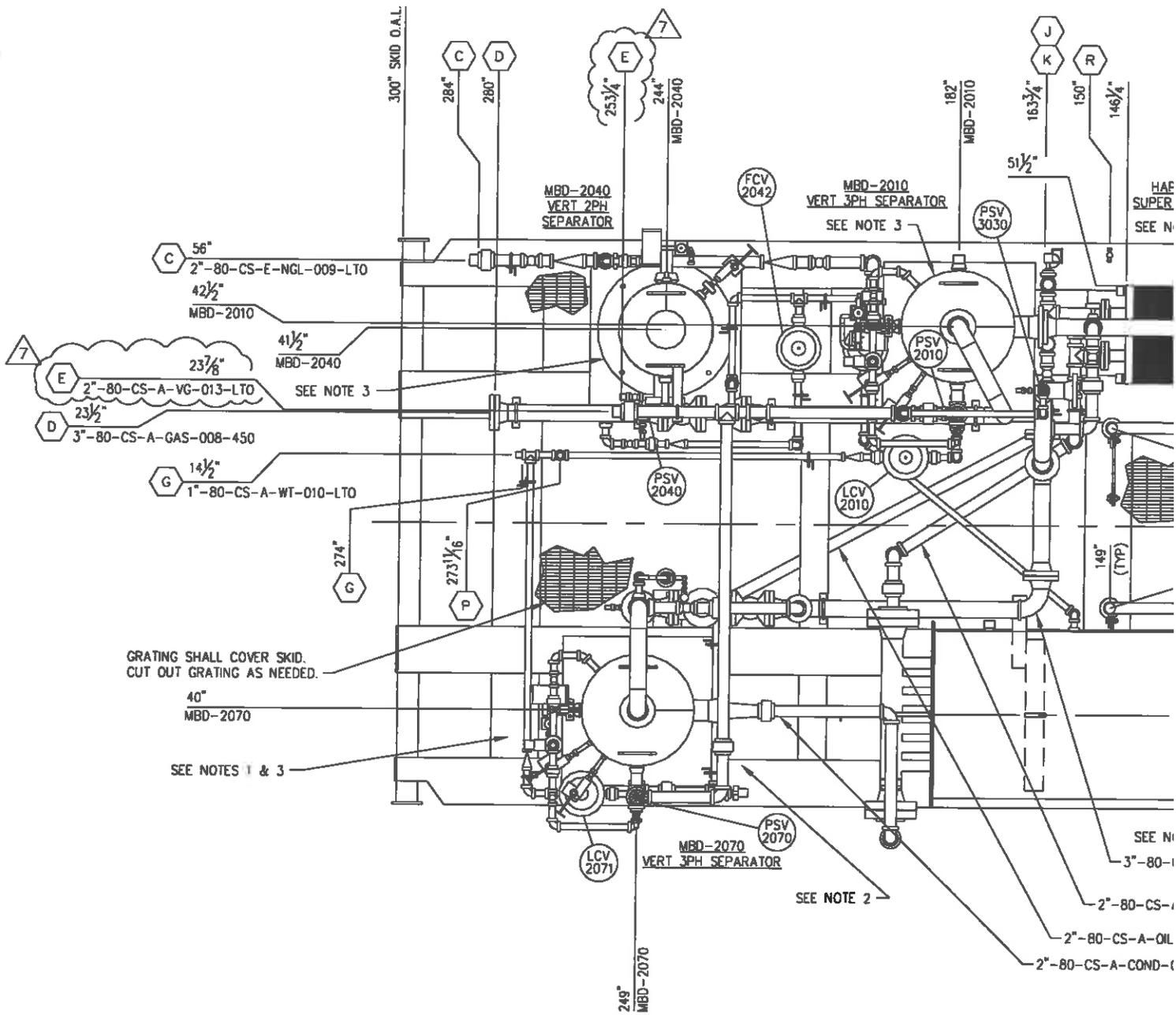
VIEW B
03

K	QTY	SIZE	RATING	TYPE	SERVICE
		1"	3000#	NPT	FUEL GAS INLET
	1	2"	3000#	NPT	WATER OUTLET
	1	2"	3000#	NPT	OIL OUTLET
	1	2"	150#	RF	GAS OUTLET
	1	2"	150#	RF	INLET





ISO VIEW - FRONT



GRATING SHALL COVER SKID.
CUT OUT GRATING AS NEEDED.

SEE NOTES 1 & 3

SEE NOTE 2

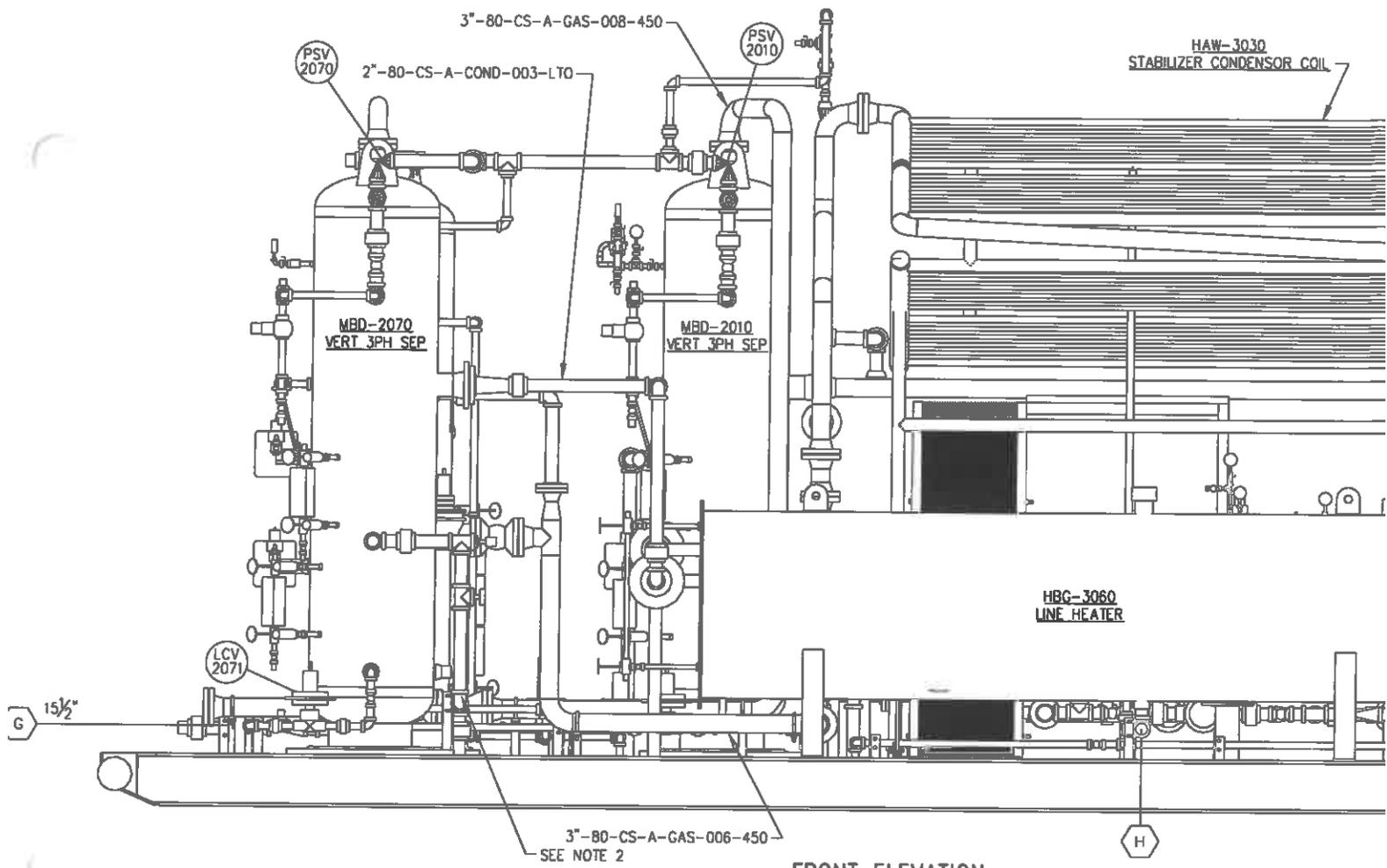
PLAN

NOTE: ALL ELEVATIONS TO BE TAKEN FROM BOTTOM OF SKID.

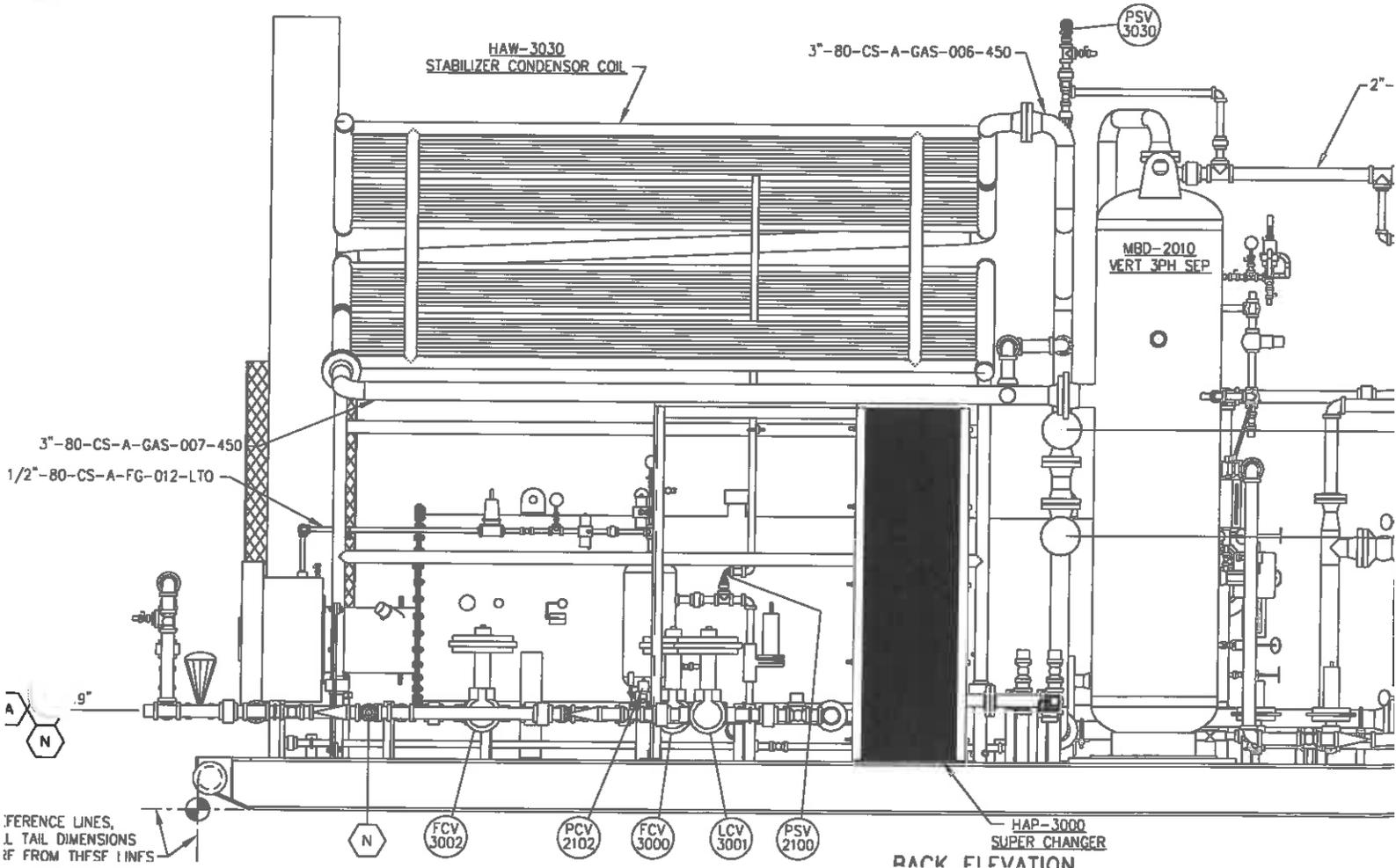
QTY	SIZE	RATING	TYPE	SERVICE	ELEVATION	
1	3/8"	6000#	FNPT	I.G.S. TO C5 RECOVERY	12"	
1	1"	3000#	FNPT	WATER FROM C5 RECOVERY	17 1/4"	
1	1"	3000#	FNPT	OIL FROM C5 RECOVERY	19"	
1	3"	150#	RFWN	FROM C5 RECOVERY	74 1/2"	
1	3"	150#	RFWN	TO C5 RECOVERY	54"	
1	2"	2000#	FNPT	LINE HEATER DRAIN	16"	
1	1"	2000#	FNPT	WATER TO CUSTOMER LIQUID STORAGE	15 1/2"	
1	1"	2000#	FNPT	FUEL SUPPLY	13"	
1	2"	2000#	FNPT	RELIEF VENT	124"	
1	3"	150#	RFWN	TO GAS SALES	19"	
1	2"	2000#	FNPT	TO NGL STORAGE TANK	15"	
1	2"	2000#	FNPT	TO OIL STORAGE TANK	19"	
1	2"	2000#	FNPT	UNIT INLET	19"	
K	QTY	SIZE	RATING	TYPE	SERVICE	ELEVATION

NOTE:

- TUBING IS TO REMAIN 3" AWAY FROM VESSEL INSULATION PURPOSES.
 - PIPE LINE 2"-80-CS-A-OIL-004-LTO SHALL BE SEAL WELD WITH A 1/4" FILLET TO MBD-2070 SEPARATOR FOR 1
 - EQUIPMENT (MBD-2010, MBD-2040, MBD-2070) SHALL BE SEAL WELD WITH A 1/4" FILLET TO
 - USE CAPSCREWS 5/8"x2" WITH LOCK WASHER BOLT DOWN HAP-3000 SUPER CHANGER TO S
- | QTY | ITEM NO. | DESCRIPTION |
|-----|----------|------------------|
| 3 | 12607 | CAPSCREW 5/8"x2" |
| 3 | 12469 | LOCK WASHER |
| 6 | 12470 | FLAT WASHER |
| 3 | 13774 | NUT 5/8" |



FRONT ELEVATION



BACK ELEVATION

REFERENCE LINES,
L TAIL DIMENSIONS
IF FROM THESE LINES

Attachment J

Class I Legal Advertisement

AIR QUALITY PERMIT NOTICE
Notice of Application

Notice is given that American Energy - Marcellus, LLC has applied to the West Virginia Department of Environmental Protection, Division of Air Quality, for a Modification to a Class II General Permit G70-A Registration for a Natural Gas Production Wellpad located on 1220 Long Ridge Road, Wileyville, in Wetzel County, West Virginia. The latitude and longitude coordinates are: 39.584111/-80.674972

The applicant estimates the increased potential to discharge the following Regulated Air Pollutants will be:

Particulate Matter (Total)	No increase
Particulate Matter (Less than 2.5)	No increase
Particulate Matter (Less than 10)	No increase
Sulfur Dioxide	0.02 TPY
Oxides of Nitrogen	5.24 TPY
Carbon Monoxide	0.82 TPY
Volatile Organic Compounds	No increase
Hazardous Air Pollutants	No increase
Greenhouse Gases (CO ₂ e)	3,003 TPY

Startup of operation is planned to begin on or about the 15th day of December 2014. Written comments will be received by the West Virginia Department of Environmental Protection, Division of Air Quality, 601 57th Street, SE, Charleston, WV 25304, for at least 30 calendar days from the date of publication of this notice.

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

Dated this the 10th day of December 2014.

By: American Energy - Marcellus, LLC
Tim Cummings
Director - Operations
301 NW 63rd, Suite 600
Oklahoma City, OK 73116

Attachment L

General Permit Registration Application Fee

Attachment N

Material Safety Data Sheets (MSDS)



AMERICAN ENERGY
PARTNERS

Natural Gas Liquids

Safety Data Sheet

Section 1: Identification of the substance or mixture and of the supplier

Product Name: Natural Gas Liquids
SDS Number: 786340

Synonyms/Other Means of Identification: Natural Gas Liquids, Raw
Natural Gas Liquids, Ethane Free
Plant Condensate
Raw NGL
EPBC Mix
PBC Mix
Y-Grade
Gas Liquids

MARPOL Annex I Category: Naphthas and Condensates
Intended Use: Feedstock

Manufacturer: American Energy Partners
301 N.W. 63rd
Oklahoma City, OK 73116

Emergency Health and Safety Number: Chemtrec: 800-424-9300 (24 Hours)

SDS Information: Phone: 844-210-6000
URL: www.americanenergypartners.com

Section 2: Hazard(s) Identification

Classification

H224 – Flammable liquids -- Category 1
H315 – Skin corrosion/irritation -- Category 2
H304 – Aspiration Hazard -- Category 1
H336 – Specific target organ toxicity (single exposure) -- Category 3
H350 – Carcinogenicity -- Category 1B
H411 – Hazardous to the aquatic environment, chronic toxicity -- Category 2

Hazards not Otherwise Classified

May contain or release poisonous hydrogen sulfide gas

Label Elements



DANGER

Extremely flammable liquid and vapor. (H224)*
Causes skin irritation. (H315)*
May contain or release poisonous hydrogen sulfide gas
May be fatal if swallowed and enters airways. (H304)*
May cause drowsiness or dizziness. (H336)*
May cause cancer. (H350)*
Toxic to aquatic life with long lasting effects. (H411)*

Precautionary Statement(s):

- Obtain special instructions before use. (P201)*
- Do not handle until all safety precautions have been read and understood. (P202)*
- Keep away from heat/sparks/open flames/hot surfaces. - No smoking. (P210)*
- Keep container tightly closed. (P233)*
- Ground/bond container and receiving equipment. (P240)*
- Use with explosion-proof equipment. (P241)*
- Use only non-sparking tools. (P242)*
- Take precautionary measures against static discharge. (P243)*
- Avoid breathing dust/fume/gas/mist/vapours/spray. (P261)*
- Wash thoroughly after handling. (P264)*
- Use only outdoors or in a well-ventilated area. (P271)*
- Wear protective gloves / protective clothing / eye protection / face protection. (P280)*
- IF ON SKIN: Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. (P303+P361+P353)*
- In case of fire: Use dry chemical, carbon dioxide, or foam for extinction.(P370+P378)*
- If skin irritation occurs: Get medical advice/attention. (P313)*
- Take off contaminated clothing and wash before reuse. (P362)*
- IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. (P301+P310)*
- Do NOT induce vomiting. (P331)*
- IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. (P304+P340)*
- Call a POISON CENTER or doctor/physician if you feel unwell. (P312)*
- In case of fire: Use dry chemical, carbon dioxide, or foam for extinction.(P370+P378)*
- Store in a well-ventilated place. Keep cool.(P403+P235)*
- Store locked up. (P405)*
- Dispose of contents/container to approved disposal facility. (P501)*

* (Applicable GHS hazard code.)

Section 3: Composition / Information on Ingredients

Component	CASRN	Concentration ¹
Natural gas (petroleum), raw liq. mix	64741-48-6	100
n-Hexane	110-54-3	5-25
Benzene	71-43-2	0.1-5
Hydrogen Sulfide	7783-06-4	<1

Total Sulfur: > 0.5 wt%

¹ All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

Section 4: First Aid Measures

Eye Contact: If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

Skin Contact: Remove contaminated shoes and clothing, and flush affected area(s) with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. If skin surface is not damaged, cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops, seek medical attention. Wash contaminated clothing before reuse.

Inhalation (Breathing): If respiratory symptoms or other symptoms of exposure develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. If symptoms persist, seek immediate medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion (Swallowing): Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is drowsy or unconscious and vomiting, place on the left side with the head down. If possible, do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention.

Most important symptoms and effects

Acute: Headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue.

Delayed: Dry skin and possible irritation with repeated or prolonged exposure.

Notes to Physician: At high concentrations hydrogen sulfide may produce pulmonary edema, respiratory depression, and/or respiratory paralysis. The first priority in treatment should be the establishment of adequate ventilation and the administration of 100% oxygen. Animal studies suggest that nitrites are a useful antidote, however, documentation of the efficacy of nitrites in humans is lacking. If the diagnosis of hydrogen sulfide poisoning is confirmed and if the patient does not respond rapidly to supportive care, the use of nitrites may be an effective antidote if delivered within the first few minutes of exposure. For adults the dose is 10 mL of a 3% NaNO₂ solution (0.5 gm NaNO₂ in 15 mL water) I.V. over 2-4 minutes. The dosage should be adjusted in children or in the presence of anemia, and methemoglobin levels, arterial blood gases, and electrolytes should be monitored closely.

Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of hydrocarbon solvents (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for the development of cardiac arrhythmias.

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

Other Comments: Before attempting rescue, first responders should be alert to the possible presence of hydrogen sulfide, a poisonous gas with the smell of rotten eggs, and should consider the need for respiratory protection (see Section 8). Remove casualty to fresh air as quickly as possible. Immediately begin artificial respiration if breathing has ceased. Consider whether oxygen administration is needed. Obtain medical advice for further treatment.

Section 5: Fire-Fighting Measures



NFPA 704 Hazard Class

Health: 1 Flammability: 4 Instability: 0 (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

Unusual Fire & Explosion Hazards: Extremely flammable. This material can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. This product will float and can be reignited on surface water. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire. Hazardous combustion/decomposition products, including hydrogen sulfide, may be released by this material when exposed to heat or fire. Use caution and wear protective clothing, including respiratory protection.

Extinguishing Media: Dry chemical, carbon dioxide, or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

Fire Fighting Instructions: For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Hydrogen sulfide and oxides of nitrogen and sulfur may also be formed.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

Section 6: Accidental Release Measures

Personal Precautions: Extremely flammable. Spillages of liquid product will create a fire hazard and may form an explosive atmosphere. Keep all sources of ignition and hot metal surfaces away from spill/release if safe to do so. The use of explosion-proof electrical equipment is recommended. May contain or release poisonous hydrogen sulfide gas. If the presence of dangerous amounts of H₂S around the spilled product is suspected, additional or special actions may be warranted, including access restrictions and use of protective equipment. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions: Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use foam on spills to minimize vapors. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

Methods for Containment and Clean-Up: Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken.

Section 7: Handling and Storage

Precautions for safe handling: Keep away from ignition sources such as heat/sparks/open flame – No smoking. Take precautionary measures against static discharge. Nonsparking tools should be used. May contain or release dangerous levels of hydrogen sulfide. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Avoid breathing vapors or mists. Use only outdoors or in well-ventilated area. Wear protective gloves/clothing and eye/face protection. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Extremely Flammable. May vaporize easily at ambient temperatures. The vapor is heavier than air and may create an explosive mixture of vapor and air. Beware of accumulation in confined spaces and low lying areas. Open container slowly to relieve any pressure. Electrostatic charge may accumulate and create a hazardous condition when handling or processing this material. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. The use of explosion-proof electrical equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-70 and/or API RP 2003 for specific bonding/grounding requirements. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames.

Static Accumulation Hazard: Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding of tanks, transfer piping, and storage tank level floats are necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating and accumulating an electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. Special care should be given to ensure that special slow load procedures for "switch loading" are followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such as gasoline or naphtha). For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'.

Conditions for safe storage: This material may contain or release poisonous hydrogen sulfide gas. In a tank, barge, or other closed container, the vapor space above this material may accumulate hazardous concentrations of hydrogen sulfide. Check atmosphere for oxygen content, H₂S, and flammability prior to entry. Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Store only in approved containers. Post area "No Smoking or Open Flame." Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

Section 8: Exposure Controls / Personal Protection

Component	ACGIH	OSHA	Other
Natural gas (petroleum), raw liq. mix	TWA: 300 ppm (as Gasoline)	TWA: 400 mg/m ³ TWA: 100 ppm	0.5 ppm TWA8hr (as benzene) 0.25 ppm TWA12hr (as benzene) 2.5 ppm STEL (as benzene) (American Energy Guidelines)
n-Hexane	TWA: 50 ppm Skin	TWA: 500 ppm TWA: 1800 mg/m ³	—
Benzene	STEL: 2.5 ppm TWA: 0.5 ppm Skin	Ceiling: 25 ppm STEL: 5 ppm TWA: 10 ppm TWA: 1 ppm	—
Hydrogen Sulfide	STEL: 5 ppm TWA: 1 ppm	Ceiling: 20 ppm	TWA: 5 ppm 8hr TWA: 2.5 ppm 12hr STEL: 15 ppm (American Energy Guidelines)

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye protection that meets or exceeds ANSI Z.87.1 is recommended to protect against potential eye contact, irritation, or injury. Depending on conditions of use, a face shield may be necessary.

Skin/Hand Protection: The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the breakthrough performance of their products. Depending on exposure and use conditions, additional protection may be necessary to prevent skin contact including use of items such as chemical resistant boots, aprons, arm covers, hoods, coveralls, or encapsulated suits. Suggested protective materials: Nitrile

Respiratory Protection: A NIOSH approved, self-contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode should be used in situations of oxygen deficiency (oxygen content less than 19.5 percent), unknown exposure concentrations, or situations that are immediately dangerous to life or health (IDLH).

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use.

If benzene concentrations equal or exceed applicable exposure limits, OSHA requirements for personal protective equipment, exposure monitoring, and training may apply (29CFR1910.1028 - Benzene).

Other Protective Equipment: Eye wash and quick-drench shower facilities should be available in the work area. Thoroughly clean shoes and wash contaminated clothing before reuse.

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

Section 9: Physical and Chemical Properties

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Appearance:	Colorless
Physical Form:	Liquid
Odor:	Gasoline; Rotten egg / sulfurous
Odor Threshold:	No data
pH:	Not applicable
Vapor Pressure:	150 - 200 psia (Reid VP) @ 100°F / 37.8°C
Vapor Density (air=1):	>1
Initial Boiling Point/Range:	No data
Melting/Freezing Point:	No data
Solubility in Water:	Negligible
Partition Coefficient (n-octanol/water) (Kow):	No data
Specific Gravity (water=1):	(estimated) 0.5 - 0.7 @ 68°F / 20°C
Percent Volatile:	100%
Evaporation Rate (nBuAc=1):	No data
Flash Point:	< -99 °F / < -73 °C
Test Method:	(estimate)
Lower Explosive Limits (vol % in air):	No data
Upper Explosive Limits (vol % in air):	No data
Auto-ignition Temperature:	No data

Section 10: Stability and Reactivity

Stability: Stable under normal ambient and anticipated conditions of use.

Conditions to Avoid: Avoid high temperatures and all sources of ignition. Prevent vapor accumulation.

Materials to Avoid (Incompatible Materials): Avoid contact with strong oxidizing agents and strong reducing agents.

Hazardous Decomposition Products: Not anticipated under normal conditions of use.

Hazardous Polymerization: Not known to occur.

Section 11: Toxicological Information

Information on Toxicological Effects of Substance/Mixture

<u>Acute Toxicity</u>	<u>Hazard</u>	<u>Additional Information</u>	<u>LC50/LD50 Data</u>
Inhalation	Expected to have a low degree of toxicity by inhalation	May contain or release poisonous hydrogen sulfide gas - see Other Comments.	> 5.2 mg/L (vapor)
Skin Absorption	Unlikely to be harmful		> 2 g/kg
Ingestion (Swallowing)	Unlikely to be harmful		> 5 g/kg

Aspiration Hazard: May be fatal if swallowed and enters airways.

Skin Corrosion/Irritation: Causes skin irritation. Repeated exposure may cause skin dryness or cracking.

Serious Eye Damage/Irritation: Causes mild eye irritation.

Signs and Symptoms: Effects of overexposure can include slight irritation of the respiratory tract, nausea, vomiting, and signs of nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue). Continued exposure to high concentrations can result in vomiting, cardiac irregularities and sudden loss of consciousness.

Skin Sensitization: Not expected to be a skin sensitizer.

Respiratory Sensitization: No information available.

Specific Target Organ Toxicity (Single Exposure): May cause drowsiness and dizziness.

Specific Target Organ Toxicity (Repeated Exposure): Not expected to cause organ effects from repeated exposure.

Carcinogenicity: May cause cancer Based on component information.

Germ Cell Mutagenicity: Not expected to cause heritable genetic effects.

Reproductive Toxicity: Not expected to cause reproductive toxicity.

Other Comments: This material may contain or liberate hydrogen sulfide, a poisonous gas with the smell of rotten eggs. The smell disappears rapidly because of olfactory fatigue so odor may not be a reliable indicator of exposure. Effects of overexposure include irritation of the eyes, nose, throat and respiratory tract, blurred vision, photophobia (sensitivity to light), and pulmonary edema (fluid accumulation in the lungs). Severe exposures can result in nausea, vomiting, muscle weakness or cramps, headache, disorientation and other signs of nervous system depression, irregular heartbeats, convulsions, respiratory failure, and death.

Information on Toxicological Effects of Components

Natural gas (petroleum), raw liq. mix

Carcinogenicity: Two year inhalation studies of vaporized unleaded gasoline produced an increased incidence of kidney tumors in male rats and liver tumors in female mice. Repeated skin application of various petroleum naphthas in mice for two years resulted in an increased incidence of skin tumors but only in the presence of severe skin irritation. Follow-up mechanistic studies suggest that the occurrence of these tumors may be the consequence of promotional processes and not relevant to human risk assessment. Epidemiology data collected from a study of more than 18,000 petroleum marketing and distribution workers showed no increased risk of leukemia, multiple myeloma, or kidney cancer from gasoline exposure. Unleaded gasoline has been identified as a possible carcinogen by the International Agency for Research on Cancer.

Target Organs: Two year inhalation studies of wholly vaporized unleaded gasoline, and 90 days studies of various petroleum naphthas, did not produce significant target organ toxicity in laboratory animals. Nephropathy in male rats, characterized by the accumulation of alpha-2-u- globulin in epithelial cells of the proximal tubules was observed, however follow-up studies suggest that these changes are unique to the male rat.

Reproductive Toxicity: No evidence of developmental toxicity was found in pregnant laboratory animals (rats and mice) exposed to high vapor concentrations of unleaded gasoline and petroleum naphthas via inhalation. A two-generation reproductive toxicity study of vapor recovery gasoline did not adversely affect reproductive function or offspring survival and development.

n-Hexane

Target Organs: Excessive exposure to n-hexane can result in peripheral neuropathies. The initial symptoms are symmetrical sensory numbness and paresthesias of distal portions of the extremities. Motor weakness is typically observed in muscles of the toes and fingers but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. The neurotoxic properties of n-hexane are potentiated by exposure to methyl ethyl ketone and methyl isobutyl ketone.

Reproductive Toxicity: Prolonged exposure to high concentrations of n-hexane (>1,000 ppm) resulted in decreased sperm count and degenerative changes in the testes of rats but not those of mice.

Benzene

Carcinogenicity: Benzene is an animal carcinogen and is known to produce acute myelogenous leukemia (a form of cancer) in humans. Benzene has been identified as a human carcinogen by IARC, the US National Toxicology Program and the US-Occupational Safety and Health Administration.

Target Organs: Prolonged or repeated exposures to benzene vapors can cause damage to the blood and blood forming organs, including disorders like leukopenia, thrombocytopenia, and aplastic anemia.

Reproductive Toxicity: Some studies in occupationally exposed women have suggested benzene exposure increased risk of miscarriage and stillbirth and decreased birth weight and gestational age. The size of the effects detected in these studies was small, and ascertainment of exposure and outcome in some cases relied on self-reports, which may limit the reliability of these results.

Germ Cell Mutagenicity: Benzene exposure has resulted in chromosomal aberrations in human lymphocytes and animal bone marrow cells. Exposure has also been associated with chromosomal aberrations in sperm cells in human and animal studies.

Toluene

Carcinogenicity: Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC.

Target Organs: Epidemiology studies suggest that chronic occupational overexposure to toluene may damage color vision. Subchronic and chronic inhalation studies with toluene produced kidney and liver damage, hearing loss and central nervous system (brain) damage in laboratory animals. Intentional misuse by deliberate inhalation of high concentrations of toluene has been shown to cause liver, kidney, and central nervous system damage, including hearing loss and visual disturbances.

Reproductive Toxicity: Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic. Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.

Cyclohexane

Reproductive Toxicity: Two-generation reproduction and developmental toxicity studies using rats and rabbits exposed (whole-body) to atmospheric concentrations up to 7000 ppm cyclohexane did not detect evidence of developmental toxicity in either species.

Section 12: Ecological Information

Toxicity: Acute aquatic toxicity studies on samples of gasoline and naphtha streams show acute toxicity values greater than 1 mg/L and mostly in the range 1-100 mg/L. These tests were carried out on water accommodated fractions, in closed systems to prevent evaporative loss. Results are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon composition. These substances should be regarded as toxic to aquatic organisms, with the potential to cause long term adverse effects in the aquatic environment. Classification: H411; Chronic Cat 2.

Persistence and Degradability: The hydrocarbons in this material are not readily biodegradable but are regarded as inherently biodegradable since their hydrocarbon components can be degraded by microorganisms.

Persistence per IOPC Fund definition: Non-Persistent

Bioaccumulative Potential: Log Kow values measured for the hydrocarbon components of this material range from 3 to greater than 6 and therefore are regarded as having the potential to bioaccumulate. In practice, metabolic processes or physical properties may prevent this effect or limit bioavailability.

Mobility in Soil: On release to water, hydrocarbons will float on the surface and since they are sparingly soluble, the only significant loss is volatilization to air. In air, these hydrocarbons are photodegraded by reaction with hydroxyl radicals with half lives varying from 6.5 days for benzene to 0.5 days for n-dodecane.

Other Adverse Effects: None anticipated.

Section 13: Disposal Considerations

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations.

This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste. However, it would likely be identified as a federally regulated RCRA hazardous waste for the following characteristic(s) shown below. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the MSDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.

Container contents should be completely used and containers should be emptied prior to discard. Container residues and rinseates could be considered to be hazardous wastes.

EPA Waste Number(s)

- D001 - Ignitability characteristic
- D018 - Toxicity characteristic (Benzene)

Section 14: Transport Information

U.S. Department of Transportation (DOT)

Shipping Description:	<i>If vapor pressure is > 300 kPa (43.5 psia) at 50° C (122° F) shipping description is:</i> UN1965, Hydrocarbon gas mixture, liquefied, n.o.s., 2.1; , <i>If vapor pressure is <= 300 kPa (43.5 psia) at 50° C (122° F) shipping description is:</i> UN3295, Hydrocarbons, liquid, n.o.s., 3, I or II [I if BP < 95° F (35° C); II if BP > 95° F]
Non-Bulk Package Marking:	<i>Must be consistent with shipping description, either:</i> Hydrocarbon gas mixture, liquefied, n.o.s., UN1965 <i>or</i> Hydrocarbons, liquid, n.o.s., UN3295
Non-Bulk Package Labeling:	<i>For UN1965:</i> Flammable gas <i>For UN3295:</i> Flammable liquid
Bulk Package/Placard Marking:	<i>For UN1965:</i> Flammable gas / 1965 <i>For UN3295:</i> Flammable / 3295
Packaging - References:	<i>For UN1965:</i> 49 CFR: 173.306; 173.304; 173.314 & .315 <i>For UN3295:</i> 49 CFR 173.150; 173.201; 173.243 [PG I] <i>-or-</i> 49 CFR 173.150; 173.202; 173.242 [PG II] <i>(Exceptions; Non-bulk; Bulk)</i>
Hazardous Substance:	See Section 15 for RQ's
Emergency Response Guide:	UN1965 - 115; UN3295 - 128;
Note:	<i>The following alternate shipping description order may be used until January 1, 2013:</i> Proper Shipping name, Hazard Class or Division, (Subsidiary Hazard if any), UN or NA number, Packing Group <i>Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not applicable</i> <i>Other shipping description elements may be required for DOT compliance.</i>

International Maritime Dangerous Goods (IMDG)

Shipping Description:	<i>If boiling point is < 20° C shipping description is:</i> UN1965, Hydrocarbon gas mixture, liquefied, n.o.s., (Propane , Butane), 2.1 <i>If vapor pressure is <= 300 kPa (43.5 psia) at 50° C (122° F) shipping description is:</i> UN3295, Hydrocarbons, liquid, n.o.s., 3, I or II (FP° C cc), [where FP is the material's flash point in degrees C cc.] [I if BP < 95° F (35° C); II if BP > 95° F];
Non-Bulk Package Marking:	<i>Must be consistent with shipping description, either:</i> Hydrocarbon gas mixture, liquefied, n.o.s., (Propane, Butane), UN1965 <i>or</i> Hydrocarbons, liquid, n.o.s., UN3295
Labels:	<i>For UN1965:</i> Flammable gas <i>For UN3295:</i> Flammable liquid
Placards/Marking (Bulk):	<i>For UN1965:</i> Flammable gas / 1965 <i>For UN3295:</i> Flammable / 3295
Packaging - Non-Bulk:	<i>For UN1965:</i> P200 <i>For UN3295:</i> P001
EMS:	<i>For UN1965:</i> F-D, S-U <i>For UN3295:</i> F-E, S-D
Note:	<i>If transported in bulk by marine vessel in international waters, product is being carried under the scope of MARPOL Annex I.</i>

International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)

UN/ID #: UN1965 or UN3295

Proper Shipping Name: For UN1965: Hydrocarbon gas mixture, liquefied, n.o.s. (Propane, Butane)
For UN3295: Hydrocarbons, liquid, n.o.s.

Hazard Class/Division: For UN1965: 2.1
For UN3295: 3

Subsidiary risk: None

Packing Group: For UN1965: None
For UN3295: I or II [*Determined by IATA 3.3.2*]

Non-Bulk Package Marking: For UN1965: Hydrocarbon gas mixture, liquefied, n.o.s. (Propane, Butane), UN1965
For UN3295: Hydrocarbons, liquid, n.o.s., UN3295

Labels: For UN1965: Flammable gas , Cargo Aircraft Only
For UN3295: Flammable liquid

ERG Code: For UN1965: 10L or For UN3295: 3H

	LTD. QTY	Passenger Aircraft	Cargo Aircraft Only
Packaging Instruction #:	UN1965 - Forbidden UN3295 - Forbidden - [PG I] Y341 - [PG II]	UN1965 - Forbidden UN3295 - 351 - [PG I] 353 - [PG II]	UN1965 - 200 UN3295 - 361 - [PG I] 364 - [PG II]
Max. Net Qty. Per Package:	UN3295 - Forbidden - [PG I] 1L - [PG II]	UN3295 - 1L - [PG I] 5 L - [PG II]	UN1965 - 150 kg UN3295 - 30 L - [PG I] 60 L - [PG II]

Section 15: Regulatory Information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):

This material contains the following chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372:

Component	TPQ	EPCRA RQ
Hydrogen Sulfide	500 lb	100 lb

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

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

CERCLA/SARA - Section 313 and 40 CFR 372:

This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372:

Component	Concentration ¹	de minimis
n-Hexane	5-25	1.0%
Toluene	1-5	1.0%
Benzene	0.1-5	0.1%
Cyclohexane	0-3	1.0%

EPA (CERCLA) Reportable Quantity (in pounds):

EPA's Petroleum Exclusion applies to this material - (CERCLA 101(14)).

California Proposition 65:

Warning: This material may contain detectable quantities of the following chemicals, known to the State of California to cause cancer, birth defects or other reproductive harm, and which may be subject to the warning requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):

Component	Type of Toxicity
Toluene	Developmental Toxicant Female Reproductive Toxicant
Benzene	Cancer Developmental Toxicant Male Reproductive Toxicant

International Hazard Classification

Canada:

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the Regulations.

WHMIS Hazard Class:

B2 - Flammable Liquids
D2A
D2B

National Chemical Inventories

All components are either listed on the US TSCA Inventory, or are not regulated under TSCA
All components are either on the DSL, or are exempt from DSL listing requirements

U.S. Export Control Classification Number: EAR99

Section 16: Other Information

Date of Issue: 20-Sep-2014
Status: FINAL
Previous Issue Date: 20-Sep-2014
Revised Sections or Basis for Revision: Identified Hazards (Section 2)
Precautionary Statement(s) (Section 2)
First Aid (Section 4) Exposure limits (Section 8)
Shipping information (Section 14)
Regulatory information (Section 15)
SDS Number: 786340

Guide to Abbreviations:

ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer of Expressed and implied Warranties:

The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.



AMERICAN ENERGY
PARTNERS

Crude Condensate

Safety Data Sheet

Section 1: Identification of the substance or mixture and of the supplier

Product Name: Crude Condensate
SDS Number: 730370

Synonyms/Other Means of Identification: Natural Gas Condensates, Petroleum
Crude Oil Condensate
Gas Drips

MARPOL Annex I Category: Naphthas and Condensates
Intended Use: Feedstock

Manufacturer: American Energy Partners
301 N.W. 63rd
Oklahoma City, OK 73116

Emergency Health and Safety Number: Chemtrec: 800-424-9300 (24 Hours)

SDS Information: Phone: 844-210-6000
URL: www.americanenergypartners.com

Section 2: Hazard(s) Identification

Classification

H224 – Flammable liquids -- Category 1
H304 -- Aspiration Hazard -- Category 1
H315 -- Skin corrosion/irritation -- Category 2
H332 -- Acute toxicity, Inhalation -- Category 4
H336 -- Specific target organ toxicity (single exposure) -- Category 3
H350 -- Carcinogenicity -- Category 1B
H411 -- Hazardous to the aquatic environment, chronic toxicity -- Category 2

Hazards not Otherwise Classified

May contain or release poisonous hydrogen sulfide gas

Label Elements



DANGER

Extremely flammable liquid and vapor. (H224)*
Causes skin irritation. (H315)*
May be fatal if swallowed and enters airways. (H304)*
Contains poisonous hydrogen sulfide gas
Harmful if inhaled. (H332)*
May cause drowsiness or dizziness. (H336)*
May cause cancer. (H350)*
Toxic to aquatic life with long lasting effects. (H411)*

Precautionary Statement(s):

Obtain special instructions before use. (P201)*
Do not handle until all safety precautions have been read and understood. (P202)*
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. (P210)*
Keep container tightly closed. (P233)*
Keep cool. (P235)*
Ground/bond container and receiving equipment. (P240)*
Use with explosion-proof equipment. (P241)*
Use only non-sparking tools. (P242)*
Take precautionary measures against static discharge. (P243)*
Avoid breathing dust/fume/gas/mist/vapours/spray. (P261)*
Wash thoroughly after handling. (P264)*
Use only outdoors or in a well-ventilated area. (P271)*
Avoid release to the environment. (P273)*
Wear protective gloves / protective clothing / eye protection / face protection. (P280)*
IF ON SKIN: Remove/Take off immediately all contaminated clothing. (P361)* Wash with plenty of soap and water. (P352)*
If skin irritation occurs: Get medical advice/attention. (P313)*
Take off contaminated clothing and wash before reuse. (P362)*
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. (P340)*
Call a POISON CENTER or doctor/physician if you feel unwell. (P312)*
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. (P301+P310)*
Do NOT induce vomiting. (P331)*
In case of fire: Use dry chemical, carbon dioxide, or foam for extinction.(P370+P378)*
Collect spillage. (P391)*
Store locked up. (P405)*
Store in a well-ventilated place. Keep container tightly closed. (P403+P233)*
Dispose of contents/container to approved disposal facility. (P501)*

* (Applicable GHS hazard code.)

Section 3: Composition / Information on Ingredients

Component	CASRN	Concentration ¹
Natural Gas Condensate ..C2-20	64741-47-5	100
Toluene	108-88-3	1-7
Hydrogen Sulfide	7783-06-4	0.1-5
Benzene	71-43-2	<5

¹ All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

Crude oil, natural gas and natural gas condensate can contain minor amounts of sulfur, nitrogen and oxygen containing organic compounds as well as trace amounts of heavy metals like mercury, arsenic, nickel, and vanadium. Composition can vary depending on the source of crude.

Section 4: First Aid Measures

Eye Contact: If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

Skin Contact: Remove contaminated shoes and clothing, and flush affected area(s) with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. If skin surface is not damaged, cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops, seek medical attention. Wash contaminated clothing before reuse.

Inhalation (Breathing): Immediately move victim away from exposure and into fresh air in a position comfortable for breathing. If respiratory symptoms or other symptoms of exposure develop, seek immediate medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion (Swallowing): Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is drowsy or unconscious and vomiting, place on the left side with the head down. If possible, do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention.

Most important symptoms and effects

Acute: Headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue.

Delayed: Dry skin and possible irritation with repeated or prolonged exposure.

Notes to Physician: At high concentrations hydrogen sulfide may produce pulmonary edema, respiratory depression, and/or respiratory paralysis. The first priority in treatment should be the establishment of adequate ventilation and the administration of 100% oxygen. Animal studies suggest that nitrites are a useful antidote, however, documentation of the efficacy of nitrites in humans is lacking. If the diagnosis of hydrogen sulfide poisoning is confirmed and if the patient does not respond rapidly to supportive care, the use of nitrites may be an effective antidote if delivered within the first few minutes of exposure. For adults the dose is 10 mL of a 3% NaNO₂ solution (0.5 gm NaNO₂ in 15 mL water) I.V. over 2-4 minutes. The dosage should be adjusted in children or in the presence of anemia, and methemoglobin levels, arterial blood gases, and electrolytes should be monitored closely.

Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of hydrocarbon solvents (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for the development of cardiac arrhythmias.

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

Other Comments: Before attempting rescue, first responders should be alert to the possible presence of hydrogen sulfide, a poisonous gas with the smell of rotten eggs, and should consider the need for respiratory protection (see Section 8). Remove casualty to fresh air as quickly as possible. Immediately begin artificial respiration if breathing has ceased. Consider whether oxygen administration is needed. Obtain medical advice for further treatment.

Section 5: Fire-Fighting Measures



NFPA 704 Hazard Class

Health: 2 **Flammability:** 4 **Instability:** 0 (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

Unusual Fire & Explosion Hazards: Extremely flammable. This material can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. This product will float and can be reignited on surface water. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire. Hazardous combustion/decomposition products, including hydrogen sulfide, may be released by this material when exposed to heat or fire. Use caution and wear protective clothing, including respiratory protection.

Extinguishing Media: Dry chemical, carbon dioxide, or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

Fire Fighting Instructions: For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Hydrogen sulfide and oxides of nitrogen and sulfur may also be formed.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

Section 6: Accidental Release Measures

Personal Precautions: Extremely flammable. Spillages of liquid product will create a fire hazard and may form an explosive atmosphere. Keep all sources of ignition and hot metal surfaces away from spill/release if safe to do so. The use of explosion-proof electrical equipment is recommended. Contains poisonous hydrogen sulfide gas. If the presence of dangerous amounts of H₂S around the spilled product is suspected, additional or special actions may be warranted, including access restrictions and use of protective equipment. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions: Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use foam on spills to minimize vapors. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

Methods for Containment and Clean-Up: Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken.

Section 7: Handling and Storage

Precautions for safe handling: Keep away from ignition sources such as heat/sparks/open flame – No smoking. Take precautionary measures against static discharge. Nonsparking tools should be used. Do not handle until all safety precautions have been read and understood. Obtain special instructions before use. Wear protective gloves/clothing and eye/face protection. May contain or release dangerous levels of hydrogen sulfide. Use only outdoors or in well-ventilated area. Avoid breathing vapors or mists. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Extremely Flammable. May vaporize easily at ambient temperatures. The vapor is heavier than air and may create an explosive mixture of vapor and air. Beware of accumulation in confined spaces and low lying areas. Open container slowly to relieve any pressure. Electrostatic charge may accumulate and create a hazardous condition when handling or processing this material. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. The use of explosion-proof electrical equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-70 and/or API RP 2003 for specific bonding/grounding requirements. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames.

Mercury and other heavy metals may be present in trace quantities in crude oil, raw natural gas, and condensates. Production and processing of these materials can lead to "drop-out" of elemental mercury in enclosed vessels and pipe work, typically at the low point of any process equipment because of its density. Mercury may also occur in other process system deposits such as sludges, sands, scales, waxes, and filter media. Personnel engaged in work with equipment where mercury deposits might occur (confined space entry, sampling, opening drain valves, draining process lines, etc), may be exposed to a mercury hazard (see sections 3 and 8).

Static Accumulation Hazard: Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding of tanks, transfer piping, and storage tank level floats are necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating and accumulating an electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. Special care should be given to ensure that special slow load procedures for "switch loading" are followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such as gasoline or naphtha). For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'.

Conditions for safe storage: This material may contain or release poisonous hydrogen sulfide gas. In a tank, barge, or other closed container, the vapor space above this material may accumulate hazardous concentrations of hydrogen sulfide. Check atmosphere for oxygen content, H₂S, and flammability prior to entry. Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Store only in approved containers. Post area "No Smoking or Open Flame." Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

Section 8: Exposure Controls / Personal Protection

Component	ACGIH	OSHA	Other
Natural Gas Condensate ..C2-20	TWA: 300 ppm (as Gasoline)	TWA: 400 mg/m ³ TWA: 100 ppm	0.5 ppm TWA8hr (as benzene) 0.25 ppm TWA12hr (as benzene) 2.5 ppm STEL (as benzene) (American Energy Guidelines)
Toluene	TWA: 20 ppm	Ceiling: 300 ppm TWA: 200 ppm	---
Hydrogen Sulfide	STEL: 5 ppm TWA: 1 ppm	Ceiling: 20 ppm	TWA: 5 ppm 8hr TWA: 2.5 ppm 12hr STEL: 15 ppm (American Energy Guidelines)
Benzene	STEL: 2.5 ppm TWA: 0.5 ppm Skin	Ceiling: 25 ppm STEL: 5 ppm TWA: 10 ppm TWA: 1 ppm	---

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye protection that meets or exceeds ANSI Z.87.1 is recommended to protect against potential eye contact, irritation, or injury. Depending on conditions of use, a face shield may be necessary.

Skin/Hand Protection: The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the breakthrough performance of their products. Depending on exposure and use conditions, additional protection may be necessary to prevent skin contact including use of items such as chemical resistant boots, aprons, arm covers, hoods, coveralls, or encapsulated suits. Suggested protective materials: Nitrile

Respiratory Protection: A NIOSH approved, self-contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode should be used in situations of oxygen deficiency (oxygen content less than 19.5 percent), unknown exposure concentrations, or situations that are immediately dangerous to life or health (IDLH).

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use.

If benzene concentrations equal or exceed applicable exposure limits, OSHA requirements for personal protective equipment, exposure monitoring, and training may apply (29CFR1910.1028 - Benzene).

Workplace monitoring plans should consider the possibility that heavy metals such as mercury may concentrate in processing vessels and equipment presenting the possibility of exposure during various sampling and maintenance operations. Implement appropriate respiratory protection and the use of other protective equipment as dictated by monitoring results (See Sections 2 and 7).

Other Protective Equipment: Eye wash and quick-drench shower facilities should be available in the work area. Thoroughly clean shoes and wash contaminated clothing before reuse.

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

Section 9: Physical and Chemical Properties

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Appearance:	Amber to dark brown
Physical Form:	Liquid
Odor:	Rotten egg / sulfurous; Petroleum.
Odor Threshold:	No data
pH:	Not applicable
Vapor Pressure:	5-15 psia (Reid VP) @ 100°F / 37.8°C
Vapor Density (air=1):	1
Initial Boiling Point/Range:	-20 to 800 °F / -29 to 427 °C
Melting/Freezing Point:	No data
Solubility in Water:	Negligible
Partition Coefficient (n-octanol/water) (Kow):	No data
Specific Gravity (water=1):	0.6 - 0.8 @ 60°F (15.6°C)
Bulk Density:	6.25 lbs/gal
VOC Content(%):	50
Evaporation Rate (nBuAc=1):	1
Flash Point:	-51 °F / -46 °C
Test Method:	Pensky-Martens Closed Cup (PMCC), ASTM D93, EPA 1010
Lower Explosive Limits (vol % in air):	1.1
Upper Explosive Limits (vol % in air):	6.0
Auto-ignition Temperature:	590 °F / 310 °C

Section 10: Stability and Reactivity

Stability: Stable under normal ambient and anticipated conditions of use.

Conditions to Avoid: Avoid high temperatures and all sources of ignition. Prevent vapor accumulation.

Materials to Avoid (Incompatible Materials): Avoid contact with strong oxidizing agents and strong reducing agents.

Hazardous Decomposition Products: Not anticipated under normal conditions of use.

Hazardous Polymerization: Not known to occur.

Section 11: Toxicological Information

Information on Toxicological Effects of Substance/Mixture

<u>Acute Toxicity</u>	<u>Hazard</u>	<u>Additional Information</u>	<u>LC50/LD50 Data</u>
Inhalation	Harmful if inhaled	Contains poisonous hydrogen sulfide gas. See Signs and Symptoms.	10 mg/L (vapor, estimated)
Skin Absorption	Unlikely to be harmful		> 2 g/kg
Ingestion (Swallowing)	Unlikely to be harmful		> 5 g/kg

Aspiration Hazard: May be fatal if swallowed and enters airways.

Skin Corrosion/Irritation: Causes skin irritation. Repeated exposure may cause skin dryness or cracking.

Serious Eye Damage/Irritation: Causes mild eye irritation.

Signs and Symptoms: Effects of overexposure can include slight irritation of the respiratory tract, nausea, vomiting, and signs of nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue). Continued exposure to high concentrations can result in vomiting, cardiac irregularities and sudden loss of consciousness.

This material contains hydrogen sulfide, a poisonous gas with the smell of rotten eggs. The smell disappears rapidly because of olfactory fatigue so odor may not be a reliable indicator of exposure. Effects of overexposure include irritation of the eyes, nose, throat and respiratory tract, blurred vision, photophobia (sensitivity to light), and pulmonary edema (fluid accumulation in the lungs). Severe exposures can result in nausea, vomiting, muscle weakness or cramps, headache, disorientation and other signs of nervous system depression, irregular heartbeats, convulsions, respiratory failure, and death.

Skin Sensitization: Not expected to be a skin sensitizer.

Respiratory Sensitization: No information available.

Specific Target Organ Toxicity (Single Exposure): May cause drowsiness and dizziness.

Specific Target Organ Toxicity (Repeated Exposure): Not expected to cause organ effects from repeated exposure.

Carcinogenicity: May cause cancer

Germ Cell Mutagenicity: Not expected to cause heritable genetic effects.

Reproductive Toxicity: Not expected to cause reproductive toxicity.

Information on Toxicological Effects of Components

Natural Gas Condensate ..C2-20

Carcinogenicity: Two year inhalation studies of vaporized unleaded gasoline produced an increased incidence of kidney tumors in male rats and liver tumors in female mice. Repeated skin application of various petroleum naphthas in mice for two years resulted in an increased incidence of skin tumors but only in the presence of severe skin irritation. Follow-up mechanistic studies suggest that the occurrence of these tumors may be the consequence of promotional processes and not relevant to human risk assessment. Epidemiology data collected from a study of more than 18,000 petroleum marketing and distribution workers showed no increased risk of leukemia, multiple myeloma, or kidney cancer from gasoline exposure. Unleaded gasoline has been identified as a possible carcinogen by the International Agency for Research on Cancer.

Target Organs: Two year inhalation studies of wholly vaporized unleaded gasoline, and 90 days studies of various petroleum naphthas, did not produce significant target organ toxicity in laboratory animals. Nephropathy in male rats, characterized by the accumulation of alpha-2-u- globulin in epithelial cells of the proximal tubules was observed, however follow-up studies suggest that these changes are unique to the male rat.

Reproductive Toxicity: No evidence of developmental toxicity was found in pregnant laboratory animals (rats and mice) exposed to high vapor concentrations of unleaded gasoline and petroleum naphthas via inhalation. A two-generation reproductive toxicity study of vapor recovery gasoline did not adversely affect reproductive function or offspring survival and development.

Xylenes

Target Organs: Rats exposed to xylenes at 800, 1000 or 1200 ppm 14 hours daily for 6 weeks demonstrated high frequency hearing loss. Another study in rats exposed to 1800 ppm 8 hours daily for 5 days demonstrated middle frequency hearing loss.

Reproductive Toxicity: Both mixed xylenes and the individual isomers produced limited evidence of developmental toxicity in laboratory animals. Inhalation and oral administration of xylene resulted in decreased fetal weight, increased incidences of delayed ossification, skeletal variations and resorptions, but no evidence of teratogenicity.

Toluene

Carcinogenicity: Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC.

Target Organs: Epidemiology studies suggest that chronic occupational overexposure to toluene may damage color vision. Subchronic and chronic inhalation studies with toluene produced kidney and liver damage, hearing loss and central nervous system (brain) damage in laboratory animals. Intentional misuse by deliberate inhalation of high concentrations of toluene has been shown to cause liver, kidney, and central nervous system damage, including hearing loss and visual disturbances.

Reproductive Toxicity: Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic. Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.

Cyclohexane

Reproductive Toxicity: Two-generation reproduction and developmental toxicity studies using rats and rabbits exposed (whole-body) to atmospheric concentrations up to 7000 ppm cyclohexane did not detect evidence of developmental toxicity in either species.

Benzene

Carcinogenicity: Benzene is an animal carcinogen and is known to produce acute myelogenous leukemia (a form of cancer) in humans. Benzene has been identified as a human carcinogen by IARC, the US National Toxicology Program and the US-Occupational Safety and Health Administration.

Target Organs: Prolonged or repeated exposures to benzene vapors can cause damage to the blood and blood forming organs, including disorders like leukopenia, thrombocytopenia, and aplastic anemia.

Reproductive Toxicity: Some studies in occupationally exposed women have suggested benzene exposure increased risk of miscarriage and stillbirth and decreased birth weight and gestational age. The size of the effects detected in these studies was small, and ascertainment of exposure and outcome in some cases relied on self-reports, which may limit the reliability of these results.

Germ Cell Mutagenicity: Benzene exposure has resulted in chromosomal aberrations in human lymphocytes and animal bone marrow cells. Exposure has also been associated with chromosomal aberrations in sperm cells in human and animal studies.

n-Hexane

Target Organs: Excessive exposure to n-hexane can result in peripheral neuropathies. The initial symptoms are symmetrical sensory numbness and paresthesias of distal portions of the extremities. Motor weakness is typically observed in muscles of the toes and fingers but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. The neurotoxic properties of n-hexane are potentiated by exposure to methyl ethyl ketone and methyl isobutyl ketone.

Reproductive Toxicity: Prolonged exposure to high concentrations of n-hexane (>1,000 ppm) resulted in decreased sperm count and degenerative changes in the testes of rats but not those of mice.

Ethyl Benzene

Carcinogenicity: Rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethyl benzene has been listed as a possible human carcinogen by IARC.

Target Organs: In rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study there was mild damage to the kidney (tubular hyperplasia), liver (eosinophilic foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.

Section 12: Ecological Information

Toxicity: Acute aquatic toxicity studies on samples of gasoline and naphtha streams show acute toxicity values greater than 1 mg/L and mostly in the range 1-100 mg/L. These tests were carried out on water accommodated fractions, in closed systems to prevent evaporative loss. Results are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon composition. These substances should be regarded as toxic to aquatic organisms, with the potential to cause long term adverse effects in the aquatic environment. Classification: H411; Chronic Cat 2.

Persistence and Degradability: The hydrocarbons in this material are not readily biodegradable but are regarded as inherently biodegradable since their hydrocarbon components can be degraded by microorganisms.

Bioaccumulative Potential: Log Kow values measured for the hydrocarbon components of this material range from 3 to greater than 6 and therefore are regarded as having the potential to bioaccumulate. In practice, metabolic processes or physical properties may prevent this effect or limit bioavailability.

Mobility in Soil: On release to water, hydrocarbons will float on the surface and since they are sparingly soluble, the only significant loss is volatilization to air. In air, these hydrocarbons are photodegraded by reaction with hydroxyl radicals with half lives varying from 6.5 days for benzene to 0.5 days for n-dodecane.

Other Adverse Effects: None anticipated.

Section 13: Disposal Considerations

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations.

This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste. However, it would likely be identified as a federally regulated RCRA hazardous waste for the following characteristic(s) shown below. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the MSDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.

Container contents should be completely used and containers should be emptied prior to discard. Container residues and rinseates could be considered to be hazardous wastes.

EPA Waste Number(s)

- D001 - Ignitability characteristic
- D018 - Toxicity characteristic (Benzene)

Section 14: Transport Information

U.S. Department of Transportation (DOT)

Shipping Description:	<i>If vapor pressure is > 300 kPa (43.5 psia) at 50° C (122° F) and H2S is > 8.8 molar % shipping description is:</i> UN3160, Liquefied gas, toxic, flammable, n.o.s., (Hydrogen sulfide; ; Liquefied Petroleum Gas), 2.3;;, (2.1), Inhalation Hazard Zone X <i>If vapor pressure is > 300 kPa (43.5 psia) at 50° C (122° F) and H2S is < 8.8 molar % shipping description is:</i> UN1965, Hydrocarbon gas mixture, liquefied, n.o.s., 2.1 <i>If vapor pressure is <= 300 kPa (43.5 psia) at 50° C (122° F) and H2S is < 8.8 molar % shipping description is:</i> UN1267, Petroleum crude oil, 3, I or II [I if BP < 35° C (95° F); II if BP > 35° C]
Non-Bulk Package Marking:	<i>Must be consistent with shipping description, either:</i> Liquefied gas, toxic, flammable, n.o.s., (Hydrogen sulfide, Liquefied petroleum gas), UN3160 <i>or</i> Hydrocarbon gas mixture, liquefied, n.o.s., UN1965 <i>or</i> Petroleum crude oil, UN1267
Non-Bulk Package Labeling:	<i>For UN3160:</i> Poison gas and Flammable gas <i>For UN1965:</i> Flammable gas <i>For UN1267:</i> Flammable liquid
Bulk Package/Placard Marking:	<i>For UN3160:</i> Poison gas / 3160 and Flammable gas <i>For UN1965:</i> Flammable gas / 1965 <i>For UN1267:</i> Flammable / 1267
Packaging - References:	<i>For UN3160:</i> None; 49 CFR 173.304; 173.314 & .315 <i>For UN1965:</i> 49 CFR: 173.306; 173.304; 173.314 & .315 <i>For UN1267:</i> 49 CFR 173.150; 173.201; 173.243 [PG I] <i>-or-</i> 49 CFR 173.150; 173.202; 173.242 [PG II] <i>(Exceptions; Non-bulk; Bulk)</i>
Hazardous Substance:	The EPA's Petroleum Exclusion applies to Section 2 and/or 15 components which are listed in 49 CFR 172.101, Table 1 to Appendix A.
Emergency Response Guide: Note:	<i>UN3160 - 119; UN1965 - 115; UN1267 - 128;</i> Replace X in shipping description with: D if Molar % H2S is from 8.8% to 14.8% C if Molar % H2S is from 14.9% to 44.4% B if Molar % H2S is from 44.5% to 100.0% <i>Container(s) greater than 5 liters (liquids) or 5 kilograms (solids), shipped by water mode and ALL bulk shipments may require the shipping description to contain the "Marine Pollutant" notation [49 CFR 172.203(I)] and the container(s) to display the [Marine Pollutant Mark] [49 CFR 172.322].</i> <i>The following alternate shipping description order may be used until January 1, 2013:</i> Proper Shipping name, Hazard Class or Division, (Subsidiary Hazard if any), UN or NA number, Packing Group <i>Other shipping description elements may be required for DOT compliance.</i> <i>Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not applicable</i>

International Maritime Dangerous Goods (IMDG)

Shipping Description:	<i>If vapor pressure is > 300 kPa (43.5 psia) at 50° C (122° F) and H2S is > 8.8 molar % shipping description is:</i> UN3160, Liquefied gas, toxic, flammable, n.o.s (Hydrogen sulphide , Liquefied Petroleum Gas), 2.3,; , (2.1) <i>If vapor pressure is > 300 kPa (43.5 psia) at 50° C (122° F) and H2S is < 8.8 molar % shipping description is:</i> UN1965, Hydrocarbon gas mixture, liquefied, n.o.s., (Hydrogen sulphide, Liquefied petroleum gas), 2.1; <i>If vapor pressure is <= 300 kPa (43.5 psia) at 50° C (122° F) and H2S is < 8.8 molar % shipping description is:</i> UN1267, Petroleum crude oil, 3, I or II [I if IBP < 35° C (95° F); II if IBP > 35° C] (-46° C);
Non-Bulk Package Marking:	<i>Must be consistent with shipping description, either:</i> Liquefied gas, toxic, flammable, n.o.s., (Hydrogen sulphide, Liquefied petroleum gas), UN3160 <i>or</i> Hydrocarbon gas mixture, liquefied, n.o.s., (Hydrogen sulphide, Liquefied petroleum gas), UN1965 <i>or</i> Petroleum crude oil, UN1267
Labels:	<i>For UN3160:</i> Toxic gas and Flammable gas <i>For UN1965:</i> Flammable gas <i>For UN1267:</i> Flammable liquid
Placards/Marking (Bulk):	<i>For UN3160:</i> Toxic gas / 3160 and Flammable gas <i>For UN1965:</i> Flammable gas / 1965 <i>For UN1267:</i> Flammable / 1267
Packaging - Non-Bulk:	<i>For UN3160 & UN1965:</i> P200 <i>For UN1267:</i> P001
EMS:	<i>For UN3160 & UN1965:</i> F-D, S-U <i>For UN1267:</i> F-E, S-E
Note:	<i>If container(s) is greater than 5 liters (liquids) or 5 kilograms (solids), shipment may require the shipping description to contain the "Marine Pollutant" description [IMDG 5.4.1.4.3.5] and the container(s) to display the Marine Pollutant mark [IMDG 5.2.1.6]. U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 25. If transported in bulk by marine vessel in international waters, product is being carried under the scope of MARPOL Annex I.</i>
<u>International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)</u>	
UN/ID #:	UN3160 - <i>Forbidden</i> UN1965 <i>or</i> UN1267
Proper Shipping Name:	<i>For UN1965:</i> Hydrocarbon gas mixture, liquefied, n.o.s. (Liquefied petroleum gas, Hydrogen sulphide) <i>For UN1267:</i> Petroleum crude oil
Hazard Class/Division:	<i>For UN1965:</i> 2.1 <i>For UN1267:</i> 3
Subsidiary risk:	None
Packing Group:	<i>For UN1965:</i> None <i>For UN1267:</i> I or II [Determined by IATA 3.3.2]
Non-Bulk Package Marking:	<i>For UN1965:</i> Hydrocarbon gas mixture, liquefied, n.o.s. (Liquefied petroleum gas, Hydrogen sulphide), UN1965 <i>For UN1267:</i> Petroleum crude oil, UN1267
Labels:	<i>For UN1965:</i> Flammable gas , Cargo Aircraft Only <i>For UN1267:</i> Flammable liquid
ERG Code:	<i>For UN1965:</i> 10L <i>or</i> <i>For UN1267:</i> 3L LTD. QTY Passenger Aircraft Cargo Aircraft Only

Packaging Instruction #:	<i>UN1965</i> - Forbidden <i>UN1267</i> - Forbidden - [PG I] Y341 - [PG II]	<i>UN1965</i> - Forbidden <i>UN1267</i> - 351 - [PG I] 353 - [PG II]	<i>UN1965</i> - 200 <i>UN1267</i> - 361 - [PG I] 364 - [PG II]
Max. Net Qty. Per Package:	<i>UN1267</i> - None (PG I); 1L (PG II)	<i>UN1267</i> - 1L - [PG I] 5 L - [PG II]	<i>UN1965</i> - 150 kg <i>UN1267</i> - 30 L - [PG I] 60 L - [PG II]

Section 15: Regulatory Information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):

This material contains the following chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372:

Component	TPQ	EPCRA RQ
Hydrogen Sulfide	500 lb	100 lb

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

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

CERCLA/SARA - Section 313 and 40 CFR 372:

This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372:

Component	Concentration ¹	de minimis
Xylenes	1-8	1.0%
Toluene	1-7	1.0%
Cyclohexane	1-5	1.0%
Benzene	<5	0.1%
n-Hexane	2-4	1.0%
Ethyl Benzene	1-3	0.1%

EPA (CERCLA) Reportable Quantity (in pounds):

EPA's Petroleum Exclusion applies to this material - (CERCLA 101(14)).

California Proposition 65:

Warning: This material may contain detectable quantities of the following chemicals, known to the State of California to cause cancer, birth defects or other reproductive harm, and which may be subject to the warning requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):

Component	Type of Toxicity
Toluene	Developmental Toxicant Female Reproductive Toxicant
Benzene	Cancer Developmental Toxicant Male Reproductive Toxicant
Ethyl Benzene	Cancer

International Hazard Classification

Canada:

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the Regulations.

WHMIS Hazard Class:

B2 - Flammable Liquids
D2A
D2B

National Chemical Inventories

All components are either listed on the US TSCA Inventory, or are not regulated under TSCA
All components are either on the DSL, or are exempt from DSL listing requirements

U.S. Export Control Classification Number: 1C981

Section 16: Other Information

Date of Issue:	20-Sep-2014
Status:	FINAL
Previous Issue Date:	20-Sep-2014
Revised Sections or Basis for Revision:	Identified Hazards (Section 2) Precautionary Statement(s) (Section 2) First Aid (Section 4) Exposure limits (Section 8) Shipping information (Section 14) Regulatory information (Section 15)
SDS Number:	730370

Guide to Abbreviations:

ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer of Expressed and implied Warranties:

The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.



AMERICAN ENERGY
PARTNERS

Produced Brine Water

Safety Data Sheet

Section 1: Identification of the substance or mixture and of the supplier

Product Name: Produced Brine Water
SDS Number: 401320
Intended Use: Process Water
Manufacturer: American Energy Partners
301 N.W. 63rd
Oklahoma City, OK 73116
Emergency Health and Safety Number: Chemtrec: 800-424-9300 (24 Hours)
SDS Information: Phone: 844-210-6000
URL: www.americanenergypartners.com

Section 2: Hazard(s) Identification

Classification

H302 -- Harmful if swallowed -- Category 1
H319 -- Eye damage/irritation -- Category 2
H316 -- Causes mild skin irritation -- Category 1
H332 -- Harmful if inhaled -- Category 1
H350 -- Carcinogenicity -- Category 1A
H412 -- May cause chronic harmful effects to aquatic life -- Category 2

Label Elements



DANGER

Causes serious eye irritation. (H319)*
Harmful if swallowed. (H302)*
Harmful if inhaled. (H332)*
May cause cancer. (H350)*
Toxic to aquatic life with long lasting effects. (H412)*

Precautionary Statement(s):

Obtain special instructions before use. (P201)*
Do not handle until all safety precautions have been read and understood. (P202)*
Do not breathe dust/fume/gas/mist/vapours/spray. (P261)
Wash thoroughly after handling. (P264)*
Do not eat, drink, or smoke when using this product. (P270)*
Avoid release to the environment. (P273)*
Use outdoors in a well ventilated space (P271)
Wear protective gloves / protective clothing / eye protection. (P281)*
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. (P305+P351+P338*)
If eye irritation persists: Get medical advice/attention. (P313)*
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. (P301+P312)*
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. (P304 + P340)*
Get medical advice/attention if you feel unwell. (P314)*
Collect spillage. (P391)*
Store locked up. (P405)*
Store in a well-ventilated place. Keep container tightly closed. (P403+P233)*
Dispose of contents/container to approved disposal facility. (P501)*

* (Applicable GHS hazard code.)

Section 3: Composition / Information on Ingredients

Component	CAS#	Concentration ¹
Water	7732-18-5	80-100%
Sodium chloride	91-20-3	<20%
Benzene	71-43-2	<2%

All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

Section 4: First Aid Measures

Eye Contact: For direct contact, remove contact lenses if present and easy to do. Immediately hold eyelids apart and flush the affected eye(s) with clean water for at least 20 minutes. Seek immediate medical attention.

Skin Contact: Remove contaminated shoes and clothing and cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops and persists, seek medical attention.

Inhalation (Breathing): If respiratory symptoms develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. If breathing is difficult, oxygen or artificial respiration should be administered by qualified personnel. If symptoms persist, seek medical attention.

Ingestion (Swallowing): First aid is not normally required; however, if swallowed and symptoms develop, seek medical attention.

Most important symptoms and effects

Acute: Headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue.

Delayed: Dry skin and possible irritation with repeated or prolonged exposure.

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

Section 5: Fire-Fighting Measures



NFPA 704 Hazard Class

Health: 1 **Flammability:** 1 **Instability:** 0 (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

Unusual Fire & Explosion Hazards: This material may burn, but will not ignite readily. If container is not properly cooled, it can rupture in the heat of a fire.

Extinguishing Media: Dry chemical, carbon dioxide, foam, or water spray is recommended. Water or foam may cause frothing of materials heated above 212°F / 100°C. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

Fire Fighting Instructions: For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Oxides of nitrogen and sulfur may also be formed.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

Section 6: Accidental Release Measures

Personal Precautions: This material may burn, but will not ignite readily. Keep all sources of ignition away from spill/release. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions: Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

Methods for Containment and Clean-Up: Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken. See Section 13 for information on appropriate disposal.

Section 7: Handling and Storage

Precautions for safe handling: Keep away from flames and hot surfaces. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not breathe vapors or mists. Wear protective gloves/clothing and eye/face protection. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes.

Conditions for safe storage: Keep container(s) tightly closed and properly labeled. This material may contain or release poisonous hydrogen sulfide gas. In a tank, barge, or other closed container, the vapor space above this material may accumulate hazardous concentrations of hydrogen sulfide. Check atmosphere for oxygen content, H₂S, and flammability prior to entry. Use and store this material in cool, dry, well-ventilated area away from heat and all sources of ignition. Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

Section 8: Exposure Controls / Personal Protection

Component	ACGIH	OSHA	NIOSH
Water (7732-18-5)	Not established	Not established	Not established
Sodium chloride (7647-14-5)	Not established	Not established	Not established
Benzene (71-43-2)	STEL: 2.5 ppm TWA: 0.5 ppm Skin	Ceiling: 25 ppm STEL: 5 ppm TWA: 1 ppm	STEL: 5 ppm TWA: 0.1 ppm

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye protection (such as splash goggles) that meets or exceeds ANSI Z.87.1 is recommended when there is potential liquid contact to the eye. Depending on conditions of use, a face shield may be necessary.

Skin/Hand Protection: The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the breakthrough performance of their products. Suggested protective materials: Nitrile

Respiratory Protection: Where there is potential for airborne exposure above the exposure limit a NIOSH certified air purifying respirator equipped with organic vapor cartridges/canisters may be used.

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use. Air purifying respirators provide limited protection and cannot be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturer's instructions), in oxygen deficient (less than 19.5 percent oxygen) situations, or under conditions that are immediately dangerous to life and health (IDLH).

If benzene concentrations equal or exceed applicable exposure limits, OSHA requirements for personal protective equipment, exposure monitoring, and training may apply (29CFR1910.1028 - Benzene).

Other Protective Equipment: Eye wash and quick-drench shower facilities should be available in the work area. Thoroughly clean shoes and wash contaminated clothing before reuse.

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

Section 9: Physical and Chemical Properties

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Appearance:	Varies (clear / amber / brown)
Physical Form:	Liquid
Odor:	Petroleum
Odor Threshold:	No data
pH:	4.9-8.5
Vapor Pressure:	No data available
Vapor Density (air=1):	>1
Initial Boiling Point/Range:	212 °F / 100 °C
Melting/Freezing Point:	32 °F / 0 °C
Pour Point:	No data
Solubility in Water:	Infinintely
Partition Coefficient (n-octanol/water) (Kow):	>10
Specific Gravity (water=1):	1.0 -1.1 °API
Viscosity:	No data available
Evaporation Rate (nBuAc=1):	No data available
Flash Point:	No data available
Test Method:	Not applicable
Lower Explosive Limits (vol % in air):	1%
Upper Explosive Limits (vol % in air):	46%
Auto-ignition Temperature:	No data available

Section 10: Stability and Reactivity

Stability: Stable under normal ambient and anticipated conditions of use.

Conditions to Avoid: Avoid all possible sources of ignition. Prevent vapor accumulation.

Materials to Avoid (Incompatible Materials): Avoid contact with strong oxidizing and reducing agents.

Hazardous Decomposition Products: Not anticipated under normal conditions of use.

Hazardous Polymerization: Not known to occur.

Section 11: Toxicological Information

Information on Toxicological Effects of Substance/Mixture

<u>Acute Toxicity</u>	<u>Hazard</u>	<u>Additional Information</u>	<u>LC50/LD50 Data</u>
Inhalation	Expected to have a low degree of toxicity by inhalation		No data
Skin Absorption	Unlikely to be harmful		No data
Ingestion (Swallowing)	Unlikely to be harmful		No data

Aspiration Hazard: Not expected to be an aspiration hazard.

Skin Corrosion/Irritation: Causes mild skin irritation. Repeated exposure may cause skin dryness or cracking.

Serious Eye Damage/Irritation: Causes serious eye irritation.

Signs and Symptoms: Effects of overexposure may include irritation of the digestive tract, irritation of the respiratory tract, nausea, vomiting, diarrhea and signs of nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue).

Skin Sensitization: Not expected to be a skin sensitizer.

Respiratory Sensitization: No information available.

Specific Target Organ Toxicity (Single Exposure): May cause drowsiness and dizziness.

Specific Target Organ Toxicity (Repeated Exposure): May cause damage to organs through prolonged or repeated exposure. Laboratory animal studies of hydrocarbon products by the dermal and inhalation exposure routes have demonstrated toxicity to the liver, blood, spleen and thymus

Carcinogenicity: May cause cancer, based on component information.

Germ Cell Mutagenicity: Inadequate information available.

Reproductive Toxicity: Inadequate information available.

Other Comments: This material may contain varying concentrations of polycyclic aromatic hydrocarbons (PAHs) which have been known to produce a phototoxic reaction when contaminated skin is exposed to sunlight. The effect is similar in appearance to an exaggerated sunburn, and is temporary in duration if exposure is discontinued. Continued exposure to sunlight can result in more serious skin problems including pigmentation (discoloration), skin eruptions (pimples), and possible skin cancers.

Information on Toxicological Effects of Components

Water

Carcinogenicity: No data available

Target Organs: No data available

Reproductive Toxicity: No data available

Germ Cell Mutagenicity: No data available

Sodium chloride

Carcinogenicity: No data available but sodium chloride has not been identified as a human carcinogen by IARC, the US National Toxicology Program and the US-Occupational Safety and Health Administration.

Target Organs: Eyes, respiratory system, central nervous system

Reproductive Toxicity: No data available

Germ Cell Mutagenicity: No data available

Benzene

Carcinogenicity: Benzene is an animal carcinogen and is known to produce acute myelogenous leukemia (a form of cancer) in humans. Benzene has been identified as a human carcinogen by IARC, the US National Toxicology Program and the US-Occupational Safety and Health Administration.

Target Organs: Prolonged or repeated exposures to benzene vapors can cause damage to the blood and blood forming organs, including disorders like leukopenia, thrombocytopenia, and aplastic anemia.

Reproductive Toxicity: Some studies in occupationally exposed women have suggested benzene exposure increased risk of miscarriage and stillbirth and decreased birth weight and gestational age. The size of the effects detected in these studies was small, and ascertainment of exposure and outcome in some cases relied on self-reports, which may limit the reliability of these results.

Germ Cell Mutagenicity: Benzene exposure has resulted in chromosomal aberrations in human lymphocytes and animal bone marrow cells. Exposure has also been associated with chromosomal aberrations in sperm cells in human and animal studies.

Section 12: Ecological Information

Toxicity: Not evaluated

Persistence and Degradability: Not evaluated

Persistence per IOPC Fund definition: Not evaluated

Bioaccumulative Potential: Not evaluated although the solubility and log KOW would indicate it has little bioaccumulative potential.

Mobility in Soil: Not evaluated although the solubility properties indicate produced water would be highly mobile throughout a system.

Other Adverse Effects: None anticipated.

Section 13: Disposal Considerations

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations.

This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste. However, it would likely be identified as a federally regulated RCRA hazardous waste for the following characteristic(s) shown below. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the MSDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.

Container contents should be completely used and containers should be emptied prior to discard. Container residues and rinsates could be considered to be hazardous wastes.

EPA Waste Number(s)

- D018 - Toxicity characteristic (Benzene)

Section 14: Transport Information

U.S. Department of Transportation (DOT)

Shipping name: *Not regulated*

Note: Some states may require specific shipping labels. Contact each jurisdiction for more information.

Section 15: Regulatory Information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):

This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372.

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

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

CERCLA/SARA - Section 313 and 40 CFR 372:

This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372:

Component	Concentration ¹	de minimis
Benzene	<2	0.1%

EPA (CERCLA) Reportable Quantity (in pounds):

EPA's Petroleum Exclusion applies to this material - (CERCLA 101(14)).

Warning: This material may contain detectable quantities of the following chemicals identified on federal and individual state hazardous substances list. Contact each jurisdiction for more information.

Component	Type of Toxicity
Benzene	Cancer Developmental Toxicant Male Reproductive Toxicant

International Hazard Classification:

Canada:

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the Regulations.

WHMIS Hazard Class:

D2A
D2B

National Chemical Inventories

All components are either listed on the US TSCA Inventory, or are not regulated under TSCA
All components are either on the DSL, or are exempt from DSL listing requirements

U.S. Export Control Classification Number: 1C981

Section 16: Other Information

Date of Issue:
Status:

20-Sep-2014
FINAL

Revised Sections or Basis for Revision:

Identified Hazards (Section 2)
Precautionary Statement(s) (Section 2)
First Aid (Section 4)
Shipping information (Section 14)
Regulatory information (Section 15)
401320

SDS Number:

Guide to Abbreviations:

ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer of Expressed and implied Warranties:

The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

Attachment O
Emissions Summary Sheets

G70-A EMISSIONS SUMMARY SHEET

Emission Point ID No.	Emission Point Type ¹	Emission Unit Vented Through This Point		Air Pollution Control Device		All Regulated Pollutants - Chemical Name/CAS ² (Speciate VOCs & HAPs)	Maximum Potential Uncontrolled Emissions ³		Maximum Potential Controlled Emissions ⁴		Emission Form or Phase (At exit conditions, Solid, Liquid or Gas/Vapor)	Est. Method Used ⁵
		ID No.	Source	ID No.	Device Type		lb/hr	ton/yr	lb/hr	ton/yr		
1E-11E	Upward Vertical Stacks	1E-11E	GPU Burners	N/A	None	NOx/1104-93-1 CO/630-08-01 SO2/7446-09-5 PM Total VOC Lead/7439-92-1 CO2/124-38-9 Methane/98615-67-9 N2O/10024-97-2 n-Hexane/110-54-3 Benzene/71-43-2 Toluene/108-88-3 Formaldehyde/206-44-0 Total HAPs Total GHG (CO2e)	0.86	3.75				
							0.72	3.15				
12E-19E	Tank Vent(s)	12E-19E	Eight (8) 210-bbl Condensate Tanks	N/A	Compressor to Sale line or Flare	n-Hexane/110-54-3 Benzene/71-43-2 Toluene/108-88-3 Ethylbenzene/100-41-4 Xylenes	0.01	0.02	0.04	0.19		
							<0.01	0.01	<0.01	0.01	<0.01	<0.01
20E-27E	Tank Vent(s)	20E-27E	Eight (8) 210-bbl Produced Water Tanks	N/A	Compressor to Sale line or Flare	VOC n-Hexane/110-54-3 Benzene/71-43-2 Toluene/108-88-3 Ethylbenzene/100-41-4 Xylenes	0.02	0.09	<0.01	<0.01		
							<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

36E	Upward Vertical Stack	36E	Condensate Stabilizer Heater	N/A	None	NOx/1104-93-1 CO/630-08-01 SO2/7446-09-5 PM Total VOC Lead/7439-92-1 CO2/124-38-9 Methane/98615-67-9 N2O/10024-97-2 n-Hexane/110-54-3 Benzene/71-43-2 Toluene/108-88-3 Formaldehyde/206-44-0 Total HAPs Total GHG (CO2e)	0.06 0.05 <0.01 <0.01 <0.01 <0.01 70.01 <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 <0.01 <0.01 308	N/A	N/A	Gas/Vapor	AP-42
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The EMISSION SUMMARY SHEET provides a summation of emissions by emission unit. Note that uncaptured process emission unit emissions are not typically considered to be fugitive and must be accounted for on the appropriate EMISSIONS UNIT DATA SHEET and on the EMISSIONS SUMMARY SHEET. Please note that total emissions from the source are equal to all vented emissions, all fugitive emissions, plus all other emissions (e.g. uncaptured emissions). Please complete the FUGITIVE EMISSIONS DATA SUMMARY SHEET for fugitive emission activities.

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

² List all regulated air pollutants. Speciate VOCs, including all HAPs. Follow chemical name with Chemical Abstracts Service (CAS) number. LIST Acids, CO, CS₂, VOCs, H₂S, Inorganics, Lead, Organics, O₃, NO, NO₂, SO₂, SO₃, all applicable Greenhouse Gases (including CO₂ and methane), etc. DO NOT LIST H₂, H₂O, N₂, O₂, and Noble Gases

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

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

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