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DEP, Southwest Regional Office

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Initial Plan Approval Application
Submitted on January 17, 2024

MarkWest Liberty Midstream & Resources, L.L.C.
1515 Arapahoe Street
Tower 1, Suite 1600
Denver, CO 80202-2126
(800) 730-8388
(303) 290-8700
(303) 825-0920 Fax

January 17, 2024

Sheri Guerrieri
Environmental Engineer Manager
PA DEP SW Regional Office
400 Waterfront Drive
Pittsburgh, PA 15222

Re: MarkWest Liberty Midstream & Resources, L.L.C.
Harmon Creek Gas Plant
Plan Approval Application

Dear Sheri Guerrieri:

MarkWest Liberty Midstream & Resources, L.L.C. (MPLX) hereby submits a plan approval application for the Harmon Creek Gas Plant located at 123 Point Pleasant Rd in Smith Township, Washington County. The Harmon Creek Gas Plant is currently authorized to operate under PA-63-01011 and GP5-63-01011B.

MPLX seeks authorization to install and operate equipment associated with Harmon Creek Cryo III with a processing capacity of 330 MMSCFD and DeEthanizer II. In addition to the equipment currently authorized at the facility, MPLX proposes the installation and operation of the following air emission sources at the facility:

- One (1) cryo plant regenerative heater rated at a maximum heat input of 21.75 MMBtu/hr equipped with flue gas recirculation (FGR);
- Two (2) deethanizer hot medium oil (HMO) heaters rated at a maximum heat input of 73.85 MMBtu/hr equipped with FGR;
- One (1) 500-gallon methanol storage tank;
- One (1) high-pressure pig receiver controlled by the process flare;
- Three (3) electric-driven centrifugal compressors and associated dry gas venting;
- One (1) electric-driven reciprocating compressor; and
- Associated fugitive components.

De minimis emission increases associated with truck loadout operations, in addition to emissions from maintenance blowdowns and some pressure relief devices, where feasible, will be controlled by the existing process flare.

If you have any questions about this application, please contact me at (412) 815-8886 or via email at ajuarez@marathonpetroleum.com.

Sincerely,

Alexandra M. Juarez
Environmental Engineer

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General Information Form

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
CENTER FOR ENVIRONMENTAL EXCELLENCE

GENERAL INFORMATION FORM – AUTHORIZATION APPLICATION

Before completing this General Information Form (GIF), read the step-by-step instructions provided in this application package. This form is used by the Department of Environmental Protection (DEP) to inform our programs regarding what other DEP permits or authorizations may be needed for the proposed project or activity. This version of the General Information Form (GIF) must be completed and returned with any program-specific application being submitted to the DEP.

Related ID#s (If Known)				DEP USE ONLY
Client ID#		**APS ID#**		Date Received & General Notes
Site ID#	823541	**Auth ID#**		
Facility ID#	819388			

CLIENT INFORMATION

DEP Client ID#	Client Type/Code	Dun & Bradstreet ID#
	OWOP	

Legal Organization Name or Registered Fictitious Name	Employer ID# (EIN)	Is the EIN a SSN?
MarkWest Liberty Midstream and Resources, L.L.C	30-0528059	☐ Yes ☒ No

State of Incorporation or Registration of Fictious Name	
Delaware	☐ Corporation ☒ LLC ☐ Partnership ☐ LLP ☐ LP ☐ Sole Proprietorship ☐ Association/Organization ☐ Estate/Trust ☐ Other

Individual Last Name	First Name	MI	Suffix

Additional Individual Last Name	First Name	MI	Suffix

Mailing Address Line 1	Mailing Address Line 2
1515 Arapahoe St	Tower 1, Suite 1600

Address Last Line – City	State	ZIP+4	Country
Denver	CO	80202-2137	USA

Client Contact Last Name	First Name	MI	Suffix
Juarez	Alexandra	M	

Client Contact Title	Phone	Ext	Cell Phone
Environmental Engineer	412-815-8886		

Email Address	FAX
ajuarez@marathonpetroleum.com	303-573-4954

SITE INFORMATION

DEP Site ID#	Site Name
823541	Harmon Creek Gas Plant

EPA ID#	Estimated Number of Employees to be Present at Site	25

Description of Site
Natural Gas Processing Plant

Tax Parcel ID(s):

County Name(s)	Municipality(ies)	City	Boro	Twp	State
Washington	Smith	☐	☐	☒	PA
		☐	☐	☐	
		☐	☐	☐	

☐	☐	☐	

Site Location Line 1	Site Location Line 2
123 Point Pleasant Rd	

Site Location Last Line – City	State	ZIP+4
Bulger	PA	15019

Detailed Written Directions to Site

From Pittsburgh head west on Hwy 22 to Exit 60A, stay left on Steubenville Pike (0.9 mi.), turn left onto Creek Road (0.5 mi.), keep left to stay on Point Pleasant Road (1.3 mi.), turn left into Harmon Creek Gas Plant

Site Contact Last Name	First Name	MI	Suffix
Ettore	David	G	

Site Contact Title	Site Contact Firm
Environmental Manager	MarkWest Liberty Midstream and Resources, L.L.C.

Mailing Address Line 1	Mailing Address Line 2
4600 J. Barry Court	Suite 500

Mailing Address Last Line – City	State	ZIP+4
Canonsburg	PA	15317

Phone	Ext	FAX	Email Address
724-873-2803			DGEttore@marathonpetroleum.com

NAICS Codes (Two- & Three-Digit Codes – List All That Apply)	6-Digit Code (Optional)
211130	NA

Client to Site Relationship

OWNOP

FACILITY INFORMATION

Modification of Existing Facility	Yes	No
1. Will this project modify an existing facility, system, or activity?	☒	☐
2. Will this project involve an addition to an existing facility, system, or activity?	☒	☐

If "Yes", check all relevant facility types and provide DEP facility identification numbers below.

	Facility Type	DEP Fac ID#		Facility Type	DEP Fac ID#
☒	Air Emission Plant	819388	☐	Industrial Minerals Mining Operation	
☐	Beneficial Use (water)		☐	Laboratory Location	
☐	Blasting Operation		☐	Land Recycling Cleanup Location	
☐	Captive Hazardous Waste Operation		☐	Mine Drainage Treatment / Land Recycling Project Location	
☐	Coal Ash Beneficial Use Operation		☐	Municipal Waste Operation	
☐	Coal Mining Operation		☐	Oil & Gas Encroachment Location	
☐	Coal Pillar Location		☐	Oil & Gas Location	
☐	Commercial Hazardous Waste Operation		☐	Oil & Gas Water Poll Control Facility	
☐	Dam Location		☐	Public Water Supply System	
☐	Deep Mine Safety Operation -Anthracite		☐	Radiation Facility	
☐	Deep Mine Safety Operation -Bituminous		☐	Residual Waste Operation	
☐	Deep Mine Safety Operation -Ind Minerals		☐	Storage Tank Location	
☐	Encroachment Location (water, wetland)		☐	Water Pollution Control Facility	
☐	Erosion & Sediment Control Facility		☐	Water Resource	
☐	Explosive Storage Location		☐	Other:	

Latitude/Longitude Point of Origin	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
Harmon Creek Gas Plant	40	24	4	80	21	26

Horizontal Accuracy Measure	Feet		--*or*--	Meters
Horizontal Reference Datum Code	☐	North American Datum of 1927		
	☐	North American Datum of 1983		
	☒	World Geodetic System of 1984		
Horizontal Collection Method Code				
Reference Point Code				
Altitude	Feet	1,171	--*or*--	Meters
Altitude Datum Name	☐	The National Geodetic Vertical Datum of 1929		
	☐	The North American Vertical Datum of 1988 (NAVD88)		
Altitude (Vertical) Location Datum Collection Method Code				
Geometric Type Code				
Data Collection Date				
Source Map Scale Number		Inch(es)	=	Feet
--*or*--		Centimeter(s)	=	Meters

PROJECT INFORMATION

Project Name

Harmon Creek 3

Project Description

The Harmon Creek III Project will include air emission sources as follows: one (1) regenerative heater rated at 21.75 MMBtu/hr, two (2) hot oil heaters rated at 73.85 MMBtu/hr, four (4) electric-driven compressor vents, one (1) high-pressure pig receiver, and associated fugitive components. Potential de minimis increases at the facility will include closed drain tank loadout emissions, measurement devices, and one (1) new 500-gallon methanol tank. Emissions from maintenance blowdowns, pigging activities, closed drain loadout, and some pressure relief devices, where feasible, from Harmon Creek Cryo III and DeEthanizer II will be controlled by the process flare. The existing plant flare PTE will remain unchanged.

Project Consultant Last Name	First Name	MI	Suffix
None used			

Project Consultant Title	Consulting Firm

Mailing Address Line 1	Mailing Address Line 2

Address Last Line – City	State	ZIP+4

Phone	Ext	FAX	Email Address

Time Schedules	Project Milestone (Optional)
December 2024	Expected Construction Start
November 2025	Expected Construction Completion
December 2025	Expected Start Up

1.	Is the project located in or within a 0.5-**mile radius of an Environmental Justice community as defined by DEP?**	☒ Yes	☐ No
	To determine if the project is located in or within a 0.5-mile radius of an environmental justice community, please use the online PennEnviroScreen tool. To see specific EJ areas, select the appropriate year of your submittal from the themes box on the right.		
2.	Have you informed the surrounding community prior to submitting the application to the Department? **Method of notification:** nicipal notifications per 25 Pa. Code § 127.413	☒ Yes	☐ No
3.	**Have you addressed community concerns that were identified?**	☐ Yes	☐ No ☒ N/A
	If no, please briefly describe the community concerns that have been expressed and not addressed.		
4.	**Is your project funded by state or federal grants?**	☐ Yes	☒ No
	Note: If "Yes", specify what aspect of the project is related to the grant and provide the grant source, contact person and grant expiration date. Aspect of Project Related to Grant Grant Source: _____ Grant Contact Person: _____ Grant Expiration Date: _____		
5.	**Is this application for an authorization on Appendix A of the Land Use Policy? (For referenced list, see Appendix A of the Land Use Policy attached to GIF instructions)**	☐ Yes	☒ No
	Note: If "No" to Question 5, the application is not subject to the Land Use Policy. If "Yes" to Question 5, the application is subject to this policy and the Applicant should answer the additional questions in the **Land Use Information** section.		

LAND USE INFORMATION

Note: Applicants should submit copies of local land use approvals or other evidence of compliance with local comprehensive plans and zoning ordinances.

1.	**Is there an adopted county or multi-county comprehensive plan?**	☐ Yes	☐ No
2.	**Is there a county stormwater management plan?**	☐ Yes	☐ No
3.	**Is there an adopted municipal or multi-municipal comprehensive plan?**	☐ Yes	☐ No
4.	**Is there an adopted county-wide zoning ordinance, municipal zoning ordinance or joint municipal zoning ordinance?**	☐ Yes	☐ No
	Note: If the Applicant answers "No" to either Questions 1, 3 or 4, the provisions of the PA MPC are not applicable and the Applicant does not need to respond to questions 5 and 6 below. If the Applicant answers "Yes" to questions 1, 3 and 4, the Applicant should respond to questions 5 and 6 below.		
5.	**Does the proposed project meet the provisions of the zoning ordinance or does the proposed project have zoning approval?** If zoning approval has been received, attach documentation.	☐ Yes	☐ No
6.	**Have you attached Municipal and County Land Use Letters for the project?**	☐ Yes	☐ No

COORDINATION INFORMATION

Note: The PA Historical and Museum Commission must be notified of proposed projects in accordance with DEP Technical Guidance Document 012-0700-001 at PHMC's online portal, PA-SHARE.

If the activity will be a mining project (i.e., mining of coal or industrial minerals, coal refuse disposal and/or the operation of a coal or industrial minerals preparation/processing facility), respond to questions 1.0 through 2.5 below.

If the activity will not be a mining project, skip questions 1.0 through 2.5 and begin with question 3.0.

1.0	**Is this a coal mining project?** If "Yes", respond to 1.1-1.6. If "No", skip to Question 2.0.	☐	Yes	☒	No
1.1	**Will this coal mining project involve coal preparation/ processing activities in which the total amount of coal prepared/processed will be equal to or greater than 200 tons/day?**	☐	Yes	☐	No
1.2	**Will this coal mining project involve coal preparation/ processing activities in which the total amount of coal prepared/processed will be greater than 50,000 tons/year?**	☐	Yes	☐	No
1.3	**Will this coal mining project involve coal preparation/ processing activities in which thermal coal dryers or pneumatic coal cleaners will be used?**	☐	Yes	☐	No
1.4	**For this coal mining project, will sewage treatment facilities be constructed and treated waste water discharged to surface waters?**	☐	Yes	☐	No
1.5	**Will this coal mining project involve the construction of a permanent impoundment meeting one or more of the following criteria: (1) a contributory drainage area exceeding 100 acres; (2) a depth of water measured by the upstream toe of the dam at maximum storage elevation exceeding 15 feet; (3) an impounding capacity at maximum storage elevation exceeding 50 acre-feet?**	☐	Yes	☐	No
1.6	**Will this coal mining project involve underground coal mining to be conducted within 500 feet of an oil or gas well?**	☐	Yes	☐	No
2.0	**Is this a non-coal (industrial minerals) mining project?** If "Yes", respond to 2.1-2.6. If "No", skip to Question 3.0.	☐	Yes	☒	No
2.1	**Will this non-coal (industrial minerals) mining project involve the crushing and screening of non-coal minerals other than sand and gravel?**	☐	Yes	☐	No
2.2	**Will this non-coal (industrial minerals) mining project involve the crushing and/or screening of sand and gravel with the exception of wet sand and gravel operations (screening only) and dry sand and gravel operations with a capacity of less than 150 tons/hour of unconsolidated materials?**	☐	Yes	☐	No
2.3	**Will this non-coal (industrial minerals) mining project involve the construction, operation and/or modification of a portable non-metallic (i.e., non-coal) minerals processing plant under the authority of the General Permit for Portable Non-metallic Mineral Processing Plants (i.e., BAQ-PGPA/GP-3)?**	☐	Yes	☐	No
2.4	**For this non-coal (industrial minerals) mining project, will sewage treatment facilities be constructed and treated waste water discharged to surface waters?**	☐	Yes	☐	No

2.5	**Will this non-coal (industrial minerals) mining project involve the construction of a permanent impoundment meeting one or more of the following criteria: (1) a contributory drainage area exceeding 100 acres; (2) a depth of water measured by the upstream toe of the dam at maximum storage elevation exceeding 15 feet; (3) an impounding capacity at maximum storage elevation exceeding 50 acre-feet?**	☐ Yes	☐ No
3.0	**Will your project, activity, or authorization have anything to do with a well related to oil or gas production, have construction within 200 feet of, affect an oil or gas well, involve the waste from such a well, or string power lines above an oil or gas well?** If "Yes", respond to 3.1-3.3. If "No", skip to Question 4.0.	☒ Yes	☐ No
3.1	**Does the oil- or gas-related project involve any of the following: placement of fill, excavation within or placement of a structure, located in, along, across or projecting into a watercourse, floodway or body of water (including wetlands)?**	☐ Yes	☒ No
3.2	**Will the oil- or gas-related project involve discharge of industrial wastewater or stormwater to a dry swale, surface water, ground water or an existing sanitary sewer system or storm water system?** If "Yes", discuss in *Project Description*.	☐ Yes	☐ No
3.3	**Will the oil- or gas-related project involve the construction and operation of industrial waste treatment facilities?**	☐ Yes	☒ No
4.0	**Will the project involve a construction activity that results in earth disturbance?** If "Yes", specify the total disturbed acreage.	☐ Yes	☒ No
	4.0.1 Total Disturbed Acreage		
	4.0.2 Will the project discharge or drain to a special protection water (EV or HQ) or an EV wetland?	☐ Yes	☐ No
	4.0.3 Will the project involve a construction activity that results in earth disturbance in the area of the earth disturbance that are contaminated at levels exceeding residential or non-residential medium-specific concentrations (MSCs) in 25 Pa. Code Chapter 250 at residential or non-residential construction sites, respectively?	☐ Yes	☐ No
5.0	**Does the project involve any of the following: water obstruction and/or encroachment, wetland impacts, or floodplain project by the Commonwealth/political subdivision or public utility?** If "Yes", respond to 5.1-5.7. If "No", skip to Question 6.0.	☐ Yes	☒ No
5.1	**Water Obstruction and Encroachment Projects – Does the project involve any of the following: placement of fill, excavation within or placement of a structure, located in, along, across or projecting into a watercourse, floodway or body of water?**	☐ Yes	☐ No
5.2	**Wetland Impacts – Does the project involve any of the following: placement of fill, excavation within or placement of a structure, located in, along, across or projecting into a wetland?**	☐ Yes	☐ No

5.3	**Floodplain Projects by the Commonwealth, a Political Subdivision of the Commonwealth or a Public Utility – Does the project involve any of the following: placement of fill, excavation within or placement of a structure, located in, along, across or projecting into a floodplain?**	☐ Yes	☐ No
5.4	**Is your project an interstate transmission natural gas pipeline?**	☐ Yes	☐ No
5.5	**Does your project consist of linear construction activities which result in earth disturbance in two or more DEP regions AND three or more counties?**	☐ Yes	☐ No
5.6	**Does your project utilize Floodplain Restoration as a best management practice for Post Construction Stormwater Management?**	☐ Yes	☐ No
5.7	**Does your project utilize Class V Gravity / Injection Wells as a best management practice for Post Construction Stormwater Management?**	☐ Yes	☐ No
6.0	**Will the project involve discharge of construction related stormwater to a dry swale, surface water, ground water or separate storm water system?**	☐ Yes	☒ No
6.1	**Will the project involve discharge of industrial waste stormwater or wastewater from an industrial activity or sewage to a dry swale, surface water, ground water or an existing sanitary sewer system or separate storm water system?**	☐ Yes	☐ No
7.0	**Will the project involve the construction and operation of industrial waste treatment facilities?**	☐ Yes	☒ No
8.0	**Will the project involve construction of sewage treatment facilities, sanitary sewers, or sewage pumping stations?** If "Yes", indicate estimated proposed flow (gal/day). Also, discuss the sanitary sewer pipe sizes and the number of pumping stations/treatment facilities/name of downstream sewage facilities in the *Project Description*, where applicable. **8.0.1 Estimated Proposed Flow (gal/day)**	☐ Yes	☒ No
9.0	**Will the project involve the subdivision of land, or the generation of 800 gpd or more of sewage on an existing parcel of land or the generation of an additional 400 gpd of sewage on an already-developed parcel, or the generation of 800 gpd or more of industrial wastewater that would be discharged to an existing sanitary sewer system?**	☐ Yes	☒ No
	9.0.1 Was Act 537 sewage facilities planning submitted and approved by DEP? If "Yes" attach the approval letter. Approval required prior to 105/NPDES approval.	☐ Yes	☐ No
10.0	**Is this project for the beneficial use of biosolids for land application within Pennsylvania?** If "Yes" indicate how much (i.e. gallons or dry tons per year). **10.0.1 Gallons Per Year (residential septage)** _____ **10.0.2 Dry Tons Per Year (biosolids)**	☐ Yes	☒ No

11.0	**Does the project involve construction, modification or removal of a dam?** If "Yes", identify the dam.	☐ Yes	☒ No
	11.0.1 Dam Name		
12.0	**Will the project interfere with the flow from, or otherwise impact, a dam?** If "Yes", identify the dam.	☐ Yes	☒ No
	12.0.1 Dam Name		
13.0	**Will the project involve operations (excluding during the construction period) that produce air emissions (i.e., NOX, VOC, etc.)?**	☒ Yes	☐ No
	13.0.1 If "Yes", is the operation subject to the agricultural exemption in 35 P.S. § 4004.1?	☐ Yes	☒ No
	13.0.2 If the answer to 13.0.1 is "No", identify each type of emission followed by the estimated amount of that emission.		
	Enter all types & amounts of emissions; separate each set with semicolons.	Detailed emission estimates are attached	
14.0	**Does the project include the construction or modification of a drinking water supply to serve 15 or more connections or 25 or more people, at least 60 days out of the year?** If "Yes," check all proposed sub-facilities.	☐ Yes	☒ No
	14.0.1 Number of Persons Served		
	14.0.2 Number of Employee/Guests		
	14.0.3 Number of Connections		
	14.0.4 Sub-Fac: Distribution System	☐ Yes	☐ No
	14.0.5 Sub-Fac: Water Treatment Plant	☐ Yes	☐ No
	14.0.6 Sub-Fac: Source	☐ Yes	☐ No
	14.0.7 Sub-Fac: Pump Station	☐ Yes	☐ No
	14.0.8 Sub-Fac: Transmission Main	☐ Yes	☐ No
	14.0.9 Sub-Fac: Storage Facility	☐ Yes	☐ No
15.0	**Will your project include infiltration of storm water or waste water to ground water within one-half mile of a public water supply well, spring or infiltration gallery?**	☐ Yes	☒ No
16.0	**Is your project to be served by an existing public water supply?** If "Yes", indicate name of supplier and attach letter from supplier stating that it will serve the project.	☐ Yes	☒ No
	16.0.1 Supplier's Name		
	16.0.2 Letter of Approval from Supplier is Attached	☐ Yes	☐ No
17.0	**Will this project be served by on-lot drinking water wells?**	☐ Yes	☒ No
18.0	**Will this project involve a new or increased drinking water withdrawal from a river, stream, spring, lake, well or other water bod(ies)?** If "Yes," reference Safe Drinking Water Program.	☐ Yes	☒ No
	18.0.1 Source Name		

19.0	**Will the construction or operation of this project involve treatment, storage, reuse, or disposal of waste?** If "Yes," indicate what type (i.e., hazardous, municipal (including infectious & chemotherapeutic), residual) and the amount to be treated, stored, re-used or disposed. **19.0.1 Type & Amount**	☐	Yes	☒	No
20.0	**Will your project involve the removal of coal, minerals, contaminated media, or solid waste as part of any earth disturbance activities?**	☐	Yes	☒	No
21.0	**Does your project involve installation of a field constructed underground storage tank?** If "Yes," list each Substance & its Capacity. **Note:** Applicant may need a Storage Tank Site Specific Installation Permit. **21.0.1 Enter all substances & capacity of each; separate each set with semicolons.**	☐	Yes	☒	No
22.0	**Does your project involve installation of an aboveground storage tank greater than 21,000 gallons capacity at an existing facility?** If "Yes," list each Substance & its Capacity. **Note:** Applicant may need a Storage Tank Site Specific Installation Permit. **22.0.1 Enter all substances & capacity of each; separate each set with semicolons.**	☐	Yes	☒	No
23.0	**Does your project involve installation of a tank greater than 1,100 gallons which will contain a highly hazardous substance as defined in DEP's Regulated Substances List, 2570-BK-DEP2724?** If "Yes," list each Substance & its Capacity. **Note:** Applicant may need a Storage Tank Site Specific Installation Permit. **23.0.1 Enter all substances & capacity of each; separate each set with semicolons.**	☐	Yes	☒	No
24.0	**Does your project involve installation of a storage tank at a new facility with a total AST capacity greater than 21,000 gallons?** If "Yes", list each Substance & its Capacity. **Note:** Applicant may need a Storage Tank Site Specific Installation Permit. **24.0.1 Enter all substances & capacity of each; separate each set with semicolons.**	☐	Yes	☒	No
	NOTE: If the project includes the installation of a regulated storage tank system, including diesel emergency generator systems, the project may require the use of a Department Certified Tank Handler. For a full list of regulated storage tanks and substances, please go to www.dep.pa.gov search term storage tanks				
25.0	**Will the intended activity involve the use of a radiation source?**	☐	Yes	☒	No

CERTIFICATION

I certify that I have the authority to submit this application on behalf of the applicant named herein and that the information provided in this application is true and correct to the best of my knowledge and information.

For applicants supplying an EIN number: I am applying for a permit or authorization from the Pennsylvania Department of Environmental Protection (DEP). As part of this application, I will provide DEP with an accurate EIN number for the applicant entity. By filing this application with DEP, I hereby authorize DEP to confirm the accuracy of the EIN number provided with the Pennsylvania Department of Revenue. As applicant, I further consent to the Department of Revenue discussing the same with DEP prior to issuance of the Commonwealth permit or authorization.

Type or Print Name Robert W. Shough III

	Operations Director	1/18/24
Signature	**Title**	**Date**

Plan Approval Application Forms

2700-PM-AQ0007 Rev. 7/2004

Submit in Triplicate

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

PROCESSES

Application for Plan Approval to Construct, Modify or Reactivate an Air Contamination Source and/or Install an Air Cleaning Device

This application must be submitted with the General Information Form (GIF).

Before completing this form, read the instructions provided for the form.

Section A - Facility Name, Checklist And Certification

Organization Name or Registered Fictitious Name/Facility Name: MarkWest Liberty Midstream & Resources, LLC

DEP Client ID# (if known): 30-0528059

Type of Review required and Fees:

- ☐ Source which is not subject to NSPS, NESHAPs, MACT, NSR and PSD: ..... $_____
- ☒ Source requiring approval under NSPS or NESHAPS or both: $7,500
- ☐ Source requiring approval under NSR regulations: ..... $_____
- ☐ Source requiring the establishment of a MACT limitation: ..... $_____
- ☐ Source requiring approval under PSD: ..... $_____

Applicant's Checklist

Check the following list to make sure that all the required documents are included.

- ☒ **General Information Form (GIF)**
- ☒ **Processes Plan Approval Application**
- ☒ **Compliance Review Form** or provide reference of most recently submitted compliance review form for facilities submitting on a periodic basis: _____
- ☒ **Copy and Proof of County and Municipal Notifications**
- ☒ **Permit Fees**
- ☒ **Addendum A:** Source Applicable Requirements (only applicable to existing Title V facility)

Certification of Truth, Accuracy and Completeness by a Responsible Official

I, Rob Shough, certify under penalty of law in 18 Pa. C. S. A. §4904, and 35 P.S. §4009(b) (2) that based on information and belief formed after reasonable inquiry, the statements and information in this application are true, accurate and complete.

(Signature): _____ Date: 1/18/24

Name (Print): Robert W. Shough Title: Operation Director

OFFICIAL USE ONLY

Application No. _____ Unit ID _____ Site ID _____

DEP Client ID #: _____ APS. ID _____ AUTH. ID _____

Date Received _____ Date Assigned _____ Reviewed By _____

Date of 1st Technical Deficiency _____ Date of 2nd Technical Deficiency _____

Comments: _____

Section B - Processes Information

1. Source Information

Source Description (give type, use, raw materials, product, etc). Attach additional sheets as necessary.

The Harmon Creek III Project will include air emission sources as follows: one (1) regenerative heater rated at 21.75 MMBtu/hr, two (2) hot oil heaters rated at 73.85 MMBtu/hr, four (4) electric-driven compressor vents, one (1) high-pressure pig receiver, and associated fugitive components. Potential de minimis increases at the facility will include closed drain tank loadout emissions, measurement devices, and one (1) new 500-gallon methanol tank. Emissions from maintenance blowdowns, pigging activities, closed drain loadout, and some pressure relief devices, where feasible, from Harmon Creek Cryo III and DeEthanizer II will be controlled by the process flare. The existing plant flare PTE will remain unchanged.

Manufacturer	Model No.	Number of Sources
N/A	N/A	8
Source Designation	**Maximum Capacity**	**Rated Capacity**
Various	330 MMSCFD	330 MMSCFD

Type of Material Processed
Natural Gas

Maximum Operating Schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
24	7	365	8760

Operational restrictions existing or requested, if any (e.g., bottlenecks or voluntary restrictions to limit PTE)
None

Capacity (specify units)

Per Hour	Per Day	Per Week	Per Year
	330 MMSCF		

Operating Schedule

Hours/Day	Days/Week	Days/Year	Hours/Year
24	7	365	8760

Seasonal variations (Months) From to

If variations exist, describe them

2. Fuel

Type	Quantity Hourly	Annually	Sulfur	% Ash (Weight)	BTU Content
Oil Number _____	GPH @ 60°F	X 10^3 Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Oil Number _____	GPH @ 60°F	X 10^3 Gal	% by wt		Btu/Gal. & Lbs./Gal. @ 60 °F
Natural Gas	SCFH	0.017 X 10^6 SCF	grain/100 SCF		1153 Btu/SCF
Gas (other) _____	SCFH	X 10^6 SCF	grain/100 SCF		Btu/SCF
Coal _____	TPH	Tons	% by wt		Btu/lb
Other * _____					
_____					

*Note: Describe and furnish information separately for other fuels in Addendum B.

Section B - Processes Information (Continued)

3.1 Burner

Manufacturer	Type and Model No.	Number of Burners
Tulsa Heaters	Enhanced IFGR and CUBL-4W-HC-HZ	1

Description:
Cryo III Regeneration Heater Equipped with Flue Gas Recirculation (Source ID 038, Facility ID H-3711)

Rated Capacity	Maximum Capacity
17.34 MMBtu/hr	21.75 MMBtu/hr

3.2 Burner

Manufacturer	Type and Model No.	Number of Burners
Tulsa Heaters	Enhanced IFGR and CUBL-16W-HC-HZ	1

Description:
DeEthanizer II HMO Heater Equipped with Flue Gas Recirculation (Source ID 039, Facility ID H-3767)

Rated Capacity	Maximum Capacity
62.23 MMBtu/hr	73.85 MMBtu/hr

3.3 Burner

Manufacturer	Type and Model No.	Number of Burners
Tulsa Heaters	Enhanced IFGR and CUBL-16W-HC-HZ	1

Description:
DeEthanizer II HMO Heater Equipped with Flue Gas Recirculation (Source ID 040, Facility ID H-3738)

Rated Capacity	Maximum Capacity
62.23 MMBtu/hr	73.85 MMBtu/hr

4. Process Storage Vessels

A. For Liquids: ***(New Source)***

Name of material stored
Methanol

Tank I.D. No.	Manufacturer	Date Installed
TBD	Exterran	Upon Approval

Design Pressure	Capacity (gallons/Meter^3)
16 oz/in2	500

Type of relief device (pressure set vent/conservation vent/emergency vent/open vent)
N/A

Relief valve/vent set pressure (psig)	Vapor press. of liquid at storage temp. (psia/kPa)
N/A	N/A

Type of Roof: Describe:
None – Horizontal tank

Total Throughput Per Year	Number of fills per day (fill/day): Filling Rate (gal./min.): Duration of fill hr./fill):
50 gal	

B. For Solids – *Not Applicable*		
Type: ☐ Silo ☐ Storage Bin ☐Other, Describe	Name of Material Stored	
Silo/Storage Bin I.D. No.	Manufacturer	Date Installed
State whether the material will be stored in loose or bags in silos	Capacity (Tons)	
Turn over per year in tons	Turn over per day in tons	
Describe fugitive dust control system for loading and handling operations		
Describe material handling system		

5. Request for Confidentiality
Do you request any information on this application to be treated as "Confidential"? ☐ Yes ☒ No If yes, include justification for confidentiality. Place such information on separate pages marked **"confidential"**.

Section B - Processes Information (Continued)

6. Miscellaneous Information

Attach flow diagram of process giving all (gaseous, liquid and solid) flow rates. Also, list all raw materials charged to process equipment, and the amounts charged (tons/hour, etc.) at rated capacity (give maximum, minimum and average charges describing fully expected variations in production rates). Indicate (on diagram) all points where contaminants are controlled (location of water sprays, collection hoods, or other pickup points, etc.). Describe collection hoods location, design, airflow and capture efficiency. Describe any restriction requested and how it will be monitored.

See Process Flow Description and Diagram appended.

Describe fully the facilities provided to monitor and to record process operating conditions, which may affect the emission of air contaminants. Show that they are reasonable and adequate.

Heaters (038-040) - Fuel usage meters will be installed to monitor fuel consumption by the heaters.
Compressor Vents (601) - Volumetric flow measurements will be conducted as required under NSPS OOOOb.
Process Flare (C601) - The existing meter at the flare header will continue to monitor the flow rate to the process flare.
Fugitives (701) - Leak detection will be conducted in accordance with NSPS OOOOb.
Pigging (801) – Pigging event information will be tracked.

Describe each proposed modification to an existing source.

The process flare (C601), currently authorized under GP5-63-01011B and PA-63-01011, will control the proposed compressor maintenance blowdowns and emissions from pressure relief valves, where feasible. Actual emissions from the process flare from sources associated with the Harmon Creek III Project is not anticipated to be greater than that included in the previous plan approval application. Therefore, potential emission estimates will not increase.

Identify and describe all fugitive emission points, all relief and emergency valves and any by-pass stacks.

The potential emission estimates attached have accounted for anticipated fugitive emission points associated with the new equipment. Some pressure relief devices, where feasible, will be controlled by the plant flare.

Pumps will be monitored via weekly inspections and monthly Method 21. MPLX conducts a quarterly LDAR program using a gas leak detector approved for Method 21 and/or an OGI camera. In addition, Harmon Creek operators conduct daily AVO inspections on the HC3 fugitive components.

Describe how emissions will be minimized especially during start up, shut down, process upsets and/or disruptions.

One (1) 20” inlet high-pressure pigging receiver is being proposed with HC3. Consistent with the 2018 Consent Decree (CD), the pigging equipment at Harmon Creek will be equipped with pig ramps and grounded steel receptacles that are covered when not in use, and vapors from depressurizing pigging barrels are/will be routed to the process flare. The CD requires high pressure pigging equipment to be connected to a low pressure gathering line where commercially reasonable and technically feasible. The connection of the high pressure launcher to a low pressure line would require MPLX to use more than 100 feet of piping and connect to a line located outside the fence line of the facility. Thus, per the CD, jumper lines at Harmon Creek are not commercially reasonable and technically feasible.

When feasible, emissions from compressor blowdowns and facility outages will be routed to the process flare.

Anticipated Milestones:

i. Expected commencement date of construction/reconstruction/installation: December 2024
ii. Expected completion date of construction/reconstruction/installation: November 2025
iii. Anticipated date of start-up: December 2025

Section C - Air Cleaning Device

1. Precontrol Emissions* - *See Emission Calculations Attached*

Pollutant	Maximum Emission Rate				Calculation/ Estimation Method
	Specify Units	Pounds/Hour	Hours/Year	Tons/Year	
PM					
PM_{10}					
SO_x					
CO					
NO_x					
VOC					
Others: (e.g., HAPs)	-----	-----	-----	-----	-----

* These emissions must be calculated based on the requested operating schedule and/or process rate, e.g., operating schedule for maximum limits or restricted hours of operation and/or restricted throughput. Describe how the emission values were determined. Attach calculations.

2. Gas Cooling – ***N/A***

Water quenching ☐ Yes ☐ No Water injection rate _____ GPM

Radiation and convection cooling ☐ Yes ☐ No	Air dilution ☐ Yes ☐ No If yes, _____CFM
Forced Draft ☐ Yes ☐ No	Water cooled duct work ☐ Yes ☐ No
Other	
Inlet Volume _____ACFM @ _____°F _____% Moisture	Outlet Volume _____ACFM @ _____°F _____% Moisture

Describe the system in detail.

Section C - Air Cleaning Device (Continued)

12. Flares *(Existing Source)*

Equipment Specifications

Manufacturer	Type	Model No.
John Zink	☐ Elevated flare ☐ Ground flare ☒ Other Air Assisted Describe	EEF Series

Design Volume (SCFM)	Dimensions of stack (ft.)
Design Volumes provided by manufacturer varies based on different scenarios. Facility Potential Volume: 100 mmscf/yr	Diameter 6'11" Height 199

Residence time (sec.) and outlet temperature (°F)	Turn down ratio	Burner details
N/A	N/A	Waste gas

Describe the flare design (air/steam-assisted or nonassisted), essential auxiliaries including pilot flame monitor of proposed flare with a sketch.

Stable in winds up to a velocity of 160 mph in all positions around the flare tip, the WindPROOF Pilot consists of a tip and tip windshield, ignition and fuel piping, venturi mixer, strainer, and a mixer windshield. Also included are two integral thermowells for thermocouple pilot detection. Two blowers to supply low pressure air are provided with the air assisted flare. The motors driving these blowers are designed to operate with a Variable Frequency Drive (VFD). The VFD allows a wide range of rotational speeds (typically from 10 to 100%).

Describe the operation of the flare's ignition system.

The Zeus Electric Spark Ignitor delivers a spark at the end of a probe mounted on the Zeus equipped pilot. The spark ignites a small slip stream of gas/air mixture taken from the main pilot supply above the pilot mixer. The flame front generated at the probe travels a short distance from the end of the probe to the pilot ignition hood where it lights the pilot. The Zeus ignitor control box located in a panel at grade uses a capacitive discharge to generate a periodic spark approximately once every 8 seconds.

Describe the provisions to introduce auxiliary fuel to the flare.

None needed.

Operation Parameters

Detailed composition of the waste gas	Heat content	Exit velocity
Conservatively assumes facility inlet. See detailed emission calculations attached.	1413.78	Maximum velocity calculated based on manufacturer provided design scenario flowrate is 83.3 ft/s

Maximum and average gas flow burned (ACFM)	Operating temperature (°F)
Maximum flow rate based on manufacturer provided design scenarios is 558,500 lb/hr. Facility Potential Volume: 100 mmscf/yr	Varies

Describe the warning/alarm system that protects against operation when unit is not meeting design requirements.

Alarms are set to trigger when specific conditions are met such as the absence of a pilot flame. The conditions which trigger alarms are determined based on Cause and Effect control documents.

Emissions Data

Pollutant	Inlet	Outlet	Removal Efficiency (%)
VOC	667.19 tpy	13.34 tpy	98%
HAP	11.40 tpy	0.23 tpy	98%

Section C - Air Cleaning Device (Continued)

13. Other Control Equipment – *N/A*

Equipment Specifications

Manufacturer	Type	Model No.

Design Volume (SCFM)	Capacity

Describe pH monitoring and pH adjustment, if any.

Indicate the liquid flow rate and describe equipment provided to measure pressure drop and flow rate, if any.

Attach efficiency curve and/or other efficiency information.

Attach any additional date including auxiliary equipment and operation details to thoroughly evaluate the control equipment.

Operation Parameters

Volume of gas handled

_____ ACFM @ _____°F _____% Moisture

Describe fully giving important parameters and method of operation.

Describe the warning/alarm system that protects against operation when unit is not meeting design requirements.

Emissions Data

Pollutant	Inlet	Outlet	Removal Efficiency (%)

Section C - Air Cleaning Device (Continued)

14. Costs

Indicate cost associated with air cleaning device and its operating cost (attach documentation if necessary)

The process flare is an existing source and thus cost is not evaluated.

The estimated cost of the cryo process heater equipped with flue gas recirculation is included below. The cost of the flue gas recirculation system on each heater is not expected to differ significantly.

Device	Direct Cost	Indirect Cost	Total Cost	Annual Operating Cost
Heater equipped with Flue Gas Recirculation	$284,000	$284,000	$568,000	$5,070

15. Miscellaneous

Describe in detail the removal, handling and disposal of dust, effluent, etc. from the air cleaning device including proposed methods of controlling fugitive emissions.

N/A

Attach manufacturer's performance guarantees and/or warranties for each of the major components of the control system (or complete system).

The existing process flare has guaranteed destruction efficiency of 98%.

The heater emission guarantees are included in the Deailed Emission Estimates section.

Attach the maintenance schedule for the control equipment and any part of the process equipment that if in disrepair would increase air contaminant emissions.

The maintenance schedule for the flare is conducted on an as-needed basis through annual third-party inspections. The inspections include all parts of the process that would increase air emissions if in disrepair.

Tune ups and inspections on the heaters are conducted as recommended by the manufacturer.

Section D - Additional Information

Will the construction, modification, etc. of the sources covered by this application increase emissions from other sources at the facility? If so, describe and quantify.

No. All sources with the potential to increase in emissions have been included in this application.

If this project is subject to any one of the following, attach a demonstration to show compliance with applicable standards.

a. Prevention of Significant Deterioration permit (PSD), 40 CFR 52? ☐ YES ☒ NO

b. New Source Review (NSR), 25 Pa. Code Chapter 127, Subchapter E? ☐ YES ☒ NO

c. New Source Performance Standards (NSPS), 40 CFR Part 60? ☒ YES ☐ NO
(If Yes, which subpart) OOOOb, Dc

d. National Emissions Standards for Hazardous Air Pollutants (NESHAP), 40 CFR Part 61? (If Yes, which subpart) _____ ☐ YES ☒ NO

e. Maximum Achievable Control Technology (MACT) 40 CFR Part 63? ☐ YES ☒ NO
(If Yes, which part) _____

Attach a demonstration showing that the emissions from any new sources will be the minimum attainable through the use of best available technology (BAT).

MPLX has appended the BAT analysis conducted for the Harmon Creek 2 project. The previous BAT analysis continues to apply to the existing process flare and measurement devices. There are no VOC service reciprocating compressors associated with the HC3 project, therefore, a BAT analysis is not applicable.

The heaters associated with the project will each be equipped with a flue gas recirculation (FGR) system previously determined to meet the BAT emission standards.

The proposed centrifugal compressors associated with the HC3 project will comply with the NSPS OOOOb standards in addition to routing dry seal vents from the regen compressors to the process flare for increased emissions reduction.

Best Available Technology Costs

Device	Direct Cost	Indirect Cost	Total Cost	Annual Operating Cost	PTE Change (TPY)

Provide emission increases and decreases in allowable (or potential) and actual emissions within the last five (5) years for applicable PSD pollutant(s) if the facility is an existing major facility (PSD purposes).

A major stationary source is defined as either a source in one of the 28 source categories identified in 40 CFR 52.21 that has a potential to emit 100 tons or more per year of any regulated NSR pollutant, or any other stationary source that has the potential to emit 250 tons or more per year of a regulated NSR pollutant.

The emissions increase associated with the Harmon Creek III project is less than 40 tpy for each regulated NSR pollutant. The Harmon Creek facility does not have the potential to emit more than 100 tpy of any regulated NSR pollutant and therefore, is not subject to a PSD review. Finally, the Harmon Creek III project is a separate project from the Harmon Creek I and II projects as gas processing plants are not designed or constructed until a demand exists from producers. MPLX has no control over if and when additional processing capacity may be required.

Section D - Additional Information (Continued) – *Not Applicable*

Indicate emission increases and decreases in tons per year (tpy), for volatile organic compounds (VOCs) and nitrogen oxides (NOx) for NSR applicability since January 1, 1991 or other applicable dates (see other applicable dates in instructions). The emissions increases include all emissions including stack, fugitive, material transfer, other emission generating activities, quantifiable emissions from exempted source(s), etc.

Permit number (if applicable)	Date issued	Indicate ***Yes*** or ***No*** if emission increases and decreases were used previously for netting	Source I. D. or Name	VOCs		NOx	
				Emission increases in potential to emit (tpy)	Creditable emission decreases in actual emissions (tpy)	Emission increases in potential to emit (tpy)	Creditable emission decreases in actual emissions (tpy)

If the source is subject to 25 Pa. Code Chapter 127, Subchapter E, New Source Review requirements,

a. Identify Emission Reduction Credits (ERCs) for emission offsets or demonstrate ability to obtain suitable ERCs for emission offsets.

b. Provide a demonstration that the lowest achievable emission rate (LAER) control techniques will be employed (if applicable).

c. Provide an analysis of alternate sites, sizes, production processes and environmental control techniques demonstrating that the benefits of the proposed source outweigh the environmental and social costs (if applicable).

Attach calculations and any additional information necessary to thoroughly evaluate compliance with all the applicable requirements of Article III and applicable requirements of the Clean Air Act adopted thereunder The Department may request additional information to evaluate the application such as a standby plan, a plan for air pollution emergencies, air quality modeling, etc.

Section E - Compliance Demonstration

Not Applicable – See Addendum A

Note: Complete this section if source is not a Title V facility. Title V facilities must complete Addendum A.

Method of Compliance Type: Check all that apply and complete all appropriate sections below

☐ Monitoring ☐ Testing ☐ Reporting

☐ Recordkeeping ☐ Work Practice Standard

Monitoring:

a. Monitoring device type (Parameter, CEM, etc):

b. Monitoring device location:

c. Describe all parameters being monitored along with the frequency and duration of monitoring each parameter:

Monitoring:

a. Monitoring device type (Parameter, CEM, etc):

b. Monitoring device location:

c. Describe all parameters being monitored along with the frequency and duration of monitoring each parameter:

Recordkeeping:

Describe what parameters will be recorded and the recording frequency:

Reporting:

a. Describe what is to be reported and frequency of reporting:

b. Reporting start date:_____

Section F - Flue and Air Contaminant Emission

1. Estimated Atmospheric Emissions*

Pollutant	Maximum emission rate			Calculation/ Estimation Method
	specify units (lb/mmscf) (lb/mmbtu)*	lbs/hr	tons/yr.	
PM	0.013	0.283	1.238	Manufacturer Guarantee
PM_{10}	0.013	0.283	1.238	Manufacturer Guarantee
SO_x	0.68	0.013	0.056	AP-42
CO	0.0398	0.866	3.792	Manufacturer Guarantee
NO_x	0.012	0.261	1.143	Manufacturer Guarantee
VOC	0.0192	0.418	1.829	Manufacturer Guarantee
HAPs	2.135	0.040	0.176	AP-42

* These emissions must be calculated based on the requested operating schedule and/or process rate e.g., operating schedule for maximum limits or restricted hours of operation and /or restricted throughput. Describe how the emission values were determined. Attach calculations.

2. Stack and Exhauster

Stack Designation/Number S038

List Source(s) or source ID exhausted to this stack: 038

% of flow exhausted to stack: 100

Stack height above grade (ft.) 25.7
Grade elevation (ft.) Approx 1170

Stack diameter (ft) or Outlet duct area (sq. ft.) 2.3

f. Weather Cap ☐ YES ☐ NO

Distance of discharge to nearest property line (ft.). Locate on topographic map.
Approx. 650 ft

Does stack height meet Good Engineering Practice (GEP)?
Yes

If modeling (estimating) of ambient air quality impacts is needed, attach a site plan with buildings and their dimensions and other obstructions. N/A

Location of stack** Latitude/Longitude Point of Origin	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
Approximate Location of Cryo III	40	24	13	80	21	34

Stack exhaust
Volume 19,264 lb/hr Temperature 462 °F Moisture N/A %

Indicate on an attached sheet the location of sampling ports with respect to exhaust fan, breeching, etc. Give all necessary dimensions.
N/A

Exhauster (attach fan curves) _____ in. of water _____ HP @ _____RPM.

** If the data and collection method codes differ from those provided on the General Information Form-Authorization Application, provide the additional detail required by that form on a separate form.

Section F - Flue and Air Contaminant Emission

1. Estimated Atmospheric Emissions*

Pollutant	Maximum emission rate			Calculation/ Estimation Method
	specify units (lb/mmscf) (lb/mmbtu)*	lbs/hr	tons/yr.	
PM	0.013	0.960	4.205	Manufacturer Guarantee
PM_{10}	0.013	0.960	4.205	Manufacturer Guarantee
SO_x	0.68	0.043	0.190	AP-42
CO	0.0398	2.939	12.874	Manufacturer Guarantee
NO_x	0.012	0.886	3.882	Manufacturer Guarantee
VOC	0.0192	1.418	6.210	Manufacturer Guarantee
HAPs	2.135	0.137	0.599	AP-42

* These emissions must be calculated based on the requested operating schedule and/or process rate e.g., operating schedule for maximum limits or restricted hours of operation and /or restricted throughput. Describe how the emission values were determined. Attach calculations.

2. Stack and Exhauster

Stack Designation/Number S039 and S040

List Source(s) or source ID exhausted to this stack:
039 and 040

% of flow exhausted to stack: 100

Stack height above grade (ft.) 30.8
Grade elevation (ft.) Approx 1160

Stack diameter (ft) or Outlet duct area (sq. ft.)
4

f. Weather Cap
☐ YES ☐ NO

Distance of discharge to nearest property line (ft.). Locate on topographic map.
Approx. 500 ft

Does stack height meet Good Engineering Practice (GEP)?
Yes

If modeling (estimating) of ambient air quality impacts is needed, attach a site plan with buildings and their dimensions and other obstructions. N/A

Location of stack** Latitude/Longitude Point of Origin	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
Approximate Location of Cryo III	40	24	10	80	21	34

Stack exhaust
Volume 71,950 lb/hr Temperature 585 °F Moisture N/A %

Indicate on an attached sheet the location of sampling ports with respect to exhaust fan, breeching, etc. Give all necessary dimensions.
N/A

Exhauster (attach fan curves) _____ in. of water _____ HP @ _____RPM.

** If the data and collection method codes differ from those provided on the General Information Form-Authorization Application, provide the additional detail required by that form on a separate form.

Section G - Attachments

Number and list all attachments submitted with this application below:

1. General Information Form
2. Plan Approval Application Forms
3. Compliance Review Form
4. Proof of Municipal Notification
5. Permitting Fees
6. Addendum A
7. Process Flow Description and Diagram
8. Site Map
9. Detailed Emission Estimates, including Manufacturer Information and Gas Analysis
10. Supporting Documentation, including:
    - Attachment A - Regulatory Review
    - Attachment B - RACT III Analysis
    - Attachment C - Best Available Technology Analysis
    - Attachment D - LDAR Program/28VHP Boilerplate Conditions
    - Attachment E - Methanol Questionnaire

Compliance Review Form

2700-PM-AQ0004 Rev. 6/2006

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

AIR POLLUTION CONTROL ACT COMPLIANCE REVIEW FORM

Fully and accurately provide the following information, as specified. Attach additional sheets as necessary.

Type of Compliance Review Form Submittal (check all that apply)

☐ Original Filing — Date of Last Compliance Review Form Filing:
☒ Amended Filing — 9/26/2023

Type of Submittal

☒ New Plan Approval ☐ New Operating Permit ☐ Renewal of Operating Permit
☐ Extension of Plan Approval ☐ Change of Ownership ☐ Periodic Submission (@ 6 mos)
☐ Other: _____

SECTION A. GENERAL APPLICATION INFORMATION

Name of Applicant/Permittee/("applicant")
(non-corporations-attach documentation of legal name)
MarkWest Liberty Midstream and Resources, L.L.C.

Address 1515 Arapahoe Street, Tower 1, Suite 1600
Denver, CO. 80202-2137

Telephone (303) 925-9200 **Taxpayer ID#** 30-0528059

Permit, Plan Approval or Application ID#

Identify the form of management under which the applicant conducts its business (check appropriate box)

☐ Individual ☐ Syndicate ☐ Government Agency
☐ Municipality ☐ Municipal Authority ☐ Joint Venture
☐ Proprietorship ☐ Fictitious Name ☐ Association
☒ Public Corporation ☐ Partnership ☐ Other Type of Business, specify below:
☐ Private Corporation ☐ Limited Partnership

Describe below the type(s) of business activities performed.

MarkWest Liberty Midstream and Resources, L.L.C. is a natural gas gathering and processing company.

SECTION B. GENERAL INFORMATION REGARDING "APPLICANT"

If applicant is a corporation or a division or other unit of a corporation, provide the names, principal places of business, state of incorporation, and taxpayer ID numbers of all domestic and foreign parent corporations (including the ultimate parent corporation), and all domestic and foreign subsidiary corporations of the ultimate parent corporation with operations in Pennsylvania. Please include all corporate divisions or units, (whether incorporated or unincorporated) and privately held corporations. (A diagram of corporate relationships may be provided to illustrate corporate relationships.) Attach additional sheets as necessary.

Unit Name	Principal Places of Business	State of Incorporation	Taxpayer ID	Relationship to Applicant
MPLX LP	Various	Delaware	27-0005456	Parent
MarkWest Energy Partners, L.P.	Various	Delaware	37-1802743	Subsidiary of MPLX LP
MarkWest Energy Operating Company, L.L.C.	Various	Delaware	27-0005448	Subsidiary of MarkWest Energy Partners, L.P.
MarkWest Liberty Gas Gathering, L.L.C.	Pennsylvania	Delaware	26-2368254	Subsidiary of MarkWest Energy Operating Company, L.L.C.
MarkWest Liberty Midstream & Resources, L.L.C.	Pennsylvania, Ohio, West Virginia	Delaware	30-0528059	***Applicant*** Subsidiary of MarkWest Liberty Gas Gathering, L.L.C.
MarkWest Liberty Bluestone, L.L.C.	Pennsylvania	Delaware	45-5100747	Subsidiary of MarkWest Liberty Midstream & Resources, L.L.C.
MarkWest Liberty Ethane Pipeline, L.L.C.	Pennsylvania, Ohio, West Virginia	Delaware	46-1374029	Subsidiary of MarkWest Liberty Midstream & Resources, L.L.C.
MarkWest Bluestone Ethane Pipeline, L.L.C.	Pennsylvania	Delaware	46-4866522	Subsidiary of MarkWest Liberty Midstream & Resources, L.L.C.
MarkWest Liberty NGL Pipeline, L.L.C.	Pennsylvania, Ohio, West Virginia	Delaware	82-1883261	Subsidiary of MarkWest Liberty Midstream & Resources, L.L.C.
MarkWest Mariner Pipeline, L.L.C.	Pennsylvania	Delaware	45-5147892	Subsidiary of MarkWest Liberty Midstream & Resources, L.L.C.

SECTION C. SPECIFIC INFORMATION REGARDING APPLICANT AND ITS "RELATED PARTIES"

Pennsylvania Facilities. List the name and location (mailing address, municipality, county), telephone number, and relationship to applicant (parent, subsidiary or general partner) of applicant and all Related Parties' places of business, and facilities in Pennsylvania. Attach additional sheets as necessary.

Unit Name	Street Address	County and Municipality	Telephone No.	Relationship to Applicant
Baker CS	151 Baker Station Road	Washington County / Amwell Township	(303) 925-9200	Applicant
Brigich CS	340 Brigich Road	Washington County / Chartiers Township	(303) 925-9200	Applicant
Carpenter CS	265 Old National Pike	Washington County / Donegal Township	(303) 925-9200	Applicant
Down Homes CS	2037 Sunnyhill Road	Washington County / Robinson Township	(303) 925-9200	Applicant
Dryer CS	819 Scenic Drive	Washington County / Independence Township	(303) 925-9200	Applicant
Fulton CS	103 Washington Ave	Washington County / Mt. Pleasant Township	(303) 925-9200	Applicant
Godwin CS	2158 Henderson Ave	Washington County / Canton Township	(303) 925-9200	Applicant
Harmon Creek Gas Plant	123 Point Pleasant Rd	Washington County / Smith Township	(303) 925-9200	Applicant
Hoskins CS	4026 Buffalo Creek Road	Washington County / Blaine Township	(303) 925-9200	Applicant
Houston Gas Plant	800 Western Avenue	Washington County / Chartiers Township	(303) 925-9200	Applicant
Imperial-Cibus Ranch CS	2213 Quiksilver Rd. 2199 Quiksilver Rd.	Washington County / Robinson Township	(303) 925-9200	Applicant
Johnston CS	210 Johnston Hill Road	Washington County / Chartiers Township	(303) 925-9200	Applicant
Lowry CS	100 Oakleaf Rd	Washington County / Hopewell Township	(303) 925-9200	Applicant
McMichael CS	1982 Hookstown Grade Rd.	Washington County / Independence Township	(303) 925-9200	Applicant
Redd CS	576 Redd Run Rd.	Washington County / Amwell Township	(303) 925-9200	Applicant
Shaw CS	492 Arden Mine Rd	Washington County / Chartiers Township	(303) 925-9200	Applicant
Smith CS	320 Point Pleasant Rd	Washington County / Smith Township	(303) 925-9200	Applicant
Stewart CS	185 Avella Road	Washington County / Mt. Pleasant Township	(303) 925-9200	Applicant
Three Brothers CS	858 Atlasburg Road	Washington County / Smith Township	(303) 925-9200	Applicant
Timberlake CS		Washington County / Buffalo Township	(303) 925-9200	Applicant
Tupta Day CS	200 Johnson Rd	Washington County / Amwell Township	(303) 925-9200	Applicant
Welling CS	165 Carlisle Rd	Washington County / Buffalo Township	(303) 925-9200	Applicant
Sarsen Gas Plant	774 Prospect Rd.	Butler County / Forward Township	(303) 925-9200	Subsidiary
Voll CS	318 Woodlands Rd. Evans City, PA	Butler County / Connoquenessing Township	(303) 925-9200	Subsidiary
Trillith CS	222 E Lancaster Rd	Butler County / Lancaster Township	(303) 925-9200	Subsidiary
Royal Oak CS	961 Brownsdale Rd	Butler County / Forward Township	(303) 925-9200	Subsidiary
Bluestone Gas Plant	440 Hartmann Rd.	Butler County / Jackson Township	(303) 925-9200	Subsidiary

Provide the names and business addresses of all general partners of the applicant and parent and subsidiary corporations, if any.

Name	Business Address
MPLX, LP	200 E. Hardin Street, Findlay, OH 45840
MarkWest Energy Partners, L.P.	1515 Arapahoe St, Tower 1, Suite 1600, Denver, CO 80202
MarkWest Energy Operating Company, L.L.C.	1515 Arapahoe St, Tower 1, Suite 1600, Denver, CO 80202
MarkWest Liberty Gas Gathering, L.L.C.	800 Western Avenue, Washington, PA 15301
MarkWest Liberty Midstream & Resources, L.L.C.	1515 Arapahoe St, Tower 1, Suite 1600, Denver, CO 80202
MarkWest Liberty Bluestone, L.L.C.	1515 Arapahoe St, Tower 1, Suite 1600, Denver, CO 80202
MarkWest Liberty Ethane Pipeline, L.L.C.	1515 Arapahoe St, Tower 1, Suite 1600, Denver, CO 80202
MarkWest Liberty Bluestone Ethane Pipeline, L.L.C.	1515 Arapahoe St, Tower 1, Suite 1600, Denver, CO 80202
MarkWest Liberty NGL Pipeline, L.L.C.	1515 Arapahoe St, Tower 1, Suite 1600, Denver, CO 80202
MarkWest Mariner Pipeline, L.L.C.	1515 Arapahoe St, Tower 1, Suite 1600, Denver, CO 80202

List the names and business address of persons with overall management responsibility for the process being permitted (i.e. plant manager).

Name	Business Address
Robert W. Shough, Operations Director, G&P East	4600 J. Barry Ct., Canonsburg, PA. 15317
Harold Rinehart, VP Operations Processing	4600 J. Barry Ct., Canonsburg, PA. 15317
Jonathan C. Jackson, VP Eastern Region G&P	4600 J. Barry Ct., Canonsburg, PA. 15317
Gregory S. Floerke, EVP & COO MPLX	1515 Arapahoe St, Tower 1, Suite 1600, Denver, CO. 80016

Plan Approvals or Operating Permits. List all plan approvals or operating permits issued by the Department or an approved local air pollution control agency under the APCA to the applicant or related parties that are currently in effect or have been in effect at any time 5 years prior to the date on which this form is notarized. This list shall include the plan approval and operating permit numbers, locations, issuance and expiration dates. Attach additional sheets as necessary.

Air Contamination Source	Plan Approval/ Operating Permit#	Location	Issuance Date	Expiration Date
Houston Gas Plant	PA-63-00936F	800 Western Ave	10/4/2012	4/2019 (Renewal Submitted 10/25/2018) (Plan Approval Submitted 4/27/2021)
Baker CS	GP5-63-00960E/AG5-63-00013A & GP9-63-00960B	151 Baker Station Road	6/28/2021	6/28/2026
Brigich CS	GP5-63-00954C	340 Brigich Road	5/11/2022	5/11/2027
Carpenter CS	GP5-63-00987A	265 Old National Pike	11/30/2022	11/30/2027
Down Homes CS	GP5-63-1009A	2037 Sunnyhill Road	6/30/2022	6/30/2027
Dryer CS	SOOP-63-00942	819 Scenic Drive	10/13/2020	10/13/2025

Fulton CS	SOOP-63-00937	103 Washington Ave	10/13/2020	10/13/2025
Godwin CS	SOOP-63-00934	2158 Henderson Ave	7/29/2021	7/29/2026
Harmon Creek Gas Plant	GP5-63-01011B PA-63-01011	123 Point Pleasant Rd	6/29/2022 4/12/2023	6/29/2027 3/28/2024
Hoskins CS	GP5-63-00938B	4026 Buffalo Creek Road	6/28/2022	6/28/2027
Imperial-Cibus Ranch CS	GP5-63-00992A	2213 Quiksilver Rd. 2199 Quiksilver Rd.	3/22/2022	3/22/2027
Johnston CS	SOOP-63-00933	210 Johnston Hill Road	3/22/2022	3/22/2027
Lowry CS	GP5-63-00947B	100 Oakleaf Rd	9/20/2022	9/20/2027
McMichael CS	GP5-04-00747	1982 Hookstown Grade Rd.	12/14/2023	12/14/2028
Redd CS	GP5-63-00962	576 Redd Run Rd.	7/2/2021	7/2/2026
Shaw CS	GP5-63-00940C	492 Arden Mine Rd	7/26/2022	7/26/2027
Smith CS	SOOP-63-00962	320 Point Pleasant Rd	Issued: 12/2/2019 Modified: 3/22/2022	12/2/2024
Stewart CS	SOOP-63-00939	185 Avella Road	7/6/2021	7/6/2026
Timberlake CS	GP5-63-01064/ AG5-63-00022A	305 Timberlake Road	7/30/2022	7/30/2027
Three Brothers CS	GP5-63-00969	858 Atlasburg Road	3/18/2019	3/18/2024
Tupta Day CS	GP5-63-00948E	200 Johnson Rd	1/10/2022	1/10/2027
Welling CS	GP5-00958A	165 Carlisle Rd	8/2/2022	8/2/2027
Sarsen Gas Plant	SOOP 10-00359	774 Prospect Rd.	12/03/2013	1/31/2024
Voll CS	SOOP-10-00367	318 Woodlands Rd. Evans City, PA	9/9/2020	8/31/2025
Trillith CS	GP5-10-370F	Southeast of intersection of Highway 79 an E Lancaster Rd	7/21/2022	6/30/2027
Royal Oak CS	SOOP 10-00390	961 Brownsdale Rd	12/16/2019	11/30/2024
Bluestone Gas Plant	TV-10-00368 PA-10-368G	440 Hartmann Rd.	11/3/2020	1/31/2025

Compliance Background. (Note: Copies of specific documents, if applicable, must be made available to the Department upon its request.) List all documented conduct of violations or enforcement actions identified by the Department pursuant to the APCA, regulations, terms and conditions of an operating permit or plan approval or order by applicant or any related party, using the following format grouped by source and location in reverse chronological order. Attach additional sheets as necessary. See the definition of "documented conduct" for further clarification. Unless specifically directed by the Department, deviations which have been previously reported to the Department in writing, relating to monitoring and reporting, need not be reported.

Date	Location	Plan Approval/ Operating Permit#	Nature of Documented Conduct	Type of Department Action	Status: Litigation Existing/Continuing or Corrected/Date	Dollar Amount Penalty
8/1/2023	Houston	63-00936F	Exceedance of 12-month rolling limit	Notice of Violation	Corrected/ 12/15/2022	N/A
11/14/2021	Houston	63-00936F	Failure to Operate and maintain a source or control device in accordance with the specifications	Notice of Violation	Corrected/Abated 1/14/2022 Penalty Paid: 12/16/2022	$7,832
2/6/2021	Houston	63-00936F	Visible emissions event	Notice of Violation	Corrected/Abated 2/16/2021	N/A
				Consent Assessment of Civil Penalty	Penalty Final Date: 10/6/2021	$5,200
11/23/2020	Houston	63-00936F	Visible emissions event	Notice of Violation	Corrected/Abated 11/23/2020	N/A
				Consent Assessment of Civil Penalty	Penalty Final Date: 10/6/2021	$5,200
7/9/2018	Houston	63-00936F	Powers and duties or DEP	Consent Decree	See Consent Decrees in Section Below	N/A
4/29/2021 4/23/2021 3/8/2021 1/25/2021	Harmon Creek	63-01011B	Failure to prevent visible emissions into the atmosphere	Notice of Violation	Corrected/Abated 4/23/2021	N/A
				Consent Assessment of Civil Penalty	Penalty Final Date: 10/5/2022	$5,400
9/6/2021	Down Homes CS Shaw CS Stewart CS	63-01009B 63-00940 63-00939	LDAR deviations	Notice of Violation	Corrected/Abated 3/22/2021	N/A
				Consent Assessment of Civil Penalty	Penalty Final Date: 10/6/2021	$19,500
10/2/2019	Smith CS Three Brothers CS	63-00968 63-00969	Failure to perform fractional analysis at inlet	Notice of Violation	Corrected/Abated 10/2/2019	N/A
				Consent Assessment of Civil Penalty	4/29/2020	$14,600
1/18/2019	Bluestone Gas Plant	10-00368	Powers and duties or DEP	Consent Decree	See Consent Decrees in Section Below	N/A
1/17/2019	Royal Oak CS Sarsen Gas Plant Bluestone Gas Plant	10-00390 10-00359 10-00368	Failure to submit operating permit fees	Notice of Violation	Corrected	N/A

List all incidents of deviations of the APCA, regulations, terms and conditions of an operating permit or plan approval or order by applicant or any related party, using the following format grouped by source and location in reverse chronological order. This list must include items both currently known and unknown to the Department. Attach additional sheets as necessary. See the definition of "deviations" for further clarification.

Date	Location	Plan Approval/ Operating Permit#	Nature of Deviation	Incident Status: Litigation Existing/Continuing Or Corrected/Date
July 6, 2015	Various	--	Pig Launcher/Receiver Permitting	Signed Consent Decree with USEPA and PADEP. 7/19/2018
2016	Houston Plant and Other Gas Plants	PA-63-00936F	LDAR	Signed Consent Decree with USEPA and PADEP. 1/9/2019
March 23, 2017	Sarsen Gas Processing Plant	SOOP 10-00359	NSPS Subpart KKK	Signed Consent Decree with USEPA. 3/26/2017
August 28, 2020	Sarsen Gas Processing Plant	SOOP 10-00359	NSPS Subpart OOOO LDAR	Signed Consent Agreement and Final Order with USEPA. Filed 8/28/2020.

CONTINUING OBLIGATION. Applicant is under a continuing obligation to update this form using the Compliance Review Supplemental Form if any additional deviations occur between the date of submission and Department action on the application.

VERIFICATION STATEMENT	
Subject to the penalties of Title 18 Pa.C.S. Section 4904 and 35 P.S. Section 4009(b)(2), I verify under penalty of law that I am authorized to make this verification on behalf of the Applicant/Permittee. I further verify that the information contained in this Compliance Review Form is true and complete to the best of my belief formed after reasonable inquiry. I further verify that reasonable procedures are in place to ensure that "documented conduct" and "deviations" as defined in 25 Pa Code Section 121.1 are identified and included in the information set forth in this Compliance Review Form.	
Signature	1/18/24 Date
Robert W. Shough Name (Print or Type)	
Operations Director Title	

Proof of Municipal Notification

MarkWest Liberty Midstream and Resources, L.L.C.
1515 Arapahoe Street
Tower 1, Suite 1600
Denver, CO 80202-2137
(800) 730-8388
(303) 925-9200
(303) 825-0902 Fax

January 17, 2024

UPS Tracking Number: 1Z2E23250191746379

Washington County Commissioners
Courthouse Square
100 West Beau Street
Suite 702
Washington, PA 15301

Re: MarkWest Liberty Midstream and Resources, L.L.C.
Harmon Creek Gas Plant
Plan Approval Application

Dear Commissioners:

This letter is being sent to notify the County Commissioners that MarkWest Liberty Midstream and Resources, L.L.C (MPLX) has applied to the Pennsylvania Department of Environmental Protection (PADEP) for an Air Quality Plan Approval for the Harmon Creek Gas Plant, located at 123 Point Pleasant Rd in Smith Township, Washington County, Pennsylvania.

MPLX seeks authorization to install and operate equipment associated with Harmon Creek Cryo III with a processing capacity of 330 MMSCFD and DeEthanizer II. In addition to the equipment currently authorized at the facility, MPLX proposes the installation and operation of the following air emission sources at the facility:

- One (1) cryogenic plant regenerative heater rated at a maximum heat input of 21.75 MMBtu/hr equipped with flue gas recirculation (FGR);
- Two (2) deethanizer hot medium oil (HMO) heaters rated at a maximum heat input of 73.85 MMBtu/hr equipped with FGR;
- One (1) 500-gallon methanol storage tank;
- One (1) high-pressure pig receiver controlled by the process flare;
- Three (3) electric-driven centrifugal compressors and associated dry gas venting;
- One (1) electric-driven reciprocating compressor; and
- Associated fugitive components.

De minimis emission increases associated with truck loadout operations, in addition to emissions from maintenance blowdowns and some pressure relief devices, where feasible, will be controlled by the existing process flare.

This notice is being provided in accordance with the requirements of 25 Pa. Code § 127.413 for municipal notification.

There is a 30-day comment period which begins upon receipt of this notice by the county. Anyone wishing to view this application may do so by making arrangements with:

Air Quality Program
PADEP - Southwest Regional Office
400 Waterfront Drive
Pittsburgh, PA. 15222
(412) 442-4000

If you have any questions about this application, please contact me at (412) 815-8886 or via email at ajuarez@marathonpetroleum.com.

Sincerely,

Alexandra M. Juarez
Environmental Engineer

cc: MarkWest file

Proof of Delivery

Dear Customer,

This notice serves as proof of delivery for the shipment listed below.

Tracking Number

1Z2E23250191746379

Weight

1.00 LBS

Service

UPS Next Day Air®

Shipped / Billed On

01/15/2024

Delivered On

01/19/2024 10:19 A.M.

Delivered To

WASHINGTON, PA, US
Received By

MEEK

Please print for your records as photo and details are only available for a limited time.

Sincerely,

UPS

Tracking results provided by UPS: 01/19/2024 10:28 A.M. EST

MarkWest Liberty Midstream and Resources, L.L.C.
1515 Arapahoe Street
Tower 1, Suite 1600
Denver, CO 80202-2137
(800) 730-8388
(303) 925-9200
(303) 825-0902 Fax

January 17, 2024

UPS Tracking Number: 1Z2E2325NP98261329

Township Supervisors
Smith Township
1848 Smith Township State Road
Slovan, PA. 15078

Re: MarkWest Liberty Midstream and Resources, L.L.C.
Harmon Creek Gas Plant
Plan Approval Application

Dear Supervisors:

This letter is being sent to notify the Township Supervisors that MarkWest Liberty Midstream and Resources, L.L.C (MPLX) has applied to the Pennsylvania Department of Environmental Protection (PADEP) for an Air Quality Plan Approval for the Harmon Creek Gas Plant, located at 123 Point Pleasant Rd in Smith Township, Washington County, Pennsylvania.

MPLX seeks authorization to install and operate equipment associated with Harmon Creek Cryo III with a processing capacity of 330 MMSCFD and DeEthanizer II. In addition to the equipment currently authorized at the facility, MPLX proposes the installation and operation of the following air emission sources at the facility:

- One (1) cryogenic plant regenerative heater rated at a maximum heat input of 21.75 MMBtu/hr equipped with flue gas recirculation (FGR);
- Two (2) deethanizer hot medium oil (HMO) heaters rated at a maximum heat input of 73.85 MMBtu/hr equipped with FGR;
- One (1) 500-gallon methanol storage tank;
- One (1) high-pressure pig receiver controlled by the process flare;
- Three (3) electric-driven centrifugal compressors and associated dry gas venting;
- One (1) electric-driven reciprocating compressor; and
- Associated fugitive components.

De minimis emission increases associated with truck loadout operations, in addition to emissions from maintenance blowdowns and some pressure relief devices, where feasible, will be controlled by the existing process flare.

This notice is being provided in accordance with the requirements of 25 Pa. Code § 127.413 for municipal notification.

There is a 30-day comment period which begins upon receipt of this notice by the county. Anyone wishing to view this application may do so by making arrangements with:

Air Quality Program
PADEP - Southwest Regional Office
400 Waterfront Drive
Pittsburgh, PA. 15222
(412) 442-4000

If you have any questions about this application, please contact me at (412) 815-8886 or via email at ajuarez@marathonpetroleum.com.

Sincerely,

Alexandra M. Juarez
Environmental Engineer

cc: MarkWest file

Proof of Delivery

Dear Customer,

This notice serves as proof of delivery for the shipment listed below.

Tracking Number

1Z2E2325NP98261329

Service

UPS Next Day Air® Early

Shipped / Billed On

01/17/2024

Delivered On

01/19/2024 7:52 A.M.

Delivered To

SLOVAN, PA, US
Received By

KRIZNIK

Please print for your records as photo and details are only available for a limited time.

Sincerely,

UPS

Tracking results provided by UPS: 01/19/2024 8:40 A.M. EST

Permitting Fee Form

2700-PM-BAQ0030e 1/2021

pennsylvania DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

AIR QUALITY FEES FOR NEW PLAN APPROVAL

Company Information	
Federal Tax ID: 30-0528059	Firm Name: MarkWest Liberty Midstream and Resources, L.L.C.
Permit # (If any): 63-01011A	Facility Name: Harmon Creek Gas Plant
Municipality: Smith Township	County: Washington
Contact Person Name: Allie Juarez	Telephone Number: 412-815-8886
E-mail: ajuarez@marathonpetroleum.com	

New Plan Approval (The following fees are cumulative.)

Line #	Check the appropriate boxes below	Type of review requested	Fee 2021 - 2025	Total Fees
1	Base Fee	Subchapter B	$2,500	$2,500
2	☐	New Source Review, Subchapter E	$7,500	
3	☒	NSPS/NESHAP /MACT standard A. # of NSPS: (Dc, OOOOb) 2 B. # of NESHAP/MACT: ____ C. Add lines A and B: ____ D. Maximum applicable standards: 3 E. Enter smaller of line C or line D: 2 Multiply line E by $2,500 and enter the amount in the "Total Fees" column.	$5,000	$5,000
4	☐	Case-by-Case MACT	$9,500	
5	☐	Prevention of Significant Deterioration (PSD) requirements. Subchapter D	$32,500	
6	☐	Plantwide Applicability Limit (PAL) for NSR regulated pollutants or PAL for PSD regulated pollutants or both	$7,500	
7	☐	Risk Assessment Analysis – Inhalation only	$10,000	
8	☐	Risk Assessment Analysis – Multi-pathway	$25,000	
Add Lines 1 thru 8 of Total Fees column and write it here. →				$7,500

Addendum A

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

Addendum A: Source Applicable Requirements

Describe and cite all applicable requirements pertaining to this source.
Note: A Method of Compliance Worksheet (Addendum 1) must be completed for each requirement listed.

Group #1 (Combustion Source >10 MMBtu/hr and <50 MMBtu/hr, Source IDs 038)
Group #2 (Combustion Source >10 MMBtu/hr and <100 MMBtu/hr, Source IDs 039 and 040)
Group #3 (Centrifugal Compressors, Source ID 602)
Group #4 (Fugitive Components, Source ID 701)

Citation Number	Citation Limitation	Limitation Used
25 Pa. Code 123.11 (Entire site and Group #1)	0.4 lb/MMBtu of PM for combustion unit between 2.5 MMBtu/hr and 50 MMBtu/hr	0.013 lb/MMBtu
25 Pa. Code 127.12b (Group #2)	BAT Conditions for NOx and CO	NA
25 Pa. Code 123.22 (Entire site and Group #2)	4.0 lb/MMBtu of SO_2 over a 1-hour period	NA
25 Pa. Code 123.41 (Entire site, Group #2)	Visible emissions may not be equal to or greater than 20% for 3 mins in 1 hour or may not be equal to or greater than 60% at any time.	NA
40 CFR Part 60 Subpart Dc (Group #2)	Recordkeeping and Reporting Requirements	NA
40 CFR Part 60 Subpart OOOOb (Group #3)	Volumetric flow measurement	NA
40 CFR Part 60 Subpart OOOOb (Group #4)	Equipment Leak Standards	NA
25 Pa. Code 123.1 (Entire site)	Prohibition of Fugitive Emissions	NA
25 Pa. Code 123.2 (Entire site)	Fugitive particulate matter outside property	NA
25 Pa. Code 123.13 (Entire site)	Process Particulate Emissions	NA
25 Pa. Code 123.14 (Entire site)	Open Burning Requirements	NA
25 Pa. Code 123.21 (Entire site)	500 ppmv SO_2	NA
25 Pa. Code 123.31	Odor Emissions	NA

(Entire site)		
25 Pa. Code 127.12b (Source ID 702)	Recordkeeping and Report Requirements	NA

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

Addendum 1
Method Of Compliance Worksheet

SECTION 1. APPLICABLE REQUIREMENT

Federal Tax Id:	30-0528059	**Firm Name:**	MarkWest Liberty Midstream & Resources, LLC
Plant Code:		**Plant Name:**	Harmon Creek Gas Plant

Applicable Requirement for: (please check only one box below)

☒ **The entire site**

☒ **A group of sources, Group ID:** Group #1 (Combustion Source >10 MMBtu/hr and <50 MMBtu/hr, Source IDs 039)

☐ **A single source, Unit ID:**

☐ **Alternative Scenario, Scenario Name:**

Citation #: 25 Pa. Code § 123.11

Compliance Method based upon: ☒ **Applicable Requirement** ☐ **Gap Filling Requirement**

Method of Compliance Type: (Check all that applies and complete all appropriate sections below)

☐ **Monitoring** ☐ **Testing** ☐ **Reporting**

☒ **Record Keeping** ☐ **Work Practice Standard**

Section 2: Monitoring

1. **Monitoring device type (stack test, CEM, etc.):**
2. **Monitoring device location:**

Describe all parameters being monitored along with the frequency and duration of monitoring each parameter:

3. **How will data be reported:**

Section 3: Testing

1. Reference Test Method Description:

2. Reference Test Method Citation:

Section 4: Record Keeping

Describe what parameters will be recorded and the frequency of recording:

Keep records of gas combusted and use the AP-42 PM emission factor to demonstrate compliance with the limitation

Section 5: Reporting

Describe what is to be reported and the frequency of reporting:

1. Reporting start date:

Section 6: Work Practice Standard

Describe any work practice standards:

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

Addendum 1
Method Of Compliance Worksheet

SECTION 1. APPLICABLE REQUIREMENT

Federal Tax Id:	30-0528059	**Firm Name:**	MarkWest Liberty Midstream & Resources, LLC
Plant Code:		**Plant Name:**	Harmon Creek Gas Plant

Applicable Requirement for: (please check only one box below)

☐ **The entire site**

☒ **A group of sources, Group ID:** Group #2 (Combustion Source >10 MMBtu/hr and <100 MMBtu/hr, Source IDs 039 and 040)

☐ **A single source, Unit ID:**

☐ **Alternative Scenario, Scenario Name:**

Citation #: 25 Pa. Code § 123.12b

Compliance Method based upon: ☒ **Applicable Requirement** ☐ **Gap Filling Requirement**

Method of Compliance Type: (Check all that applies and complete all appropriate sections below)

☐ **Monitoring** ☐ **Testing** ☐ **Reporting**

☒ **Record Keeping** ☒ **Work Practice Standard**

Section 2: Monitoring

4. Monitoring device type (stack test, CEM, etc.):

5. Monitoring device location:

Describe all parameters being monitored along with the frequency and duration of monitoring each parameter:

6. How will data be reported:

Section 3: Testing

3. Reference Test Method Description:

4. Reference Test Method Citation:

Section 4: Record Keeping

Describe what parameters will be recorded and the frequency of recording:

Keep records of gas combusted and use guaranteed emission factor to demonstrate compliance with the limitations

Section 5: Reporting

Describe what is to be reported and the frequency of reporting:

2. Reporting start date:

Section 6: Work Practice Standard

Describe any work practice standards:

Operate heater in accordance with manufacturers specificationsand conduct recommended tune-up/inspections to ensure compliance

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

Addendum 1
Method Of Compliance Worksheet

SECTION 1. APPLICABLE REQUIREMENT

Federal Tax Id:	30-0528059	**Firm Name:**	MarkWest Liberty Midstream & Resources, LLC
Plant Code:		**Plant Name:**	Harmon Creek Gas Plant

Applicable Requirement for: (please check only one box below)

☒ **The entire site**

☒ **A group of sources, Group ID:** Group #2 (Combustion Source >10 MMBtu/hr and <100 MMBtu/hr, Source IDs 039 and 040)

☐ **A single source, Unit ID:**

☐ **Alternative Scenario, Scenario Name:**

Citation #: 25 Pa. Code § 123.22

Compliance Method based upon: ☒ **Applicable Requirement** ☐ **Gap Filling Requirement**

Method of Compliance Type: (Check all that applies and complete all appropriate sections below)

☐ **Monitoring** ☐ **Testing** ☐ **Reporting**

☒ **Record Keeping** ☐ **Work Practice Standard**

Section 2: Monitoring

7. Monitoring device type (stack test, CEM, etc.):

8. Monitoring device location:

Describe all parameters being monitored along with the frequency and duration of monitoring each parameter:

9. How will data be reported:

Section 3: Testing

5. Reference Test Method Description:

6. Reference Test Method Citation:

Section 4: Record Keeping

Describe what parameters will be recorded and the frequency of recording:

Keep records of gas combusted and sulfur content to demonstrate compliance with the limitation

Section 5: Reporting

Describe what is to be reported and the frequency of reporting:

3. Reporting start date:

Section 6: Work Practice Standard

Describe any work practice standards:

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

Addendum 1
Method Of Compliance Worksheet

SECTION 1. APPLICABLE REQUIREMENT

Federal Tax Id:	30-0528059	**Firm Name:**	MarkWest Liberty Midstream & Resources, LLC
Plant Code:		**Plant Name:**	Harmon Creek Gas Plant

Applicable Requirement for: (please check only one box below)

☒ **The entire site**

☒ **A group of sources, Group ID:** Group #2 (Combustion Source >10 MMBtu/hr and <100 MMBtu/hr, Source IDs 039 and 040)

☐ **A single source, Unit ID:**

☐ **Alternative Scenario, Scenario Name:**

Citation #: 25 Pa. Code § 123.41

Compliance Method based upon: ☒ **Applicable Requirement** ☐ **Gap Filling Requirement**

Method of Compliance Type: (Check all that applies and complete all appropriate sections below)

☒ **Monitoring** ☐ **Testing** ☐ **Reporting**

☒ **Record Keeping** ☐ **Work Practice Standard**

Section 2: Monitoring

10. Monitoring device type (stack test, CEM, etc.): Observations using Method 9 or Method 22

11. Monitoring device location: NA

Describe all parameters being monitored along with the frequency and duration of monitoring each parameter:

Opacity of emissions

12. How will data be reported: NA

Section 3: Testing

7. Reference Test Method Description: _____

8. Reference Test Method Citation: _____

Section 4: Record Keeping

Describe what parameters will be recorded and the frequency of recording:

Maintain log of visible emissions observations

Section 5: Reporting

Describe what is to be reported and the frequency of reporting:

4. Reporting start date: _____

Section 6: Work Practice Standard

Describe any work practice standards:

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF AIR QUALITY

Addendum 1
Method Of Compliance Worksheet

SECTION 1. APPLICABLE REQUIREMENT

Federal Tax Id:	30-0528059	**Firm Name:**	MarkWest Liberty Midstream & Resources, LLC
Plant Code:		**Plant Name:**	Harmon Creek Gas Plant

Applicable Requirement for: (please check only one box below)

☐ **The entire site**

☒ **A group of sources, Group ID:** Group #2 (Combustion Source >10 MMBtu/hr and <100 MMBtu/hr, Source IDs 039 and 040)

☐ **A single source, Unit ID:**

☐ **Alternative Scenario, Scenario Name:**

Citation #: 40 CFR Part 60 Subpart Dc

Compliance Method based upon: ☒ **Applicable Requirement** ☐ **Gap Filling Requirement**

Method of Compliance Type: (Check all that applies and complete all appropriate sections below)

☐ **Monitoring** ☐ **Testing** ☒ **Reporting**

☒ **Record Keeping** ☐ **Work Practice Standard**

Section 2: Monitoring

13. Monitoring device type (stack test, CEM, etc.):

14. Monitoring device location:

Describe all parameters being monitored along with the frequency and duration of monitoring each parameter:

15. How will data be reported:

Section 3: Testing

9. Reference Test Method Description:

10. Reference Test Method Citation:

Section 4: Record Keeping

Describe what parameters will be recorded and the frequency of recording:

Keep records of hours operated/gas combusted per §60.48c(g)(2)

Section 5: Reporting

Describe what is to be reported and the frequency of reporting:

Notification of the construction start date within 30 days and start up notification within 15 days (§60.7(a)(1) and (3))

Notification 60 days prior to any physical or operational change that increases emissions unless exempt (§60.7(a)(4))

5. Reporting start date: Specified above

Section 6: Work Practice Standard

Describe any work practice standards:

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Method Of Compliance Worksheet

SECTION 1. APPLICABLE REQUIREMENT

Federal Tax Id:	30-0528059	**Firm Name:**	MarkWest Liberty Midstream & Resources, LLC
Plant Code:		**Plant Name:**	Harmon Creek Gas Plant

Applicable Requirement for: (please check only one box below)

☐ **The entire site**

☒ **A group of sources, Group ID:** Group #3 (Centrifugal Compressors, Source ID 602)

☐ **A single source, Unit ID:**

☐ **Alternative Scenario, Scenario Name:**

Citation #: 40 CFR Part 60 Subpart OOOOb

Compliance Method based upon: ☒ **Applicable Requirement** ☐ **Gap Filling Requirement**

Method of Compliance Type: (Check all that applies and complete all appropriate sections below)

☐ **Monitoring** ☐ **Testing** ☒ **Reporting**

☒ **Record Keeping** ☒ **Work Practice Standard**

Section 2: Monitoring

16. Monitoring device type (stack test, CEM, etc.): As required under per §60.5380b(a)(6)

17. Monitoring device location: Dry seal vents

Describe all parameters being monitored along with the frequency and duration of monitoring each parameter:

Volumetric measurements as required under per §60.5380b(a)(6)

18. How will data be reported: See Reporting

Section 3: Testing

11. Reference Test Method Description:

12. Reference Test Method Citation:

Section 4: Record Keeping

Describe what parameters will be recorded and the frequency of recording:

Records as required per §60.5420b(c)(4), (8), and (13)

Section 5: Reporting

Describe what is to be reported and the frequency of reporting:

Submit reports per §60.5420b(b)(1),(5), and (11)

6. Reporting start date:

Section 6: Work Practice Standard

Describe any work practice standards:

Repair any emission rate exceedances as required under §60.5380b(a)(8)

As an alternative to the monitoring requirements, reduce VOC and methane emissions by 95% per §60.5380b(a)(9)

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SECTION 1. APPLICABLE REQUIREMENT

Federal Tax Id:	30-0528059	**Firm Name:**	MarkWest Liberty Midstream & Resources, LLC
Plant Code:		**Plant Name:**	Harmon Creek Gas Plant

Applicable Requirement for: (please check only one box below)

☐ **The entire site**

☒ **A group of sources, Group ID:** Group #4 (Fugitive Components, Source ID 701)

☐ **A single source, Unit ID:**

☐ **Alternative Scenario, Scenario Name:**

Citation #: 40 CFR Part 60 Subpart OOOOb

Compliance Method based upon: ☒ **Applicable Requirement** ☐ **Gap Filling Requirement**

Method of Compliance Type: (Check all that applies and complete all appropriate sections below)

☒ **Monitoring** ☐ **Testing** ☒ **Reporting**

☐ **Record Keeping** ☒ **Work Practice Standard**

Section 2: Monitoring

19. Monitoring device type (stack test, CEM, etc.): LDAR Program – See Attachment D

20. Monitoring device location: Fugitive components

Describe all parameters being monitored along with the frequency and duration of monitoring each parameter:

Monitoring frequency meeting requirements per §60.5400b depending on monitoring method

21. How will data be reported: See Reporting Below

Section 3: Testing

13. Reference Test Method Description:

14. Reference Test Method Citation:

Section 4: Record Keeping

Describe what parameters will be recorded and the frequency of recording:

Maintain records of LDAR program monitoring per §60.5420b(c)(8), (10), and (12) and §60.5421b

Section 5: Reporting

Describe what is to be reported and the frequency of reporting:

Notification of the construction start date within 30 days and start up notification within 15 days (§§60.7(a)(1) and (3))

Submit semiannual reports per §60.5420b(b)(1) and (11) and §60.5422b

7. Reporting start date:

Section 6: Work Practice Standard

Describe any work practice standards:

Make repairs in accordance with §60.5400b

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SECTION 1. APPLICABLE REQUIREMENT

Federal Tax Id:	30-0528059	**Firm Name:**	MarkWest Liberty Midstream & Resources, LLC
Plant Code:		**Plant Name:**	Harmon Creek Gas Plant

Applicable Requirement for: (please check only one box below)

☒ **The entire site**

☐ **A group of sources, Group ID:**

☐ **A single source, Unit ID:**

☐ **Alternative Scenario, Scenario Name:**

Citation #: 25 Pa. Code 123.1 (Prohibition of Fugitive Emissions)

Compliance Method based upon: ☒ **Applicable Requirement** ☐ **Gap Filling Requirement**

Method of Compliance Type: (Check all that applies and complete all appropriate sections below)

☒ **Monitoring** ☐ **Testing** ☐ **Reporting**

☒ **Record Keeping** ☒ **Work Practice Standard**

Section 2: Monitoring

22. Monitoring device type (stack test, CEM, etc.): Observations

23. Monitoring device location: Varies

Describe all parameters being monitored along with the frequency and duration of monitoring each parameter:

Fugitive emissions

24. How will data be reported: NA

Section 3: Testing

15. Reference Test Method Description:

16. Reference Test Method Citation:

Section 4: Record Keeping

Describe what parameters will be recorded and the frequency of recording:

Log of observations

Section 5: Reporting

Describe what is to be reported and the frequency of reporting:

8. Reporting start date:

Section 6: Work Practice Standard

Describe any work practice standards:

Take actions to minimize fugitive emissions

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SECTION 1. APPLICABLE REQUIREMENT

Federal Tax Id:	30-0528059	**Firm Name:**	MarkWest Liberty Midstream & Resources, LLC
Plant Code:		**Plant Name:**	Harmon Creek Gas Plant

Applicable Requirement for: (please check only one box below)

☒ **The entire site**

☐ **A group of sources, Group ID:**

☐ **A single source, Unit ID:**

☐ **Alternative Scenario, Scenario Name:**

Citation #: 25 Pa. Code 123.2 (Fugitive PM Emissions Outside Property)

Compliance Method based upon: ☒ **Applicable Requirement** ☐ **Gap Filling Requirement**

Method of Compliance Type: (Check all that applies and complete all appropriate sections below)

☒ **Monitoring** ☐ **Testing** ☐ **Reporting**

☒ **Record Keeping** ☒ **Work Practice Standard**

Section 2: Monitoring

25. Monitoring device type (stack test, CEM, etc.): Observations

26. Monitoring device location: Varies

Describe all parameters being monitored along with the frequency and duration of monitoring each parameter:

Fugitive emissions

27. How will data be reported: NA

Section 3: Testing

17. Reference Test Method Description:

18. Reference Test Method Citation:

Section 4: Record Keeping

Describe what parameters will be recorded and the frequency of recording:

Log of observations

Section 5: Reporting

Describe what is to be reported and the frequency of reporting:

9. Reporting start date:

Section 6: Work Practice Standard

Describe any work practice standards:

Take actions to minimize fugitive emissions

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SECTION 1. APPLICABLE REQUIREMENT

Federal Tax Id:	30-0528059	**Firm Name:**	MarkWest Liberty Midstream & Resources, LLC
Plant Code:		**Plant Name:**	Harmon Creek Gas Plant

Applicable Requirement for: (please check only one box below)

☒ **The entire site**

☐ **A group of sources, Group ID:**

☐ **A single source, Unit ID:**

☐ **Alternative Scenario, Scenario Name:**

Citation #: 25 Pa. Code 123.13 Process Particulate Emissions

Compliance Method based upon: ☒ **Applicable Requirement** ☐ **Gap Filling Requirement**

Method of Compliance Type: (Check all that applies and complete all appropriate sections below)

☐ **Monitoring** ☐ **Testing** ☐ **Reporting**

☐ **Record Keeping** ☒ **Work Practice Standard**

Section 2: Monitoring

28. Monitoring device type (stack test, CEM, etc.):

29. Monitoring device location:

Describe all parameters being monitored along with the frequency and duration of monitoring each parameter:

30. How will data be reported:

Section 3: Testing

19. Reference Test Method Description:

20. Reference Test Method Citation:

Section 4: Record Keeping

Describe what parameters will be recorded and the frequency of recording:

Section 5: Reporting

Describe what is to be reported and the frequency of reporting:

Keep records of gas combusted and use the AP-42 PM emission factor to demonstrate compliance with the limitation

10. Reporting start date:

Section 6: Work Practice Standard

Describe any work practice standards:

Operate in accordance with manufacturers specifications to minimize particulate emissions

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SECTION 1. APPLICABLE REQUIREMENT

Federal Tax Id:	30-0528059	**Firm Name:**	MarkWest Liberty Midstream & Resources, LLC
Plant Code:		**Plant Name:**	Harmon Creek Gas Plant

Applicable Requirement for: (please check only one box below)

☒ **The entire site**

☐ **A group of sources, Group ID:**

☐ **A single source, Unit ID:**

☐ **Alternative Scenario, Scenario Name:**

Citation #: 25 Pa. Code 123.14 Open Burning Requirements

Compliance Method based upon: ☒ **Applicable Requirement** ☐ **Gap Filling Requirement**

Method of Compliance Type: (Check all that applies and complete all appropriate sections below)

☐ **Monitoring** ☐ **Testing** ☐ **Reporting**

☐ **Record Keeping** ☒ **Work Practice Standard**

Section 2: Monitoring

31. Monitoring device type (stack test, CEM, etc.):

32. Monitoring device location:

Describe all parameters being monitored along with the frequency and duration of monitoring each parameter:

33. How will data be reported:

Section 3: Testing

21. Reference Test Method Description: _____

22. Reference Test Method Citation: _____

Section 4: Record Keeping

Describe what parameters will be recorded and the frequency of recording:

_____

_____

_____

Section 5: Reporting

Describe what is to be reported and the frequency of reporting:

_____

_____

_____

11. Reporting start date: _____

Section 6: Work Practice Standard

Describe any work practice standards:

Open burning allowed only as approved (ex. - fire training exercises)

_____

_____

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SECTION 1. APPLICABLE REQUIREMENT

Federal Tax Id:	30-0528059	**Firm Name:**	MarkWest Liberty Midstream & Resources, LLC
Plant Code:		**Plant Name:**	Harmon Creek Gas Plant

Applicable Requirement for: (please check only one box below)

☒ **The entire site**

☐ **A group of sources, Group ID:**

☐ **A single source, Unit ID:**

☐ **Alternative Scenario, Scenario Name:**

Citation #: 25 Pa. Code 123.21 Process SO_2 Emissions

Compliance Method based upon: ☒ **Applicable Requirement** ☐ **Gap Filling Requirement**

Method of Compliance Type: (Check all that applies and complete all appropriate sections below)

☐ **Monitoring** ☐ **Testing** ☐ **Reporting**

☒ **Record Keeping** ☐ **Work Practice Standard**

Section 2: Monitoring

34. Monitoring device type (stack test, CEM, etc.):

35. Monitoring device location:

Describe all parameters being monitored along with the frequency and duration of monitoring each parameter:

36. How will data be reported:

Section 3: Testing

23. Reference Test Method Description:

24. Reference Test Method Citation:

Section 4: Record Keeping

Describe what parameters will be recorded and the frequency of recording:

Keep records of sulfur content of gas

Section 5: Reporting

Describe what is to be reported and the frequency of reporting:

12. Reporting start date:

Section 6: Work Practice Standard

Describe any work practice standards:

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SECTION 1. APPLICABLE REQUIREMENT

Federal Tax Id:	30-0528059	**Firm Name:**	MarkWest Liberty Midstream & Resources, LLC
Plant Code:		**Plant Name:**	Harmon Creek Gas Plant

Applicable Requirement for: (please check only one box below)

☒ **The entire site**

☐ **A group of sources, Group ID:**

☐ **A single source, Unit ID:**

☐ **Alternative Scenario, Scenario Name:**

Citation #: 25 Pa. Code 123.31 Odor Emissions

Compliance Method based upon: ☒ **Applicable Requirement** ☐ **Gap Filling Requirement**

Method of Compliance Type: (Check all that applies and complete all appropriate sections below)

☒ **Monitoring** ☐ **Testing** ☐ **Reporting**

☒ **Record Keeping** ☒ **Work Practice Standard**

Section 2: Monitoring

37. Monitoring device type (stack test, CEM, etc.): Observations

38. Monitoring device location: Property line

Describe all parameters being monitored along with the frequency and duration of monitoring each parameter:

Odors

39. How will data be reported: NA

Section 3: Testing

25. Reference Test Method Description:

26. Reference Test Method Citation:

Section 4: Record Keeping

Describe what parameters will be recorded and the frequency of recording:

Keep logs of observations for malodors crossing the property line

Section 5: Reporting

Describe what is to be reported and the frequency of reporting:

13. Reporting start date:

Section 6: Work Practice Standard

Describe any work practice standards:

Operate in accordance with manufacturers specifications to minimize particulate emissions

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SECTION 1. APPLICABLE REQUIREMENT

Federal Tax Id:	30-0528059	**Firm Name:**	MarkWest Liberty Midstream & Resources, LLC
Plant Code:		**Plant Name:**	Harmon Creek Gas Plant

Applicable Requirement for: (please check only one box below)

☐ **The entire site**

☐ **A group of sources, Group ID:**

☒ **A single source, Unit ID:** 702 – Truck Loadout

☐ **Alternative Scenario, Scenario Name:**

Citation #: 25 Pa. Code § 123.12b

Compliance Method based upon: ☒ **Applicable Requirement** ☐ **Gap Filling Requirement**

Method of Compliance Type: (Check all that applies and complete all appropriate sections below)

☐ **Monitoring** ☐ **Testing** ☐ **Reporting**

☒ **Record Keeping** ☒ **Work Practice Standard**

Section 2: Monitoring

40. Monitoring device type (stack test, CEM, etc.):

41. Monitoring device location:

Describe all parameters being monitored along with the frequency and duration of monitoring each parameter:

42. How will data be reported:

Section 3: Testing

27. Reference Test Method Description:

28. Reference Test Method Citation:

Section 4: Record Keeping

Describe what parameters will be recorded and the frequency of recording:

Keep records of liquids loaded from 702 on 12-month rolling basis

Section 5: Reporting

Describe what is to be reported and the frequency of reporting:

14. Reporting start date:

Section 6: Work Practice Standard

Describe any work practice standards:

Route loadout emissions to the flare during truck loadout operations

Process Flow Description
& Diagram

Process Flow Narrative
Harmon Creek

The Harmon Creek Gas Plant receives dehydrated and compressed natural gas from upstream gathering compressor station(s) for processing. The processing includes extracting natural gas liquids from the field gas and partial fractionation of the mixed natural gas liquids (NGLs) to natural gas products. The fractionation equipment at Harmon Creek includes stabilization, cryogenic separation, and de-ethanization fractionation. Because these processes are closed loop, the primary emission points (besides combustion emissions from the process heaters) are fugitive emissions from component leaks. Other emission sources include process safety valves (PSV) and maintenance depressurization which are controlled by the flare. The air-assisted elevated plant flare is used to control emissions from numerous process safety valves and vents throughout the plant as well as emissions from the pig launchers/receivers. The flare manufacturer, John Zink, designed the process flare to achieve a minimum DRE of 98% under the specific process conditions of Harmon Creek.

Stabilization Unit

As raw, wellhead gas traverses the Harmon Creek inlet system, the heavier components of the stream will condense and restrict flow. Regular pigging of inlet piping pushes the condensate into collection vessels known as Slug Catchers. The Slug Catchers house the condensate until enough inventory exists for Stabilizer operation. During Stabilizer operation, the condensate is fed to a Three Phase Separator where water, vapor, and condensate are separated. The water, oftentimes contaminated with sludge and triethylene glycol, is disposed of in the facility Closed Drain Tank and trucked out as needed. The condensate is sent to the Stabilizer tower for separation of light-end hydrocarbon from the heavier liquid. The light-end hydrocarbon, which flows from the overhead of the Stabilizer tower, is combined with vapor from the Three Phase Separator, compressed, and injected into the facility's inlet gas stream for Cryogenic processing. The Stabilizer tower liquid, similar in composition to C3+, flows to the C3+ Surge Tank and is pumped to the Houston facility for further fractionation.

Cryogenic Processing Plants

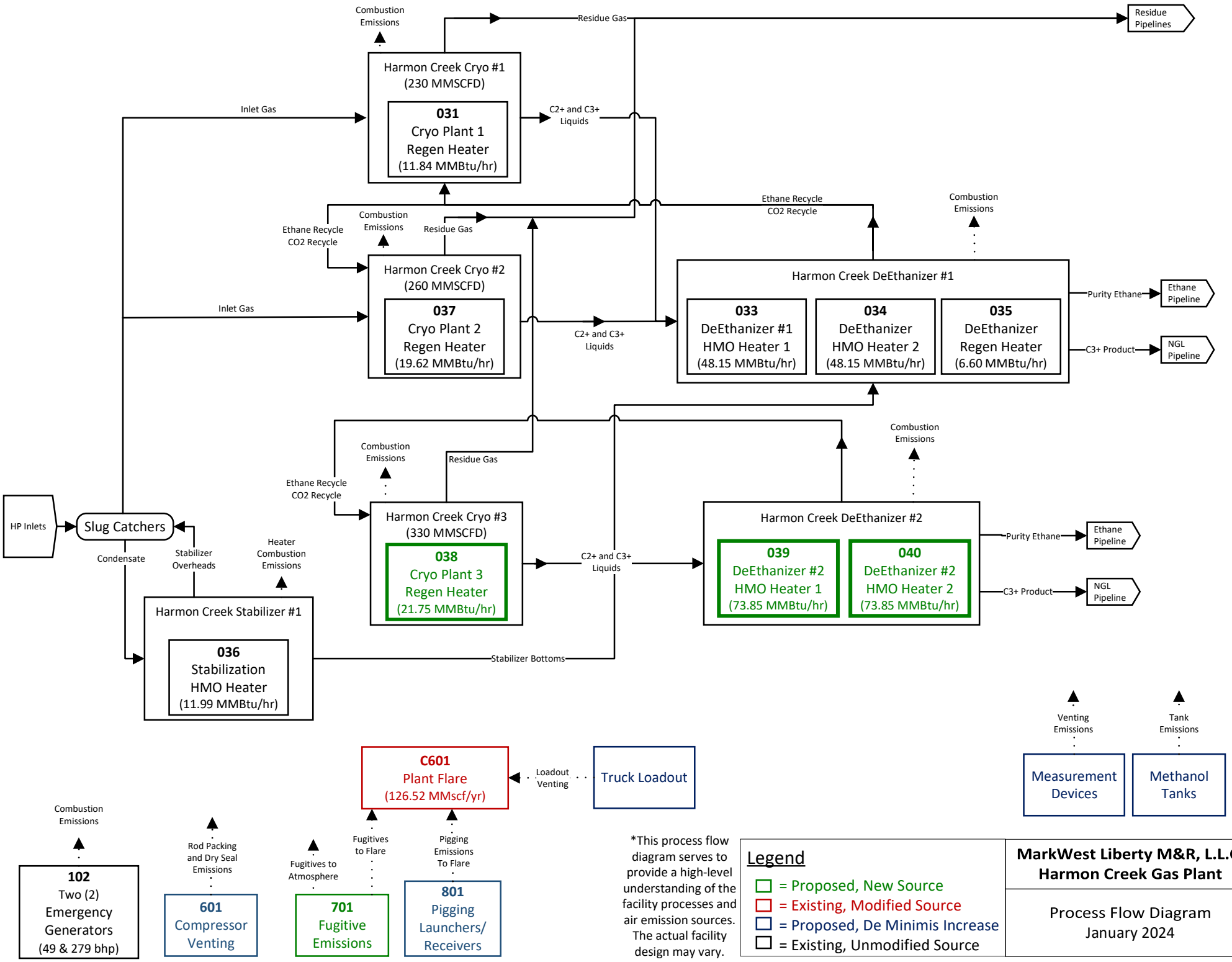
The cryogenic processing plants utilize a mole sieve to dry incoming gas and electrically driven compressors to cool the gas to facilitate separation of ethane and heavier hydrocarbon liquids from methane gas (i.e. it acts as a de-methanizer). The cryogenic plants receive field gas at high pressure from various producers that has undergone compression and dehydration at upstream compressor station(s). Upon arrival at Harmon Creek, the gas enters a molecular sieve tower which removes any remaining entrained water to prevent hydrates in the subsequent cryogenic process. The removal of the entrained water works by passing the gas through a tower packed with material that has a high affinity for water so that the water is removed from the gas stream by absorbing into the media. Three towers of each unit are used in parallel with two receiving gas while the third is being regenerated. The regenerative heaters are used to heat dry natural gas which desorbs the water from the media thus regenerating the tower and making it available for dewatering of the inlet gas. The gas used for regeneration is then cooled to condense the water and remove it from the system, after which the gas is re-routed to the inlet of the plant for processing. The streams leaving the cryogenic units consist of residue methane gas sent to the pipeline for distribution and C2+ liquids sent to the de-ethanizers. Emission points associated with the cryogenic plants include combustion emissions from the three (3) regenerative heaters (031,

037, and 038), fugitive emissions from component leaks (701), and rod packing emissions from the electric-driven compressors (601).

De-Ethanization Plant

Liquids from the cryogenic plants enter the de-ethanizers to separate out pure ethane from the C3+ hydrocarbons. The lighter ethane leaves through the top of the tower and is pumped to the ethane sales line. The heavier C3+ liquids collect at the bottom of the tower and are sent via pipeline for further processing (primarily at the Houston Gas Plant). Emission sources associated with the de-ethanizers include combustion emissions from the four (4) HMO heaters (033, 034, 039, and 040), one (1) regenerative heater (035), and fugitive emissions from component leaks (701).

There are two (2) emergency generators (102) onsite. These units provide backup power to the administrative building and control room in the event of a power outage.



*This process flow diagram serves to provide a high-level understanding of the facility processes and air emission sources. The actual facility design may vary.

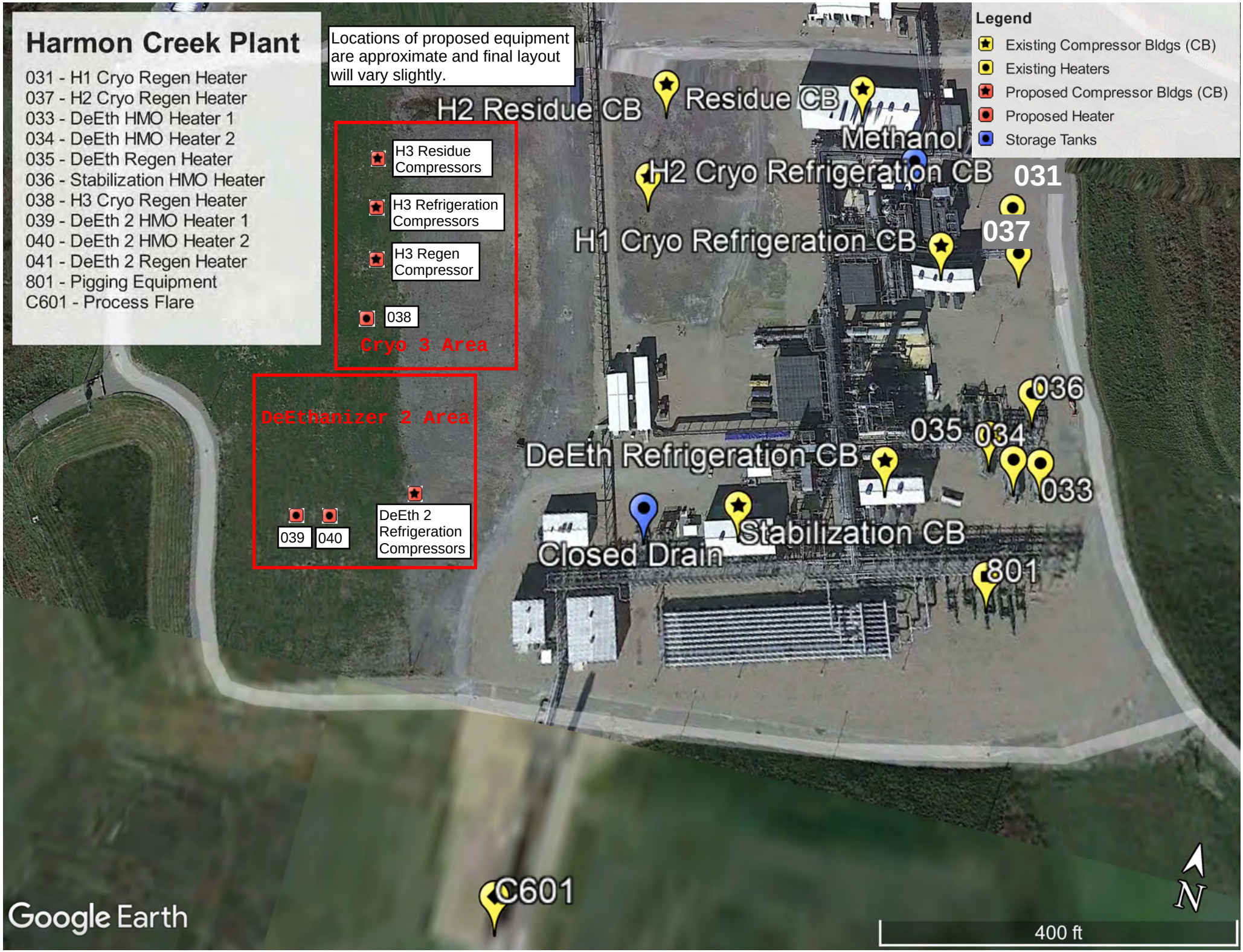
Legend

- ☐ = Proposed, New Source
- ☐ = Existing, Modified Source
- ☐ = Proposed, De Minimis Increase
- ☐ = Existing, Unmodified Source

MarkWest Liberty M&R, L.L.C.
Harmon Creek Gas Plant

Process Flow Diagram
January 2024

Site Map


Harmon Creek Plant
031 - H1 Cryo Regen Heater
037 - H2 Cryo Regen Heater
033 - DeEth HMO Heater 1
034 - DeEth HMO Heater 2
035 - DeEth Regen Heater
036 - Stabilization HMO Heater
038 - H3 Cryo Regen Heater
039 - DeEth 2 HMO Heater 1
040 - DeEth 2 HMO Heater 2
041 - DeEth 2 Regen Heater
801 - Pigging Equipment
C601 - Process Flare
Locations of proposed equipment are approximate and final layout will vary slightly.
Legend
Existing Compressor Bldgs (CB)
Existing Heaters
Proposed Compressor Bldgs (CB)
Proposed Heater
Storage Tanks
H2 Residue CB
Residue CB
Methanol
H2 Cryo Refrigeration CB
031
H1 Cryo Refrigeration CB
037
H3 Residue Compressors
H3 Refrigeration Compressors
H3 Regen Compressor
038
Cryo 3 Area
DeEthanizer 2 Area
036
035
034
DeEth Refrigeration CB
033
039
040
DeEth 2 Refrigeration Compressors
Closed Drain
Stabilization CB
801
C601
Google Earth
N
400 ft

Detailed Emission Estimates

MarkWest Liberty Midstream & Resources, L.L.C.
Harmon Creek Gas Plant

Summary of Potential Emissions

Criteria Pollutant Potential Emissions

Process/Facility	Source ID	Potential Emissions (lb/hr)					
		NOx	CO	VOC	SO_2	PM[1]	HAPs
Cryo Plant 1 Regen Heater (H-1711)	031	0.47	0.47	0.22	0.01	0.09	0.02
Cryo Plant 2 Regen Heater (H-2711)	037	0.20	0.71	0.34	0.01	0.23	0.03
Cryo Plant 3 Regen Heater (H-3711)	**038**	**0.26**	**0.87**	**0.42**	**0.01**	**0.28**	**0.04**
De-Ethanizer HMO Heater 1 (H-1767)	033	1.93	1.93	0.91	0.03	0.36	0.09
De-Ethanizer HMO Heater 2 (H-1768)	034	1.93	1.93	0.91	0.03	0.36	0.09
De-Ethanizer 2 HMO Heater 1 (H-3767)	**039**	**0.89**	**2.94**	**1.42**	**0.04**	**0.96**	**0.14**
De-Ethanizer 2 HMO Heater 2 (H-3768)	**040**	**0.89**	**2.94**	**1.42**	**0.04**	**0.96**	**0.14**
Stabilization HMO Heater (H-1769)	036	0.48	0.48	0.23	0.01	0.09	0.02
De-Ethanizer Regen Heater (H-1775)	035	0.26	0.26	0.13	0.00	0.05	0.01
Generac SD015	102	0.26	0.14	0.08	0.10	0.02	0.00
Generac SD150	102	1.31	0.55	0.41	0.10	0.04	0.01
Fugitives Emissions	701	--	--	--	--	--	--
Process Flare	C601	1.21	5.53	3.05	0.01	0.11	0.05
*Pigging**	*801*	--	--	--	--	--	--
*Blowdowns**	*601*	--	--	--	--	--	--
*Drain Tank Loadout**	*702*	--	--	--	--	--	--
Regen Dry Seal Vents*	***602***	--	--	--	--	--	--
Rod Packing	601	--	--	0.28	--	--	0.00
Residue Dry Seal Vents	**602**	**--**	**--**	**0.31**	**--**	**--**	**0.00**
Methanol Tanks	--	--	--	0.12	--	--	0.12
Measurement Devices	--	--	--	0.41	--	--	0.01
Future Site-Wide Emissions (lb/hr)		**10.08**	**18.76**	**10.66**	**0.40**	**3.55**	**0.77**

Process/Facility	Source ID	Potential Emissions (tpy)					
		NOx	CO	VOC	SO_2	PM[1]	HAPs
Cryo Plant 1 Regen Heater (H-1711)	031	2.07	2.07	0.98	0.03	0.39	0.10
Cryo Plant 2 Regen Heater (H-2711)	037	0.86	3.13	1.48	0.05	1.02	0.14
Cryo Plant 3 Regen Heater (H-3711)	**038**	**1.14**	**3.79**	**1.83**	**0.06**	**1.24**	**0.18**
De-Ethanizer HMO Heater 1 (H-1767)	033	8.44	8.44	4.01	0.12	1.57	0.39
De-Ethanizer HMO Heater 2 (H-1768)	034	8.44	8.44	4.01	0.12	1.57	0.39
De-Ethanizer 2 HMO Heater 1 (H-3767)	**039**	**3.88**	**12.87**	**6.21**	**0.19**	**4.21**	**0.60**
De-Ethanizer 2 HMO Heater 2 (H-3768)	**040**	**3.88**	**12.87**	**6.21**	**0.19**	**4.21**	**0.60**
Stabilization HMO Heater (H-1769)	036	2.10	2.10	1.00	0.03	0.39	0.10
De-Ethanizer Regen Heater (H-1775)	035	1.16	1.16	0.55	0.02	0.22	0.05
Generac SD015	102	0.07	0.04	0.02	0.03	0.01	0.00
Generac SD150	102	0.33	0.14	0.10	0.03	0.01	0.00
Fugitives Emissions	701	--	--	20.01	--	--	0.64
Process Flare	C601	5.32	24.23	13.34	0.04	0.50	0.23
*Pigging**	*801*	--	--	--	--	--	--
*Blowdowns**	*601*	--	--	--	--	--	--
*Drain Tank Loadout**	*702*	--	--	--	--	--	--
Regen Dry Seal Vents*	***602***	**--**	**--**	**--**	**--**	**--**	**--**
Rod Packing	601	--	--	1.22	--	--	0.01
Residue Dry Seal Vents	**602**	**--**	**--**	**1.34**	**--**	**--**	**0.00**
Methanol Tanks	--	--	--	0.53	--	--	0.53
Measurement Devices	--	--	--	1.81	--	--	0.03
Future Site-Wide Emissions (tpy)		**37.68**	**79.27**	**64.65**	**0.90**	**15.31**	**3.98**

[1] $PM = PM_{10} = PM_{2.5}$

* Emissions are controlled by the flare and thus, are accounted for in the process flare emissions.

Hazardous Air Pollutant Potential Emissions

Process/Facility	Source ID	HAPs - Potential Emissions (lb/hr)								
		Acetaldehyde	Acrolein	Benzene	Ethylbenzene	Formaldehyde	Methanol	n-Hexane	Toluene	Xylenes
Cryo Plant 1 Regen Heater (H-1711)	031	--	--	2.44E-05	--	8.70E-04	--	0.02	3.95E-05	--
Cryo Plant 2 Regen Heater (H-2711)	037	--	--	3.67E-05	--	1.31E-03	--	0.03	5.95E-05	--
Cryo Plant 3 Regen Heater (H-3711)	**038**	**--**	**--**	**4.48E-05**	**--**	**1.60E-03**	**--**	**0.04**	**7.25E-05**	**--**
De-Ethanizer HMO Heater 1 (H-1767)	033	--	--	9.91E-05	--	3.54E-03	--	0.08	1.60E-04	--
De-Ethanizer HMO Heater 2 (H-1768)	034	--	--	9.91E-05	--	3.54E-03	--	0.08	1.60E-04	--
De-Ethanizer 2 HMO Heater 1 (H-3767)	**039**	**--**	**--**	**1.52E-04**	**--**	**5.43E-03**	**--**	**0.13**	**2.46E-04**	**--**
De-Ethanizer 2 HMO Heater 2 (H-3768)	**040**	**--**	**--**	**1.52E-04**	**--**	**5.43E-03**	**--**	**0.13**	**2.46E-04**	**--**
Stabilization HMO Heater (H-1769)	036	--	--	2.47E-05	--	8.82E-04	--	0.02	4.00E-05	--
De-Ethanizer Regen Heater (H-1775)	035	--	--	1.36E-05	--	4.85E-04	--	0.01	2.20E-05	--
Generac SD015	102	2.89E-04	3.48E-05	3.51E-04	--	4.44E-04	--	--	1.54E-04	1.07E-04
Generac SD150	102	1.42E-03	1.72E-04	1.73E-03	--	2.19E-03	--	--	7.59E-04	5.29E-04
Fugitives Emissions	701	--	--	--	--	--	--	--	--	--
Process Flare	C601	--	--	3.83E-03	3.83E-03	--	--	0.02	6.78E-03	1.30E-03
*Pigging**	*801*	--	--	--	--	--	--	--	--	--
*Blowdowns**	*601*	--	--	--	--	--	--	--	--	--
*Drain Tank Loadout**	*702*	--	--	--	--	--	--	--	--	--
Regen Dry Seal Vents*	***602***	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**
Rod Packing	601	--	--	0.00	0.00	--	--	0.00	0.00	0.00
Residue Dry Seal Vents	**602**	**--**	**--**	**6.04E-04**	**6.04E-04**	**--**	**--**	**0.00**	**0.00**	**0.00**
Methanol Tanks	--	--	--	--	--	--	1.21E-01	--	--	--
Measurement Devices	--	--	--	5.19E-04	5.19E-04	--	--	0.00	9.19E-04	1.76E-04
Future Site-Wide Emissions (lb/hr)		**0.00**	**0.00**	**0.01**	**0.00**	**0.03**	**0.12**	**0.59**	**0.01**	**0.00**

Process/Facility	Source ID	HAPs - Potential Emissions (tpy)								
		Acetaldehyde	Acrolein	Benzene	Ethylbenzene	Formaldehyde	Methanol	n-Hexane	Toluene	Xylenes
Cryo Plant 1 Regen Heater (H-1711)	031	--	--	1.07E-04	--	3.81E-03	--	0.09	1.73E-04	--
Cryo Plant 2 Regen Heater (H-2711)	037	--	--	1.61E-04	--	5.75E-03	--	0.14	2.60E-04	--
Cryo Plant 3 Regen Heater (H-3711)	**038**	**--**	**--**	**1.96E-04**	**--**	**7.00E-03**	**--**	**0.17**	**3.18E-04**	**--**
De-Ethanizer HMO Heater 1 (H-1767)	033	--	--	4.34E-04	--	1.55E-02	--	0.37	7.03E-04	--
De-Ethanizer HMO Heater 2 (H-1768)	034	--	--	4.34E-04	--	1.55E-02	--	0.37	7.03E-04	--
De-Ethanizer 2 HMO Heater 1 (H-3767)	**039**	**--**	**--**	**6.66E-04**	**--**	**2.38E-02**	**--**	**0.57**	**1.08E-03**	**--**
De-Ethanizer 2 HMO Heater 2 (H-3768)	**040**	**--**	**--**	**6.66E-04**	**--**	**2.38E-02**	**--**	**0.57**	**1.08E-03**	**--**
Stabilization HMO Heater (H-1769)	036	--	--	1.08E-04	--	3.86E-03	--	0.09	1.75E-04	--
De-Ethanizer Regen Heater (H-1775)	035	--	--	5.95E-05	--	2.13E-03	--	0.05	9.64E-05	--
Generac SD015	102	7.22E-05	8.70E-06	8.78E-05	--	1.11E-04	--	--	3.85E-05	2.68E-05
Generac SD150	102	3.56E-04	4.29E-05	4.33E-04	--	5.47E-04	--	--	1.90E-04	1.32E-04
Fugitives Emissions	701	--	--	--	--	--	--	--	--	--
Process Flare	C601	--	--	1.68E-02	1.68E-02	--	--	0.11	2.97E-02	5.70E-03
*Pigging**	*801*	--	--	--	--	--	--	--	--	--
*Blowdowns**	*601*	--	--	--	--	--	--	--	--	--
*Drain Tank Loadout**	*702*	--	--	--	--	--	--	--	--	--
Regen Dry Seal Vents*	***602***	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**
Rod Packing	601	--	--	0.00	0.00	--	--	0.01	0.00	0.00
Residue Dry Seal Vents	**602**	**--**	**--**	**2.65E-03**	**2.65E-03**	**--**	**--**	**0.02**	**0.00**	**0.00**
Methanol Tanks	--	--	--	--	--	--	5.28E-01	--	--	--
Measurement Devices	--	--	--	2.27E-03	2.27E-03	--	--	0.01	4.02E-03	7.73E-04
Future Site-Wide Emissions (tpy)		**0.00**	**0.00**	**0.03**	**0.02**	**0.10**	**0.53**	**2.58**	**0.04**	**0.01**

* Emissions are controlled by the flare and thus, are accounted for in the process flare emissions.

Greenhouse Gas Potential Emissions

Process/Facility	Source ID	GHG (tpy)			
		CO_2	CH_4	N_2O	$CO_2(e)$
Cryo Plant 1 Regen Heater (H-1711)	031	6,850	0.129	0.013	6,857
Cryo Plant 2 Regen Heater (H-2711)	037	10,324	0.195	0.019	10,335
Cryo Plant 3 Regen Heater (H-3711)	**038**	**12,587**	**0.237**	**0.024**	**12,600**
De-Ethanizer HMO Heater 1 (H-1767)	033	27,864	0.526	0.053	27,893
De-Ethanizer HMO Heater 2 (H-1768)	034	27,864	0.526	0.053	27,893
De-Ethanizer 2 HMO Heater 1 (H-3767)	**039**	**42,739**	**0.806**	**0.081**	**42,783**
De-Ethanizer 2 HMO Heater 2 (H-3768)	**040**	**42,739**	**0.806**	**0.081**	**42,783**
Stabilization HMO Heater (H-1769)	036	6,939	0.131	0.013	6,946
De-Ethanizer Regen Heater (H-1775)	035	3,820	0.072	0.007	3,824
Generac SD015	102	15.35	0.001	0.000	15
Generac SD150	102	75.65	0.003	0.001	76
Fugitives Emissions	701	0.64	22.073	-	552
Process Flare	C601	9158	53.562	0.017	10,502
*Pigging**	*801*	-	-	-	--
*Blowdowns**	*601*	-	-	-	--
*Drain Tank Loadout**	*702*	-	-	-	--
Regen Dry Seal Vents*	***602***	**-**	**-**	**-**	**--**
Rod Packing	601	342	107.500	-	3,030
Residue Dry Seal Vents	**602**	**2.86**	**803.548**	**-**	**20,092**
Methanol Tanks	--	-	-	-	--
Measurement Devices	--	0.02	5.822	-	146
Future Site-Wide Emissions (tpy)					**216,325.95**

* Emissions are controlled by the flare and thus, are accounted for in the process flare emissions.

MarkWest Liberty Midstream & Resources, L.L.C.
Harmon Creek Gas Plant

Potential Emissions Increases from HC3 Project

Process/Facility	Source ID	Potential Emissions (tpy)					
		NOx	CO	VOC	SO2	PM_1	HAPs
Cryo Plant 3 Regen Heater (H-3711)	038	1.14	3.79	1.83	0.06	1.24	0.18
De-Ethanizer 2 HMO Heater 1 (H-3767)	039	3.88	12.87	6.21	0.19	4.21	0.60
De-Ethanizer 2 HMO Heater 2 (H-3768)	040	3.88	12.87	6.21	0.19	4.21	0.60
Fugitives Emissions	701	--	--	9.29	--	--	0.14
Process Flare	C601	--	--	--	--	--	--
*Pigging**	*801*	--	--	*0.10*	--	--	*0.01*
*Blowdowns**	*601*	--	--	*1.06*	--	--	*0.01*
*Drain Tank Loadout**	*702*	--	--	*0.28*	--	--	--
*Regen Dry Seal Vents**	--	--	--	*0.70*	--	--	--
Rod Packing	601	--	--	0.04	--	--	0.00
Residue Dry Seal Vents	702	--	--	0.67	--	--	0.00
Methanol Tanks (De Minimis)	--	--	--	0.18	--	--	0.18
Measurement Devices (Exempt)	--	--	--	0.76	--	--	-0.04
Future Site-Wide Emissions (tpy)		**8.91**	**29.54**	**25.19**	**0.44**	**9.65**	**1.64**

1 PM = PM10 = PM2.5

* Emissions are controlled by the flare and thus, are accounted for in the process flare emissions. There are no changes to the PTE for the process flare.

MarkWest Liberty Midstream & Resources, L.L.C.
Harmon Creek Gas Plant

Cryo Plant III Regen Heater Equipped with FGR
H-3711

Source Designation:	
Manufacturer:	Tulsa Heaters
Year Installed	*Planned 2024*
Fuel Used:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,153
Rated Duty (mmbtu/hr)	17.34
Maximim Fired Heat Input (HHV) (mmbtu/hr)	21.75
Fuel Consumption (mmscf/hr):	0.0189
Potential Annual Hours of Operation (hr/yr):	8,760

Criteria and Manufacturer Specific Pollutant Emission Rates

Pollutant	**Emission Factor (lb/mmbtu) (lb/MMscf)[a,b]**	**Potential Emissions (lb/hr)[c]**	**(tons/yr)[d]**
NOx	0.012	0.261	1.143
CO	0.0398	0.866	3.792
VOC	0.0192	0.418	1.829
SO_2	0.68	0.0128	0.0560
PM Total	0.013	0.283	1.238
PM Condensable	0.013	0.283	1.238
PM_{10} (Filterable)	0.013	0.283	1.238
$PM_{2.5}$ (Filterable)	0.013	0.283	1.238
CO_2	59.9 kg/mmbtu	2,874	12,587
CH_4	0.001 kg/mmbtu	0.05420	0.237
N_2O	0.0001 kg/mmbtu	0.00542	0.024

Hazardous Air Pollutant (HAP) Potential Emissions

Pollutant	Emission Factor (lb/MMscf)[a]	Potential Emissions (lb/hr)[c]	Potential Emissions (tons/yr)[d]
HAPs:			
3-Methylchloranthrene	2.03E-06	3.84E-08	1.68E-07
7,12-Dimethylbenz(a)anthracene	1.81E-05	3.41E-07	1.49E-06
Acenaphthene	2.03E-06	3.84E-08	1.68E-07
Acenaphthylene	2.03E-06	3.84E-08	1.68E-07
Anthracene	2.71E-06	5.12E-08	2.24E-07
Benz(a)anthracene	2.03E-06	3.84E-08	1.68E-07
Benzene	2.37E-03	4.48E-05	1.96E-04
Benzo(a)pyrene	1.36E-06	2.56E-08	1.12E-07
Benzo(b)fluoranthene	2.03E-06	3.84E-08	1.68E-07
Benzo(g,h,i)perylene	1.36E-06	2.56E-08	1.12E-07
Benzo(k)fluoranthene	2.03E-06	3.84E-08	1.68E-07
Chrysene	2.03E-06	3.84E-08	1.68E-07
Dibenzo(a,h) anthracene	1.36E-06	2.56E-08	1.12E-07
Dichlorobenzene	1.36E-03	2.56E-05	1.12E-04
Fluoranthene	3.39E-06	6.40E-08	2.80E-07
Fluorene	3.17E-06	5.97E-08	2.62E-07
Formaldehyde	8.48E-02	1.60E-03	7.00E-03
Hexane	2.03E+00	3.84E-02	1.68E-01
Indo(1,2,3-cd)pyrene	2.03E-06	3.84E-08	1.68E-07
Phenanthrene	1.92E-05	3.63E-07	1.59E-06
Pyrene	5.65E-06	1.07E-07	4.67E-07
Toluene	3.84E-03	7.25E-05	3.18E-04
Arsenic	2.26E-04	4.26E-06	1.87E-05
Beryllium	1.36E-05	2.56E-07	1.12E-06
Cadmium	1.24E-03	2.35E-05	1.03E-04
Chromium	1.58E-03	2.99E-05	1.31E-04
Cobalt	9.50E-05	1.79E-06	7.85E-06
Lead	5.65E-04	1.07E-05	4.67E-05
Manganese	4.30E-04	8.10E-06	3.55E-05
Mercury	2.94E-04	5.54E-06	2.43E-05
Nickel	2.37E-03	4.48E-05	1.96E-04
Selenium	2.71E-05	5.12E-07	2.24E-06
Polycyclic Organic Matter:			
Methylnaphthalene (2-)	2.71E-05	5.12E-07	2.24E-06
Naphthalene	6.90E-04	1.30E-05	5.70E-05
Total HAP	**2.135**	**0.040**	**0.176**

[a] Emission factors from manufacturers guarantees on VOC, NOx, CO, PM in lb/mmbtu. The remainder from AP-42 Section 1.4 "Natural Gas Combustion" Tables 1.4-1, 1.4-2, & 1.4-3 (07/98) for all criteria and HAP pollutants, corrected to site-specific gas heat content.

[b] Emission factors for GHG pollutants from 40 CFR Part 98, Subpart C and corrected to site-specific gas heat content.

[c] Emission Rate (lb/hr) = Rated Capacity (MMscf/hr) × Emission Factor (lb/MMscf).

[d] Annual Emissions $(\text{tons/yr})_{\text{Potential}} = (\text{lb/hr})_{\text{Emissions}} \times$ (Maximum Allowable Operating Hours, 8760 hr/yr) × (1 ton/2000 lb).

Owner:	TBD	Owner Ref.:	H-3711
Purchaser:	Exterran	Purchaser Ref.:	OP-125001
Manufacturer:	Tulsa Heaters Midstream	THM Ref.:	P23-0634A
Service:	Regen Gas Heater	Project:	TBD
Number:	1	Location:	TBD
SHO Duty:	17.34 MMBTU/ hr	SHO Model:	SHO1750

Guarantees:

NOx	0.012	Lb/MMBTU	9	ppm
SOx	no quote	Lb/MMBTU	-	ppm
CO	0.0398	Lb/MMBTU	49	ppm
VOC	0.0192	Lb/MMBTU	15	ppm
UHC	0.007	Lb/MMBTU	15	ppm
SPM	0.013	Lb/MMBTU	15	ppm

			Design Case				Maximum Case			
Heat Release	LHV Basis		19.77	MMBTU/hr			21.75	MMBTU/hr		
Products of Combustion										
		MW								
	O2	32.00	556	Lbm/ hr			611	Lbm/ hr		
	N2 + Ar	28.15	14,010	Lbm/ hr			15,411	Lbm/ hr		
	CO2	44.01	2,521	Lbm/ hr			2,774	Lbm/ hr		
	H2O	18.02	2,175	Lbm/ hr			2,393	Lbm/ hr		
	NOx	46.01	0.24	Lbm/ hr /	9	ppm	0.26	Lbm/ hr /	9	ppm
	SOx	64.06	0.00	Lbm/ hr /	0	ppm	0.00	Lbm/ hr /	0	ppm
	CO	28.01	0.79	Lbm/ hr /	49	ppm	0.87	Lbm/ hr /	49	ppm
	VOC	44.10	0.38	Lbm/ hr /	15	ppm	0.42	Lbm/ hr /	15	ppm
	UHC	16.04	0.14	Lbm/ hr /	15	ppm	0.15	Lbm/ hr /	15	ppm
	SPM		0.26	Lbm/ hr /	15	ppm	0.28	Lbm/ hr /	15	ppm
	Total		19,264	Lbm/ hr			21,191	Lbm/ hr		
Flue Gas Exit Temp.			462	°F						
Flue Gas Exit Velocity			34.5	Ft/sec			38.0	Ft/sec		
Stack Height			25.7	ft			25.7	ft		
Stack ID			28	in			28	in		

NOTE:

THM emissions guarantees applicable between 50-100% of Design Case combustion conditions w/ 15% excess air.

THM emissions guarantees applicable for firebox temperatures above 1100°F.

Emissions above are for Design Case operation with air and fuel in ratio control. Upset conditions, such as operation outside the design, high turndown or start-up are not considered as guaranteed emissions cases.

The Maximum Case is the the specified heat release for the burner purchased. Extra duty is spec'd into the burner to ensure that the burner is never the limiting factor on duty.

revision	date	description	by	chk'd	appv'd
A	30-Jun-23	Initial Design	DCB		

TULSA HEATERS MIDSTREAM

USA Applications

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P23-0634A-Emissions- A

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MarkWest Liberty Midstream & Resources, L.L.C.
Harmon Creek Gas Plant

DeEthanizer 2 HMO Heaters Equipped with FGR
H-3767, H-3768

Source Designation:	
Manufacturer:	Tulsa Heaters
Year Installed	*Planned 2024*
Fuel Used:	Natural Gas
Higher Heating Value (HHV) (Btu/scf):	1,153
Rated Duty (mmbtu/hr)	62.23
Maximim Fired Heat Input (HHV) (mmbtu/hr)	73.85
Fuel Consumption (mmscf/hr):	6.41E-02
Potential Annual Hours of Operation (hr/yr):	8,760

Criteria and Manufacturer Specific Pollutant Emission Rates

Pollutant	**Emission Factor (lb/mmbtu) (lb/MMscf)[a,b]**	**Potential Emissions (lb/hr)[c]**	**(tons/yr)[d]**
NO_x	0.01	0.886	3.882
CO	0.04	2.939	12.874
VOC	0.019	1.418	6.210
SO_2	0.68	0.0434	0.1903
PM Total	0.013	0.960	4.205
PM Condensable	0.013	0.960	4.205
PM_{10} (Filterable)	0.013	0.960	4.205
$PM_{2.5}$ (Filterable)	0.013	0.960	4.205
CO_2	59.9 kg/mmbtu	9,758	42,739
CH_4	0.001 kg/mmbtu	0.18404	0.806
N_2O	0.0001 kg/mmbtu	0.01840	0.081

Hazardous Air Pollutant (HAP) Potential Emissions

Pollutant	Emission Factor (lb/MMscf)[a]	Potential Emissions (lb/hr)[c]	Potential Emissions (tons/yr)[d]
HAPs:			
3-Methylchloranthrene	2.03E-06	1.30E-07	5.71E-07
7,12-Dimethylbenz(a)anthracene	1.81E-05	1.16E-06	5.07E-06
Acenaphthene	2.03E-06	1.30E-07	5.71E-07
Acenaphthylene	2.03E-06	1.30E-07	5.71E-07
Anthracene	2.71E-06	1.74E-07	7.61E-07
Benz(a)anthracene	2.03E-06	1.30E-07	5.71E-07
Benzene	2.37E-03	1.52E-04	6.66E-04
Benzo(a)pyrene	1.36E-06	8.69E-08	3.81E-07
Benzo(b)fluoranthene	2.03E-06	1.30E-07	5.71E-07
Benzo(g,h,i)perylene	1.36E-06	8.69E-08	3.81E-07
Benzo(k)fluoranthene	2.03E-06	1.30E-07	5.71E-07
Chrysene	2.03E-06	1.30E-07	5.71E-07
Dibenzo(a,h) anthracene	1.36E-06	8.69E-08	3.81E-07
Dichlorobenzene	1.36E-03	8.69E-05	3.81E-04
Fluoranthene	3.39E-06	2.17E-07	9.51E-07
Fluorene	3.17E-06	2.03E-07	8.88E-07
Formaldehyde	8.48E-02	5.43E-03	2.38E-02
Hexane	2.03E+00	1.30E-01	5.71E-01
Indo(1,2,3-cd)pyrene	2.03E-06	1.30E-07	5.71E-07
Phenanthrene	1.92E-05	1.23E-06	5.39E-06
Pyrene	5.65E-06	3.62E-07	1.59E-06
Toluene	3.84E-03	2.46E-04	1.08E-03
Arsenic	2.26E-04	1.45E-05	6.34E-05
Beryllium	1.36E-05	8.69E-07	3.81E-06
Cadmium	1.24E-03	7.96E-05	3.49E-04
Chromium	1.58E-03	1.01E-04	4.44E-04
Cobalt	9.50E-05	6.08E-06	2.66E-05
Lead	5.65E-04	3.62E-05	1.59E-04
Manganese	4.30E-04	2.75E-05	1.21E-04
Mercury	2.94E-04	1.88E-05	8.25E-05
Nickel	2.37E-03	1.52E-04	6.66E-04
Selenium	2.71E-05	1.74E-06	7.61E-06
Polycyclic Organic Matter:			
Methylnaphthalene (2-)	2.71E-05	1.74E-06	7.61E-06
Naphthalene	6.90E-04	4.42E-05	1.93E-04
Total HAP		**0.137**	**0.599**

[a] Emission factors from manufacturers guarantees on VOC, NOx, and CO in lb/mmbtu. The remainder from AP-42 Section 1.4 "Natural Gas Combustion" Tables 1.4-1, 1.4-2, & 1.4-3 (07/98) for all criteria and HAP pollutants, corrected to site-specific gas heat content.

[b] Emission factors for GHG pollutants from 40 CFR Part 98, Subpart C and corrected to site-specific gas heat content.

[c] Emission Rate (lb/hr) = Rated Capacity (MMscf/hr) × Emission Factor (lb/MMscf).

[d] Annual Emissions $(\text{tons/yr})_{\text{Potential}} = (\text{lb/hr})_{\text{Emissions}} \times$ (Maximum Allowable Operating Hours, 8760 hr/yr) × (1 ton/2000 lb).

Owner:	TBD	Owner Ref.:	H-3768A
Purchaser:	Exterran	Purchaser Ref.:	OP-125001
Manufacturer:	Tulsa Heaters Midstream	THM Ref.:	P23-0634C
Service:	Hot Oil Heater	Project:	TBD
Number:	1	Location:	TBD
SHO Duty:	62.23 MMBTU/ hr	SHO Model:	SHO5000

Guarantees:

NOx	0.012	Lb/MMBTU	9	ppm
SOx	no quote	Lb/MMBTU	-	ppm
CO	0.0398	Lb/MMBTU	49	ppm
VOC	0.0192	Lb/MMBTU	15	ppm
UHC	0.007	Lb/MMBTU	15	ppm
SPM	0.013	Lb/MMBTU	15	ppm

			Design Case				Maximum Case			
Heat Release	LHV Basis		73.85	MMBTU/hr			73.85	MMBTU/hr		
Products of Combustion										
		MW								
	O2	32.00	2,076	Lbm/ hr			2,076	Lbm/ hr		
	N2 + Ar	28.15	52,325	Lbm/ hr			52,325	Lbm/ hr		
	CO2	44.01	9,418	Lbm/ hr			9,418	Lbm/ hr		
	H2O	18.02	8,124	Lbm/ hr			8,124	Lbm/ hr		
	NOx	46.01	0.89	Lbm/ hr /	9	ppm	0.89	Lbm/ hr /	9	ppm
	SOx	64.06	0.00	Lbm/ hr /	0	ppm	0.00	Lbm/ hr /	0	ppm
	CO	28.01	2.94	Lbm/ hr /	49	ppm	2.94	Lbm/ hr /	49	ppm
	VOC	44.10	1.42	Lbm/ hr /	15	ppm	1.42	Lbm/ hr /	15	ppm
	UHC	16.04	0.52	Lbm/ hr /	15	ppm	0.52	Lbm/ hr /	15	ppm
	SPM		0.96	Lbm/ hr /	15	ppm	0.96	Lbm/ hr /	15	ppm
	Total		71,950	Lbm/ hr			71,950	Lbm/ hr		
Flue Gas Exit Temp.			585	°F						
Flue Gas Exit Velocity			49.6	Ft/sec			54.5	Ft/sec		
Stack Height			30.8	ft			30.8	ft		
Stack ID			48	in			48	in		

NOTE:

THM emissions guarantees applicable between 50-100% of Design Case combustion conditions w/ 15% excess air.

THM emissions guarantees applicable for firebox temperatures above 1100°F.

Emissions above are for Design Case operation with air and fuel in ratio control. Upset conditions, such as operation outside the design, high turndown or start-up are not considered as guaranteed emissions cases.

The Maximum Case is the the specified heat release for the burner purchased. Extra duty is spec'd into the burner to ensure that the burner is never the limiting factor on duty.

revision	date	description	by	chk'd	appv'd
A	30-Jun-23	Initial Design	DCB		

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P23-0634C-Emissions- A

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MarkWest Liberty Midstream & Resources, L.L.C.
Harmon Creek Gas Plant

Flare

Source Designation:	
Manufacturer:	John Zink
Operating Hours: (hr/yr)	8,760
Pilot + Purge Gas Heat Input (MMBtu/hr)	3.205
Pilot + Purge Gas Annual Fuel Use (mmscf/yr)	26.518
Pilot Fuel Consumption (mmscf/hr):	2.00E-04
Purge Fuel Consumption (mmscf/hr):	2.83E-03
Fuel HHV (Btu/scf)	1,059

Combustion of Hydrocarbons

Source Designation:	
Annual Gas Flow (mmscf/yr)	100.00
Heating value (btu/scf)	1,282.67
Maximum Heat Release of Flare (mmbtu/yr)	128,267

Total Emissions

Pollutant	**Emission Factor (lb/MMBtu)**	**lb/hr**	**tpy**
VOC	--	3.05	13.34
NO_X	0.068	1.21	5.32
CO	0.31	5.53	24.23
SO_2	0.0005	0.01	0.04
PM Total	0.0064	0.11	0.50
PM Condensable	0.0048	0.09	0.37
PM_{10} (Filterable)	0.0016	0.03	0.12
$PM_{2.5}$ (Filterable)	0.0016	0.03	0.12
Hazardous Air Pollutants		**lb/hr**	**tpy**
HAP	--	0.05	0.23
n-Hexane	--	0.02	0.11
Benzene	--	0.00	0.02
Toluene	--	0.01	0.03
Ethylbenzene	--	0.00	0.02
Xylene	--	0.00	0.01
Greenhouse Gases	**Emission Factor (lb/MMBtu)**	**lb/hr**	**tpy**
CO_2	117.05	2090.78	9157.61
CH_4	0.002	12.23	53.56
N_2O	0.0002	0.00	0.02

[a] The NOx and CO emission factors are from AP-42 Section 13.5 "Industrial Flares" Table 13.5-1.

[b] Emission factors for GHG pollutants from 40 CFR Part 98, Subpart C. Tables C-1 and C-2.

[c] The remaining factors are from AP-42 Section 1.4 "Natural Gas Combustion" Tables 1.4-1 and 1.4-2.

[d] VOC and HAP emissions are based on mass balance.

[e] The flare calculations assume the composition to the flare is inlet gas.

MarkWest Liberty Midstream & Resources, L.L.C.
Harmon Creek Gas Plant

Pigging Emissions (Controlled by Flare)

Description	Gas Source Basis	Pressure Type	High to Low Pressure Jumper	Control Device	L/R	Size	Max Events/Yr	Pressure (PSIG)[a]	Temp (deg F)	Vessel Volume (acf)	Z Factor[a]	R Factor[b]	MW of Gas[a]	Maximum Volume		Controlled VOC		Controlled HAP	
								Pre-Jump			Pre-Jump			Per Event (scf)	Annually (scf/yr)	Wt%[a]	tpy[c]	Wt%[a]	tpy[c]
Houston Plant HP NGL Launcher	Harmon Creek Plant	HP	N	Flare	Launcher	12	1	1100	85	19.04	0.956	1,545	20.8	1,509.8	1,510	23.9%	0.000	0.41%	0.0000
Mariner West HP Ethane Launcher	Harmon Creek Plant	HP	N	Flare	Launcher	10	1	1100	85	15.95	0.956	1,545	20.8	1,264.8	1,265	23.9%	0.000	0.41%	0.0000
National Fuel Line N HP Residue Launcher	Harmon Creek Plant	HP	N	Flare	Launcher	20	1	1300	85	55.07	0.956	1,545	20.8	5,150.3	5,150	23.9%	0.001	0.41%	0.0000
Rover HP Interconnect Launcher	Harmon Creek Plant	HP	N	Flare	Launcher	24	1	1300	85	108.94	0.758	1,545	20.8	12,852.0	12,852	23.9%	0.002	0.41%	0.0000
Smith CS to Harmon Creek Plant HP Receiver	Harmon Creek Plant	HP	N	Flare	Receiver	20	365	1060	54.2	26.50	0.956	1,545	21.0	2,025.9	739,460	20.2%	0.099	1.67%	0.0082
Proposed HP Receiver	Harmon Creek Plant	HP	N	Flare	Receiver	20	365	1060	54.2	26.50	0.956	1,545	21.0	2,025.9	739,460	20.2%	0.099	1.67%	0.0082
Total															**1,499,696**		**0.201**		**0.016**

* **Pigging emissions are controlled by the flare and emission associated with pigging events are accounted for in the flare emissions section. While potential emissions are included in this section, they are captured under the flaring emissions in the Facility Summary.**

[a] Actual factors for PSIG, Z-factor, MW of gas, VOC wt% of gas and LHV of gas have been calculated but the numbers in the spreadsheet are provided to be very conservative in the event that the composition of the gas field changes over time.

[b] R Factor = (psfa*ft3* lbmol/(lb*R))

[c] Per the Consent Decree filed in April 2018, the mass of VOC emissions from pigging operations are multiplied by a factor of: 1.2

CO_2 wt%	0.21%	
CH_4 wt%	77.0%	
CO_2 emissions	**0.002**	**tpy**
CH_4 emissions	**0.65**	**tpy**

MarkWest Liberty Midstream & Resources, L.L.C.

Harmon Creek Gas Plant

Estimated Potential Blowdowns (Controlled by Flare)

Compressor	Description	Rated HP[a]	Blowdown frequency per year	Operating pressure (PSIG)	Volume Gas or Liquid (ft^3)	Product	Z-factor	MW	Volume Routed to Flare (scf)	Mass Routed to Flare (lb)	VOC Wt%	VOC Emissions (lbs)	HAP wt%	HAP Emissions (lbs)	Methane wt%	Methane Emissions (lbs)	CO2 wt%	CO2 Emissions (lbs)
C-1111	Regen Centrifugal	150	6	1,100.00	20	Inlet	0.71	21.17	730	41	23.886%	9.724	0.409%	0.166	77.010%	31.352	0.212%	0.086
C-2111	Regen Centrifugal	150	6	1,100.00	20	Inlet	0.71	21.17	730	41	23.886%	9.724	0.409%	0.166	77.010%	31.352	0.212%	0.086
C-1121	Centrifugal w/ no drive	19700	6	400.00	2681	Residue	0.95	17.04	21446	928	0.109%	1.013	0.000%	0.000	95.123%	883.156	0.528%	4.900
C-2121	Centrifugal w/ no drive	19700	6	400.00	2681	Residue	0.95	17.04	21446	928	0.109%	1.013	0.000%	0.000	95.123%	0.000	0.528%	0.000
C-1151	Recip	5000	6	385.00	125.5	Residue	0.95	17.04	968	42	0.109%	0.046	0.000%	0.000	95.123%	39.848	0.528%	0.221
			6	705.00	162.3	Residue	0.91	17.04	2352	102	0.109%	0.111	0.000%	0.000	95.123%	96.868	0.528%	0.537
			6	1,210.00	60.8	Residue	0.86	17.04	1587	69	0.109%	0.075	0.000%	0.000	95.123%	96.868	0.528%	0.537
C-1152	Recip	5000	6	385.00	125.5	Residue	0.95	17.04	968	42	0.109%	0.046	0.000%	0.000	95.123%	96.868	0.528%	0.537
			6	705.00	162.3	Residue	0.91	17.04	2352	102	0.109%	0.111	0.000%	0.000	95.123%	96.868	0.528%	0.537
			6	1,210.00	60.8	Residue	0.86	17.04	1587	69	0.109%	0.075	0.000%	0.000	95.123%	96.868	0.528%	0.537
C-1153	Recip	5000	6	385.00	125.5	Residue	0.95	17.04	968	42	0.109%	0.046	0.000%	0.000	95.123%	96.868	0.528%	0.537
			6	705.00	162.3	Residue	0.91	17.04	2352	102	0.109%	0.111	0.000%	0.000	95.123%	96.868	0.528%	0.537
			6	1,210.00	60.8	Residue	0.86	17.04	1587	69	0.109%	0.075	0.000%	0.000	95.123%	96.868	0.528%	0.537
C-1154	Recip	5000	6	385.00	125.5	Residue	0.95	17.04	968	42	0.109%	0.046	0.000%	0.000	95.123%	96.868	0.528%	0.537
			6	705.00	162.3	Residue	0.91	17.04	2352	102	0.109%	0.111	0.000%	0.000	95.123%	96.868	0.528%	0.537
			6	1,210.00	60.8	Residue	0.86	17.04	1587	69	0.109%	0.075	0.000%	0.000	95.123%	96.868	0.528%	0.537
C-2151	Recip	5000	6	385.00	125.5	Residue	0.95	17.04	968	42	0.109%	0.046	0.000%	0.000	95.123%	39.848	0.528%	0.221
			6	705.00	162.3	Residue	0.91	17.04	2352	102	0.109%	0.111	0.000%	0.000	95.123%	96.868	0.528%	0.537
			6	1,210.00	60.8	Residue	0.86	17.04	1587	69	0.109%	0.075	0.000%	0.000	95.123%	96.868	0.528%	0.537
C-2152	Recip	5000	6	385.00	125.5	Residue	0.95	17.04	968	42	0.109%	0.046	0.000%	0.000	95.123%	39.848	0.528%	0.221
			6	705.00	162.3	Residue	0.91	17.04	2352	102	0.109%	0.111	0.000%	0.000	95.123%	96.868	0.528%	0.537
			6	1,210.00	60.8	Residue	0.86	17.04	1587	69	0.109%	0.075	0.000%	0.000	95.123%	96.868	0.528%	0.537
C-2153	Recip	5000	6	385.00	125.5	Residue	0.95	17.04	968	42	0.109%	0.046	0.000%	0.000	95.123%	39.848	0.528%	0.221
			6	705.00	162.3	Residue	0.91	17.04	2352	102	0.109%	0.111	0.000%	0.000	95.123%	96.868	0.528%	0.537
			6	1,210.00	60.8	Residue	0.86	17.04	1587	69	0.109%	0.075	0.000%	0.000	95.123%	96.868	0.528%	0.537
C-1179	Centirfugal	100	6	495.00	14	Ethane	0.57	30.07	394	30	0.001%	0.000	0.001%	0.000	0.000%	0.000	0.001%	0.000
C-1140	Screw	1500	6	297.00	204	Propane	0.84	16.04	1307	149	100.000%	148.971	0.001%	0.001	0.000%	0.000	0.000%	0.000
C-1141	Screw	1500	6	297.00	204	Propane	0.84	16.04	1307	149	100.000%	148.971	0.001%	0.001	0.000%	0.000	0.000%	0.000
C-1142	Screw	1500	6	297.00	204	Propane	0.84	16.04	1307	149	100.000%	148.971	0.001%	0.001	0.000%	0.000	0.000%	0.000
C-1155	Screw	1500	6	297.00	204	Propane	0.84	16.04	1307	149	100.000%	148.971	0.001%	0.001	0.000%	0.000	0.000%	0.000
C-1156	Screw	1500	6	297.00	204	Propane	0.84	16.04	1307	149	100.000%	148.971	0.001%	0.001	0.000%	0.000	0.000%	0.000
C-1157	Screw	1500	6	297.00	204	Propane	0.84	16.04	1307	149	100.000%	148.971	0.001%	0.001	0.000%	0.000	0.000%	0.000
C-2141	Screw	1500	6	297.00	204	Propane	0.84	16.04	1307	149	100.000%	148.971	0.001%	0.001	0.000%	0.000	0.000%	0.000
C-2142	Screw	1500	6	297.00	204	Propane	0.84	16.04	1307	149	100.000%	148.971	0.001%	0.001	0.000%	0.000	0.000%	0.000
C-2143	Screw	1500	6	297.00	204	Propane	0.84	16.04	1307	149	100.000%	148.971	0.001%	0.001	0.000%	0.000	0.000%	0.000
C-1191	Recip	900	6	285.00	122	Inlet	0.71	21.17	1177	66	23.886%	15.687	0.409%	0.268	77.010%	50.577	0.212%	0.139
			6	1,117.00	122	Inlet	0.71	21.17	4428	247	23.886%	59.006	0.409%	0.268	77.010%	50.577	0.212%	0.139
C-1192	Recip	900	6	285.00	122	Inlet	0.71	21.17	1173	65	23.886%	15.626	0.409%	0.268	77.010%	50.577	0.212%	0.139
			6	1,117.00	122	Inlet	0.71	21.17	4428	247	23.886%	59.006	0.409%	0.268	77.010%	50.577	0.212%	0.139
TBD	Screw	75	6	25.00	10	CO2	0.94	43.57	20	2	0.001%	0.000	0.001%	0.000	0.000%	0.000	100.00%	2.319
			6	40.00	10	CO2	0.94	43.57	27	3	0.001%	0.000	0.001%	0.000	0.000%	0.000	100.00%	2.319
			6	210.00	10	CO2	0.94	43.57	112	13	0.001%	0.000	0.001%	0.000	0.000%	0.000	100.00%	2.319
			6	420.00	10	CO2	0.94	43.57	217	25	0.001%	0.000	0.001%	0.000	0.000%	0.000	100.00%	2.319
TBD	Recip	75	6	25.00	10	CO2	0.94	43.57	20	2	0.001%	0.000	0.001%	0.000	0.000%	0.000	100.00%	2.319
			6	40.00	10	CO2	0.94	43.57	27	3	0.001%	0.000	0.001%	0.000	0.000%	0.000	100.00%	2.319
			6	210.00	10	CO2	0.94	43.57	112	13	0.001%	0.000	0.001%	0.000	0.000%	0.000	100.00%	2.319
			6	420.00	10	CO2	0.94	43.57	217	25	0.001%	0.000	0.001%	0.000	0.000%	0.000	100.00%	2.319
TBD	Centrifugal	150	6	1,100.00	20	Regen/Inlet	0.71	21.17	730	41	23.886%	9.724	0.409%	0.166	77.010%	31.352	0.212%	0.086
TBD	Centirfugal	100	6	495.00	14	Ethane	0.57	30.07	394	30	0.001%	0.000	0.001%	0.000	0.000%	0.000	0.001%	0.000
TBD	Screw	2250	6	297.00	306	Propane	0.84	16.04	1960	223	100.000%	223.457	0.001%	0.001	0.000%	0.000	0.000%	0.000
TBD	Screw	2250	6	297.00	306	Propane	0.84	16.04	1960	223	100.000%	223.457	0.001%	0.001	0.000%	0.000	0.000%	0.000
TBD	Screw	2250	6	297.00	306	Propane	0.84	16.04	1960	223	100.000%	223.457	0.001%	0.001	0.000%	0.000	0.000%	0.000
TBD	Screw	3500	6	297.00	476	Propane	0.84	16.04	3049	348	100.000%	347.600	0.001%	0.001	0.000%	0.000	0.000%	0.000
TBD	Screw	3500	6	297.00	476	Propane	0.84	16.04	3049	348	100.000%	347.600	0.001%	0.001	0.000%	0.000	0.000%	0.000
TBD	Screw	3500	6	297.00	476	Propane	0.84	16.04	3049	348	100.000%	347.600	0.001%	0.001	0.000%	0.000	0.000%	0.000
TBD	Centrifugal	20000	6	385.00	125.5	Residue	0.95	17.04	968	42	0.109%	0.046	0.000%	0.000	95.123%	39.848	0.528%	0.221
			6	705.00	162.3	Residue	0.91	17.04	2352	102	0.109%	0.111	0.000%	0.000	95.123%	96.868	0.528%	0.537
			6	1,210.00	60.8	Residue	0.86	17.04	1587	69	0.109%	0.075	0.000%	0.000	95.123%	96.868	0.528%	0.537
TBD	Centrifugal	20000	6	385.00	125.5	Residue	0.95	17.04	968	42	0.109%	0.046	0.000%	0.000	95.123%	39.848	0.528%	0.221
			6	705.00	162.3	Residue	0.91	17.04	2352	102	0.109%	0.111	0.000%	0.000	95.123%	96.868	0.528%	0.537
			6	1,210.00	60.8	Residue	0.86	17.04	1587	69	0.109%	0.075	0.000%	0.000	95.123%	96.868	0.528%	0.537
--	Misc. Maintenance Activities	--	64	1,200.00	500	Inlet	0.71	21.17	207761	11591	23.886%	2768.661	0.409%	47.387	77.010%	8926.448	0.212%	24.560
--	Plant Shutdown	--	1	--	--	Inlet	0.71	21.17	11520480	642744	23.886%	153523.978	0.409%	2627.624	77.010%	494977.093	0.212%	1361.841
								Total Volume to Flare	23,714,032		Total (lbs)	319058.32		2676.607		507356.376		1423.280
										Potential	Controlled (lbs)	6381.17		53.53		10147.13		28.47
											Controlled (tpy)	3.19		0.03		5.07		0.01

[a] Maintenance blowdown frequencies and volumes listed are estimates and may vary. Maintenance blowdown emissions are controlled by the flare and accounted for in the flare emissions section.

[b] Volumes of compressors based on engineering estimates or calculated using CATG3612 at 483.1 acf and scaled to horsepower from 3550.

[c] Miscellaneous maintenance activities, such as filter change outs, are included for conservatism.

[d] The plant shutdown volume is based on estimates from actual flare meter data and a conservative factor of 3 is applied to the volume to account for HC2 and HC3.

[e] A factor of 2.0 is applied to the total blowdown volume to flare for conservatism.

Calculation Methodology

Emissions (lbs) = ((Operating P (PSIG) + Standard P (14.7 PSIG)) x Volume x MW) / (R (1545 ft lb/lb-mol R) x Standard Temp (60 F) x Z-Factor) x Pollutant wt% x # Events x Control Efficiency (1-98%)

MarkWest Liberty Midstream and Resources, L.L.C.
Harmon Creek Gas Plant

Condensate Truck Loadout Emissions

Source	Volume Loaded (gal/yr)	Saturation Factor[1]	Vapor Pressure[2] (psia)	Vapor Molecular Weight[2] (lb/lb-mol)	Liquid Temp[3] (ºF)	Liquid Temp (ºR)	Loading Loss[4] (lb VOC/1000 gal)	Loading Loss (lb/yr)	(tpy)
Harmon Creek Closed Drain Tank	300,000	0.6	8.1621	60	58.5	518.2	7.1	2,119.69	1.06

[1] From AP-42 Table 5.2-1, for tank trucks in submerged loading: dedicated normal service

[2] From AP42 Table 7.1-2, Gasoline (RVP 15), 60 deg

[3] Daily average liquid surface temperature (TANKS 4.09d)

[4] Loading Loss (lb VOC/1000 gal) = (12.46*S*P*M)/T [AP42 Section 5.2 (1/95)]

[5] Loading losses are controlled by the flare. Thus, emissions associated with the Condensate Truck Loadout Emissions are captured under the Flare Emission estimates.

MarkWest Liberty Midstream & Resources, L.L.C.
Harmon Creek Gas Plant

Fugitive Emissions

Component Type	Stream Type (Gas Vapor, Light Liquid, Heavy Liquid)	Gas Type	From LeakDAS	Number of Components[a]	AP-42 Leak Emission Factors kg/hr/component[b]	Reduction Factors[c]	Final Leak Factor lb/hr/component	Weight Percent[e]				Total	Potential VOC Emissions		Potential HAP Emissions		Potential CH4 Emissions		Potential CO2 Emissions	
								VOC	HAP	CH4	CO2	Emissions (tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Compressor	GV	INLET	7	21	8.80E-03	80%	3.88E-03	23.9%	0.4%	77.0%	0.2%	0.357	0.02	0.09	0.00	0.00	0.06	0.28	0.00	0.00
Compressor	GV	RESIDUE	12	36	8.80E-03	0%	1.94E-02	0.1%	0.0%	87.5%	0.3%	3.061	0.00	0.00	0.00	0.00	0.61	2.68	0.00	0.01
Compressor	GV	ETHAN	3	9	8.80E-03	0%	1.94E-02	0.5%	0.1%	0.0%	0.0%	0.765	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Compressor	GV	CO2	2	6	8.80E-03	0%	1.94E-02	0.5%	0.1%	0.0%	100.0%	0.510	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.51
Compressor	GV	PROPANE	11	33	8.80E-03	80%	3.88E-03	100.0%	0.0%	0.0%	0.0%	0.561	0.13	0.56	0.00	0.00	0.00	0.00	0.00	0.00
Compressor	LL	INLET	4	12	7.50E-03	80%	3.31E-03	23.9%	0.4%	77.0%	0.2%	0.174	0.01	0.04	0.00	0.00	0.03	0.13	0.00	0.00
Connector	GV	INLET GAS	19	57	2.00E-04	75%	1.10E-04	23.9%	0.4%	77.0%	0.2%	0.028	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.00
Connector	GV	C3+	424	1272	2.00E-04	75%	1.10E-04	100.0%	0.0%	0.0%	0.0%	0.615	0.14	0.61	0.00	0.00	0.00	0.00	0.00	0.00
Connector	GV	REFRIG C3	42	126	2.00E-04	75%	1.10E-04	100.0%	0.0%	0.0%	0.0%	0.061	0.01	0.06	0.00	0.00	0.00	0.00	0.00	0.00
Connector	GV	REGEN De-Eth	10	30	2.00E-04	75%	1.10E-04	0.5%	0.1%	0.0%	0.0%	0.014	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Connector	GV	FLARE GAS	1254	3762	2.00E-04	75%	1.10E-04	23.9%	0.4%	77.0%	0.2%	1.817	0.10	0.43	0.00	0.01	0.32	1.40	0.00	0.00
Connector	GV	C3+	1	3	2.00E-04	75%	1.10E-04	100.0%	0.0%	0.0%	0.0%	0.001	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Connector	GV	INLET	69	207	2.00E-04	75%	1.10E-04	23.9%	0.4%	77.0%	0.2%	0.100	0.01	0.02	0.00	0.00	0.02	0.08	0.00	0.00
Connector	GV	REGEN GAS De-Eth	13	39	2.00E-04	75%	1.10E-04	0.5%	0.1%	0.0%	0.0%	0.019	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Connector	GV	C2+	112	336	2.00E-04	75%	1.10E-04	51.4%	5.3%	0.1%	0.1%	0.162	0.02	0.08	0.00	0.01	0.00	0.00	0.00	0.00
Connector	GV	INLET	252	756	2.00E-04	75%	1.10E-04	23.9%	0.4%	77.0%	0.2%	0.365	0.02	0.09	0.00	0.00	0.06	0.28	0.00	0.00
Connector	GV	REGEN De-Eth	1	3	2.00E-04	75%	1.10E-04	0.5%	0.1%	0.0%	0.0%	0.001	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Connector	GV	C3+	3	9	2.00E-04	75%	1.10E-04	100.0%	0.0%	0.0%	0.0%	0.004	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Connector	LL	FLARE GAS	1	3	2.10E-04	75%	1.16E-04	23.9%	0.4%	77.0%	0.2%	0.002	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Connector	LL	METHANOL	102	306	2.10E-04	75%	1.16E-04	100.0%	100.0%	0.0%	0.0%	0.155	0.04	0.16	0.04	0.16	0.00	0.00	0.00	0.00
Connector	LL	REGEN GAS De-Eth	108	324	2.10E-04	75%	1.16E-04	0.5%	0.1%	0.0%	0.0%	0.164	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Connector	LL	ETHAN	47	141	2.10E-04	75%	1.16E-04	0.5%	0.1%	0.0%	0.0%	0.072	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Connector	LL	ETHAN	20	60	2.10E-04	75%	1.16E-04	0.5%	0.1%	0.0%	0.0%	0.030	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Connector	LL	C3+	857	2571	2.10E-04	75%	1.16E-04	100.0%	0.0%	0.0%	0.0%	1.304	0.30	1.30	0.00	0.00	0.00	0.00	0.00	0.00
Connector	LL	METHANOL	25	75	2.10E-04	75%	1.16E-04	100.0%	100.0%	0.0%	0.0%	0.038	0.01	0.04	0.01	0.04	0.00	0.00	0.00	0.00
Connector	LL	INLET GAS	238	714	2.10E-04	75%	1.16E-04	23.9%	0.4%	77.0%	0.2%	0.362	0.02	0.09	0.00	0.00	0.06	0.28	0.00	0.00
Connector	LL	C3+	310	930	2.10E-04	75%	1.16E-04	100.0%	0.0%	0.0%	0.0%	0.472	0.11	0.47	0.00	0.00	0.00	0.00	0.00	0.00
Connector	LL	INLET GAS	100	300	2.10E-04	75%	1.16E-04	23.9%	0.4%	77.0%	0.2%	0.152	0.01	0.04	0.00	0.00	0.03	0.12	0.00	0.00
Pressure Relief	GV	REGEN De-Eth	28	84	8.80E-03	97%	5.82E-04	0.5%	0.1%	0.0%	0.0%	0.214	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pressure Relief	GV	FLARE	467	1401	8.80E-03	97%	5.82E-04	23.9%	0.4%	77.0%	0.2%	3.574	0.19	0.85	0.00	0.01	0.63	2.75	0.00	0.01
Pressure Relief	GV	FLARE GAS	344	1032	8.80E-03	97%	5.82E-04	23.9%	0.4%	77.0%	0.2%	2.632	0.14	0.63	0.00	0.01	0.46	2.03	0.00	0.01
Pressure Relief	LL	C3	148	444	7.50E-03	97%	4.96E-04	100.0%	0.0%	0.0%	0.0%	0.965	0.22	0.97	0.00	0.00	0.00	0.00	0.00	0.00
Pressure Relief	LL	C2+	782	2346	7.50E-03	97%	4.96E-04	51.4%	5.3%	0.1%	0.1%	5.100	0.60	2.62	0.06	0.27	0.00	0.00	0.00	0.01
Pressure Relief	LL	REGEN GAS De-Eth	337	1011	7.50E-03	97%	4.96E-04	0.5%	0.1%	0.0%	0.0%	2.198	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Pressure Relief	LL	FLARE	79	237	7.50E-03	97%	4.96E-04	23.9%	0.4%	77.0%	0.2%	0.515	0.03	0.12	0.00	0.00	0.09	0.40	0.00	0.00
Pressure Relief	LL	C3+	4	12	7.50E-03	97%	4.96E-04	100.0%	0.0%	0.0%	0.0%	0.026	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00
Pressure Relief	LL	REGEN GAS	26	78	7.50E-03	97%	4.96E-04	23.9%	0.4%	77.0%	0.2%	0.170	0.01	0.04	0.00	0.00	0.03	0.13	0.00	0.00
Pressure Relief	LL	REGEN GAS	80	240	7.50E-03	97%	4.96E-04	23.9%	0.4%	77.0%	0.2%	0.522	0.03	0.12	0.00	0.00	0.09	0.40	0.00	0.00
Pressure Relief	LL	C3	403	1209	7.50E-03	97%	4.96E-04	100.0%	0.0%	0.0%	0.0%	2.628	0.60	2.63	0.00	0.00	0.00	0.00	0.00	0.00
Pump	GV	FLARE	5	15	2.40E-03	0%	5.29E-03	23.9%	0.4%	77.0%	0.2%	0.348	0.02	0.08	0.00	0.00	0.06	0.27	0.00	0.00
Pump	GV	FLARE	129	387	2.40E-03	0%	5.29E-03	23.9%	0.4%	77.0%	0.2%	8.974	0.49	2.14	0.01	0.04	1.58	6.91	0.00	0.02
Pump	LL	C2+	6	18	1.30E-02	85%	4.30E-03	51.4%	5.3%	0.1%	0.1%	0.339	0.04	0.17	0.00	0.02	0.00	0.00	0.00	0.00

MarkWest Liberty Midstream & Resources, L.L.C.
Harmon Creek Gas Plant

Fugitive Emissions

Component Type	Stream Type (Gas Vapor, Light Liquid, Heavy Liquid)	Gas Type	From LeakDAS	Number of Components[a]	AP-42 Leak Emission Factors kg/hr/component[b]	Reduction Factors[c]	Final Leak Factor lb/hr/component	Weight Percent[e]				Total	Potential VOC Emissions		Potential HAP Emissions		Potential CH4 Emissions		Potential CO2 Emissions	
								VOC	HAP	CH4	CO2	Emissions (tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Valve	GV	REGEN GAS De-Eth	63	189	4.50E-03	97%	2.98E-04	0.5%	0.1%	0.0%	0.0%	0.247	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Valve	GV	C2+	44	132	4.50E-03	97%	2.98E-04	51.4%	5.3%	0.1%	0.1%	0.172	0.02	0.09	0.00	0.01	0.00	0.00	0.00	0.00
Valve	GV	C3	3	9	4.50E-03	97%	2.98E-04	100.0%	0.0%	0.0%	0.0%	0.012	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Valve	GV	INLET GAS	44	132	4.50E-03	97%	2.98E-04	23.9%	0.4%	77.0%	0.2%	0.172	0.01	0.04	0.00	0.00	0.03	0.13	0.00	0.00
Valve	GV	C3+	113	339	4.50E-03	97%	2.98E-04	100.0%	0.0%	0.0%	0.0%	0.442	0.10	0.44	0.00	0.00	0.00	0.00	0.00	0.00
Valve	GV	C3	489	1467	4.50E-03	97%	2.98E-04	100.0%	0.0%	0.0%	0.0%	1.914	0.44	1.91	0.00	0.00	0.00	0.00	0.00	0.00
Valve	GV	REFRIG C3	154	462	4.50E-03	97%	2.98E-04	100.0%	0.0%	0.0%	0.0%	0.603	0.14	0.60	0.00	0.00	0.00	0.00	0.00	0.00
Valve	GV	INLET	12	36	4.50E-03	97%	2.98E-04	23.9%	0.4%	77.0%	0.2%	0.047	0.00	0.01	0.00	0.00	0.01	0.04	0.00	0.00
Valve	GV	REFRIG C3	2	6	4.50E-03	97%	2.98E-04	100.0%	0.0%	0.0%	0.0%	0.008	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Valve	GV	C3	140	420	4.50E-03	97%	2.98E-04	100.0%	0.0%	0.0%	0.0%	0.548	0.13	0.55	0.00	0.00	0.00	0.00	0.00	0.00
Valve	LL	C2+	290	870	2.50E-03	97%	1.65E-04	51.4%	5.3%	0.1%	0.1%	0.630	0.07	0.32	0.01	0.03	0.00	0.00	0.00	0.00
Valve	LL	INLET	935	2805	2.50E-03	97%	1.65E-04	23.9%	0.4%	77.0%	0.2%	2.033	0.11	0.49	0.00	0.01	0.36	1.57	0.00	0.00
Valve	LL	REGEN GAS	2	6	2.50E-03	97%	1.65E-04	23.9%	0.4%	77.0%	0.2%	0.004	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Valve	LL	METHANOL	2	6	2.50E-03	97%	1.65E-04	100.0%	100.0%	0.0%	0.0%	0.004	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Valve	LL	INLET	390	1170	2.50E-03	97%	1.65E-04	23.9%	0.4%	77.0%	0.2%	0.848	0.05	0.20	0.00	0.00	0.15	0.65	0.00	0.00
Valve	LL	C3+	2	6	2.50E-03	97%	1.65E-04	100.0%	0.0%	0.0%	0.0%	0.004	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Valve	LL	METHANOL	1	3	2.50E-03	97%	1.65E-04	100.0%	100.0%	0.0%	0.0%	0.002	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Valve	LL	REFRIG C3	181	543	2.50E-03	97%	1.65E-04	100.0%	0.0%	0.0%	0.0%	0.393	0.09	0.39	0.00	0.00	0.00	0.00	0.00	0.00
Valve	LL	REFRIG C3	92	276	2.50E-03	97%	1.65E-04	100.0%	0.0%	0.0%	0.0%	0.200	0.05	0.20	0.00	0.00	0.00	0.00	0.00	0.00
Valve	LL	FLARE	19	57	2.50E-03	97%	1.65E-04	23.9%	0.4%	77.0%	0.2%	0.041	0.00	0.01	0.00	0.00	0.01	0.03	0.00	0.00
Valve	LL	FLARE	3	9	2.50E-03	97%	1.65E-04	23.9%	0.4%	77.0%	0.2%	0.007	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Connector	HL	HMO		1708	7.50E-06	0%	1.65E-05	100.0%	0.0%	0.0%	0.0%	0.124	0.03	0.12	0.00	0.00	0.00	0.00	0.00	0.00
Valve	HL	HMO		569	8.40E-06	0%	1.85E-05	100.0%	0.0%	0.0%	0.0%	0.046	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.00
Pressure Relief	HL	HMO		16	3.20E-05	0%	7.06E-05	100.0%	0.0%	0.0%	0.0%	0.005	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Connector	HL	CO2		569	7.50E-06	0%	1.65E-05	0.5%	0.1%	0.0%	100.0%	0.041	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.04
Valve	HL	CO2		190	8.40E-06	0%	1.85E-05	0.5%	0.1%	0.0%	100.0%	0.015	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
Pressure Relief	HL	CO2		5	3.20E-05	0%	7.06E-05	0.5%	0.1%	0.0%	100.0%	0.002	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Connector	GV	Residue		1900	2.00E-04	75%	1.10E-04	0.1%	0.0%	87.5%	0.3%	0.918	0.00	0.00	0.00	0.00	0.18	0.80	0.00	0.00
Valve	GV	Residue		600	4.50E-03	97%	2.98E-04	0.1%	0.0%	87.5%	0.3%	0.783	0.00	0.00	0.00	0.00	0.16	0.69	0.00	0.00
				35,155								**Total**	**4.57**	**20.01**	**0.15**	**0.64**	**5.04**	**22.07**	**0.15**	**0.64**

Notes:

[a] Component counts are based on a combination of counts from LeakDas and PIDs and estimates based on studies at similar facilities.

[b] Table 2-4. Oil & Gas Production Operations Average Emission Factors, Protocol for Equipment Leak Emission Estimates, EPA 453/R-95-017, November 1995. Emission factors based on average measured TOC from component types indicated in gas or light oil service at O&G Production Operations.

[c] Table V: Control Efficiencies for LDAR for 28VHP programs, Air Permit Technical Guidance for Chemical Sources Fugitive Guidance, TCEQ (APDG 6422v2, Revised 06/2018). Compressors are monitored quarterly via OGI.

[d] Table 5-1. Summary of Equipment Modifications, Protocol for Equipment Leak Emission Estimates, EPA 453/R-95-017, November 1995.

[e] CO2 and C2 service are estimated at 0.5 VOC wt% to be conservative.

MarkWest Liberty Midstream & Resources, L.L.C.
Harmon Creek Gas Plant
Rod Packing Emissions

Reciprocating Compressors
Rod Packing Venting

Total Rod Packing Emissions

Pollutant	Emissions	
	lb/hr	tpy
VOC	0.28	1.22
Methane	24.54	107.50
Carbon Dioxide	78.14	342.26
n-Hexane	0.00	0.01
Benzene	0.00	0.00
Toluene	0.00	0.00
Ethylbenzene	0.00	0.00
Xylene	0.00	0.00
Total HAPs	0.00	0.01

Proposed CO2 Compressors

Emission Rate[a]	480.0	(scf/hr)
MW	0.115	(lb/scf)
Number of Compressors	1	
Total Emissions	55.108	(lb/hr)

[a]Based on max allowable under NSPS OOOOb

Pollutant	Mass %	Emissions	
		lb/hr	tpy
VOC	0.02%	0.009	0.040
Methane	0.01%	0.005	0.022
Carbon Dioxide	97.82%	53.907	236.115
n-Hexane	0.00%	0.000	0.000
Benzene	0.00%	0.000	0.000
Toluene	0.00%	0.000	0.000
Ethylbenzene	0.00%	0.000	0.000
Xylene	0.00%	0.000	0.000
Total HAPs	0.00%	0.000	0.000

MarkWest Liberty Midstream & Resources, L.L.C.
Harmon Creek Gas Plant
Dry Seal Vent Emissions

Centrifugal Compressor
Dry Seal Vents

Total Dry Seal Vent Emissions

Pollutant	Uncontrolled Emissions	
	lb/hr	tpy
VOC	0.79	3.44
Methane	183.46	803.55
Carbon Dioxide	0.65	2.86
n-Hexane	0.00	0.02
Benzene	0.00	0.00
Toluene	0.00	0.00
Ethylbenzene	0.00	0.00
Xylene	0.00	0.00
Total HAPs	0.01	0.04

Proposed Residue Compressors

Emission Rate[a]	600.0	(scf/hr)
Density	0.043	(lb/scf)
Seals per Compressor	2	
Number of Compressors	2	
Total Emissions	103.90	(lb/hr)

[a]Based on max allowable level under NSPS OOOOb

Pollutant	Mass %	Emissions	
		lb/hr	tpy
VOC	0.15%	0.153	0.671
Methane	87.54%	90.956	398.386
Carbon Dioxide	0.31%	0.324	1.420
n-Hexane	0.00%	0.000	0.000
Benzene	0.00%	0.000	0.000
Toluene	0.00%	0.000	0.000
Ethylbenzene	0.00%	0.000	0.000
Xylene	0.00%	0.000	0.000
Total HAPs	0.00%	0.000	0.000

Proposed Regen Centrifugal Compressors

Emission Rate[a]	600.0	(scf/hr)
Density	0.056	(lb/scf)
Number of Compressors	1	
Seals per Compressor	1	
Total Emissions	33.475	(lb/hr)
Recovery Rate	98%	
Total Emissions	0.669	(lb/hr)

[a]Based on max allowable level under NSPS OOOOb

Pollutant	Mass %	Emissions	
		lb/hr	tpy
VOC	23.89%	0.160	0.700
Methane	77.01%	0.516	2.258
Carbon Dioxide	0.21%	0.001	0.006
n-Hexane	0.19%	0.001	0.006
Benzene	0.03%	0.000	0.001
Toluene	0.05%	0.000	0.002
Ethylbenzene	0.03%	0.000	0.001
Xylene	0.01%	0.000	0.000
Total HAPs	0.41%	0.003	0.012

Existing Residue Centrifugal Compressors

Emission Rate[a]	600.0	(scf/hr)
Density	0.043	(lb/scf)
Number of Compressors	2	
Seals per Compressor	2	
Total Emissions	103.899	(lb/hr)

[a]Based on max allowable level under NSPS OOOOb

Pollutant	Mass %	Emissions	
		lb/hr	tpy
VOC	0.15%	0.153	0.671
Methane	87.54%	90.956	398.386
Carbon Dioxide	0.31%	0.324	1.420
n-Hexane	0.00%	0.000	0.000
Benzene	0.00%	0.000	0.000
Toluene	0.00%	0.000	0.000
Ethylbenzene	0.00%	0.000	0.000
Xylene	0.00%	0.000	0.000
Total HAPs	0.00%	0.000	0.000

Existing Regen Centrifugal Compressors

Emission Rate[a]	600.0	(scf/hr)
Density	0.056	(lb/scf)
Number of Compressors	2	
Seals per Compressor	1	
Uncontrolled Emissions	66.950	
Destruction Efficiency	98%	
Controlled Emissions	1.339	(lb/hr)

[a]Based on max allowable level under NSPS OOOOb and controlled by the process flare.

Pollutant	Mass %	Emissions	
		lb/hr	tpy
VOC	23.89%	0.320	1.401
Methane	77.01%	1.031	4.516
Carbon Dioxide	0.21%	0.003	0.012
n-Hexane	0.19%	0.003	0.011
Benzene	0.03%	0.000	0.002
Toluene	0.05%	0.001	0.003
Ethylbenzene	0.03%	0.000	0.002
Xylene	0.01%	0.000	0.001
Total HAPs	0.41%	0.005	0.024

MarkWest Liberty Midstream & Resources, L.L.C.
Harmon Creek Gas Plant

Methanol Emission Estimates

Source Information:	
Contents:	Methanol
Quantity:	3
Tank Orientation/Geometry:	Horizontal Cylinder
Approx. Height (ft):	5.0
Approx. Diameter (ft):	4.2
Volume (gal):	500
Turnovers per year:	0.10
Maximum Fill Level:	90%
Insulation:	None
Tank Color:	Red
Control Percentage:	0
Site-Wide Throughput (gal/yr)	150
Site-Wide Throughput (bbl/day)	0.010

Total Methanol Emissions (Sum of Tank Emissions + Process Emissions below):

Pollutant	**Conservative Losses**	
	lb/hr	**tpy**
Total VOC	**0.121**	**0.528**
Total HAP	**0.121**	**0.528**

Tank Emissions:

Pollutant	Tank Losses	
	lb/hr	tpy
Total VOC	0.005	0.020
Total HAP	0.005	0.020

Methanol tank losses are conservatively based on 50 gallons of use annually and modeled using ProMax 5.0. Please note, MarkWest uses no more than five (5) gallons of methanol per year.

Process Emissions:

Pollutant	Conservative Losses	
	lb/hr	tpy
Total VOC	0.116	0.508
Total HAP	0.116	0.508

Methanol losses from the process conservatively assumes all methanol injected into the system is emitted to the atmosphere, however, only a portion of the injected methanol will be emitted.
Additionally, MarkWest uses no more than five (5) gallons of methanol per year, however, emission estimates are based on 10 times that quantity.
Sample Calculation:
Methanol emissions (tpy) = Methanol usage (gal/yr) * Density (lb/gal) / 2000 (ton/lbs)

MarkWest Liberty Midstream & Resources, L.L.C.
Harmon Creek Gas Plant

Measurement Devices

Exempt under Section 127.14(a) #7

Source Information:	
Analyzer Vent Rate (scf/hr)	2.12
Spectra Analyzers	14
GC Vent Rate (scf/hr)	0.04
GC Streams	36
Total Number of Measurement Vents to Atm	50.0
Potential Annual Hours of Operation (hr/yr)	8,760
Potential Volume Emitted (scf/yr)	18,561

Pollutant	Per Analyzer		Per GC Stream		Total	
	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Carbon Dioxide	0.000	0.001	0.000	0.000	0.00	0.016
Methane	0.09	0.399	0.00	0.007	1.33	5.822
VOC	0.03	0.124	0.00	0.002	0.41	1.806
n-Hexane	2.26E-04	0.001	3.76E-06	0.000	0.00	0.014
Benzene	3.56E-05	0.000	5.93E-07	0.000	0.00	0.002
Toluene	6.29E-05	0.000	1.05E-06	0.000	0.00	0.004
Ethylbenzene	3.56E-05	0.000	5.93E-07	0.000	0.00	0.002
Xylene	1.21E-05	0.000	2.01E-07	0.000	0.00	0.001
Total HAPs	4.83E-04	0.002	8.05E-06	0.000	0.01	0.031

MarkWest Liberty Midstream & Resources, L.L.C.
Harmon Creek Gas Plant

Harmon Creek Gas Analysis

Component	MW	Unit	Inlet Gas	Residue Gas - Recovery	Residue Gas	Stabilizer Overhead	CO2	C2+
Nitrogen	28.0135	mole %	0.41	0.51	0.48	0.10	0.00	0.00
CO2	44.01	mole %	0.10	0.20	0.12	0.16	96.84	0.06
H2S	34.1	mole %	0.00	0.00	0.00	0.00	0.00	0.00
Methane	16.042	mole %	77.01	97.41	92.99	44.04	0.03	0.10
Ethane	30.069	mole %	14.79	1.84	6.35	29.62	3.12	59.23
Propane	44.096	mole %	5.15	0.04	0.06	17.14	0.02	23.38
i-Butane	58.122	mole %	0.54	0.00	0.00	1.86	0.00	2.95
n-Butane	58.122	mole %	1.26	0.00	0.00	4.96	0.00	7.05
i-Pentane	72.149	mole %	0.25	0.00	0.00	0.79	0.00	1.69
n-Pentane	72.149	mole %	0.29	0.00	0.00	1.06	0.00	2.18
n-Hexane	86.175	mole %	0.05	0.00	0.00	0.20	0.00	3.46
n-Heptane	100.202	mole %	0.04	0.00	0.00	0.05	0.00	0.00
n-Octane	114.229	mole %	0.00	0.00	0.00	0.00	0.00	0.00
Benzene	78.122	mole %	0.008	0.00	0.00	0.00	0.00	0.00
Toluene	92.138	mole %	0.012	0.00	0.00	0.00	0.00	0.00
Ethylbenzene	106.167	mole %	0.001	0.00	0.00	0.00	0.00	0.00
Xylene	106.16	mole %	0.002	0.00	0.00	0.00	0.00	0.00
Nonanes	128.255	mole %	0.002	0.00	0.00	0.00	0.00	0.00
Decanes Plus	142.282	mole %	0.021	0.00	0.00	0.00	0.00	0.00

	Component	MW	Unit	Inlet Gas	Residue Gas - Recovery	Residue Gas	Stabilizer Overhead	CO2	C2+
23	Nitrogen	28.0135	wt%	0.5530	0.8738	0.7852	0.0965	0.0000	0.0000
24	CO2	44.01	wt%	0.2119	0.5278	0.3121	0.2440	97.8220	0.1187
25	H2S	34.1	wt%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
26	Methane	16.042	wt%	77.0100	95.1232	87.5426	24.2604	0.0092	0.0736
27	Ethane	30.069	wt%	21.4104	3.3662	11.2128	30.5465	2.1522	48.5233
28	Propane	44.096	wt%	10.9331	0.1031	0.1442	25.9200	0.0166	27.2355
29	i-Butane	58.122	wt%	1.5110	0.0025	0.0011	3.7135	0.0000	3.8104
30	n-Butane	58.122	wt%	3.5257	0.0035	0.0013	9.8881	0.0000	9.4580
31	i-Pentane	72.149	wt%	0.8684	0.0000	0.0002	1.9617	0.0000	2.4280
32	n-Pentane	72.149	wt%	1.0073	0.0000	0.0005	2.6260	0.0000	3.1565
33	n-Hexane	86.175	wt%	0.1908	0.0000	0.0001	0.5960	0.0000	5.3212
34	n-Heptane	100.202	wt%	0.2026	0.0000	0.0000	0.1622	0.0000	0.0000
35	n-Octane	114.229	wt%	0.0110	0.0000	0.0000	0.0192	0.0000	0.0000
36	Benzene	78.122	wt%	0.0301	0.0000	0.0000	0.0000	0.0000	0.0000
37	Toluene	92.138	wt%	0.0532	0.0000	0.0000	0.0000	0.0000	0.0000
38	Ethylbenzene	106.167	wt%	0.0301	0.0000	0.0000	0.0000	0.0000	0.0000
39	Xylene	106.16	wt%	0.0102	0.0000	0.0000	0.0000	0.0000	0.0000
40	Nonanes	128.255	wt%	0.0123	0.0000	0.0000	0.0000	0.0000	0.0000
41	Decanes Plus	142.282	wt%	0.1438	0.0000	0.0000	0.0000	0.0000	0.0000
	*Dry Basis		VOC wt %	23.89	0.11	0.15	44.89	0.02	51.41
			LHV =	1158.81	916.57	949.85	1562.36	51.09	
			HHV =	1282.67	1022.94	1058.62	1715.11	61.37	
			Density (lb	0.0558	0.0433	0.0449	0.0768	0.1148	
			Gas MW=	20.77	16.43	17.04	29.16	43.57	
			HAP wt%=	0.4088	0.0000	0.0001	0.5960	0.0000	5.3212

Notes:

[a] The inlet gas composition is based on a sample collected on 8/1/2023 from the Harmon Creek plant feed inlet and a 30% factor is applied for conservatism. The residue gas and C2+ gas compositions are the annual average from GC readings.

[b] Stabilizer Overhead and CO2 compositions are modeled.

MARKWEST LIBERTY MIDSTREAM & RESOURCES LLC
1515 ARAPAHOE ST., TOWER 1
SUITE 1600
80202, DENVER
United States

Attention of : Mr. P. Jereza

Analysis Report

Report number	: **13087/00013734.1/L/23**	Date of sampling	: 08-01-2023
Main Object	: Inlet Sample	Place of sampling	: Harmon Creek Gas Plant
Report Date	: 08-16-2023	Date received	: 08-14-2023
Date of issue	: 08-14-2023	Date completed	: 08-14-2023
Sample object	: Inlet Sample	Sample number	: 15054521
Sample type	: Sampled		
Sample submitted as	: Natural Gas		
Marked	: Inlet line sample 8/1/23 for analysis only		

NAME	METHOD	UNIT	RESULT
Natural gas analysis	GPA 2261		
Hydrogen		mol %	<0.10
Oxygen		mol %	<0.03
Nitrogen		mol %	0.41
Carbon Dioxide		mol %	0.10
Methane		mol %	77.01
Ethane		mol %	14.79
Propane		mol %	5.15
Isobutane		mol %	0.54
N-Butane		mol %	1.26
Isopentane		mol %	0.25
N-Pentane		mol %	0.29
Hexanes Plus		mol %	0.20
Hydrogen Sulfide		mol %	<0.10
Total		mol %	100.00
Relative Density		-	0.72215
Compressibility Factor		-	0.99644
Gross Heating Value (Real)		Btu/CF	1264.1
Net Heating Value (Real)		Btu/CF	1146.5
Pressure Base		psi	14.696
Molecular Weight		#/#-mol	21.9
Hexanes	GPA 2172		
Hexanes Plus Mol Wt		units	84.9
Hexanes Plus Relative Density		#/#-mol	0.6951
Hexanes Plus Heating Value (Ideal)		Btu/CF	4622.7
Hexanes Plus Vapor Equivalent		CF/gal	25.89
Natural Gas Analysis, Extended	GPA 2286		
2,2-Dimethylbutane		mol %	<0.001
2-Methyl Pentane		mol %	0.351
3-Methyl Pentane		mol %	0.077

All results in this report refer to the sample(s) tested as taken or submitted like specified in this Analysis report. Uncertainties, available on request, apply in the evaluation of the test results. All tests are conducted according to the latest version of the methods, unless another version is specifically indicated. Where available and for convenience purposes, the tested sample has been checked for compliance with supplied specifications, without accepting any liability for the supplied information. In case of dispute or concern, we refer to the interpretation of test results as defined in ASTM D3244, IP 367, ISO 4259 or GOST 33701. This report shall not be partially copied and reproduced without the written permission of the laboratory.

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MARKWEST LIBERTY MIDSTREAM & RESOURCES LLC
1515 ARAPAHOE ST., TOWER 1
SUITE 1600
80202, DENVER
United States

Attention of : Mr. P. Jereza

Analysis Report

Report number	: **13087/00013734.1/L/23**	Date of sampling	: 08-01-2023
Main Object	: Inlet Sample	Place of sampling	: Harmon Creek Gas Plant
Report Date	: 08-16-2023	Date received	: 08-14-2023
Date of issue	: 08-14-2023	Date completed	: 08-14-2023
Sample object	: Inlet Sample	Sample number	: 15054521
Sample type	: Sampled		
Sample submitted as	: Natural Gas		
Marked	: Inlet line sample 8/1/23 for analysis only		

NAME	METHOD	UNIT	RESULT
n-Hexane		mol %	0.046
Methylcyclopentane		mol %	<0.001
Benzene		mol %	0.008
Cyclohexane		mol %	<0.001
2-Methyl Hexane		mol %	<0.001
3-Methyl Hexane		mol %	<0.001
Dimethylcyclopentanes		mol %	0.041
n-Heptane		mol %	<0.001
Methylcyclohexane		mol %	<0.001
Trimethylcyclopentanes		mol %	<0.001
Toluene		mol %	0.012
2-Methylheptane		mol %	<0.001
3-Methylheptane		mol %	<0.001
Dimethylcyclohexanes		mol %	0.001
n-Octane		mol %	0.002
Ethyl Benzene		mol %	<0.001
Xylenes (Total)		mol %	0.002
C9 Naphthenes		mol %	<0.001
C9 Paraffins		mol %	0.002
n-Nonane		mol %	<0.001
Decanes Plus		mol %	0.021

Signed by: Robert Boersma - Location Manager
Issued by: Saybolt LP
Place and date of issue: Pittsburgh - 08-14-2023

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Attachment A

Regulatory Review

Regulatory Review

Federal New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAP) require new, modified, or reconstructed sources to control emissions to the level that is achievable by the best system for emission reduction as specified in the provisions of the applicable rule. The following section provides applicability determinations for each of the NSPS and NESHAP regulation to which the Harmon Creek 3 (HC3) project is potentially subject.

40 Code of Federal Regulations (CFR) Part 60 Subpart Dc – Standards of Performance for Small (10 to 100 MMBtu/hr) Industrial, Commercial, Institutional Steam Generating Units for Which Construction, Reconstruction, or Modification Commenced After June 9, 1989.
The heaters associated with HC3 will be rated at maximum design heat release greater than 10 MMBtu/hr and less than 100 MMBtu/hr on a LHV basis and will be constructed after June 9, 1989. However, process heaters (038) are excluded from the definition of a steam generating unit. The two (2) DeEthanizer HMO heaters (039 and 040) are subject to the requirements under NSPS Subpart Dc [40 CFR 60.41c].

40 CFR Part 60 Subpart OOOOb - Standards of Performance for Crude Oil and Natural Gas Facilities:
NSPS Subpart OOOOb establishes emission standards and compliance schedules for the control of GHG and VOC emissions from affected facilities that were constructed, modified, or reconstructed after December 6, 2022. The Harmon Creek 3 plant will be constructed after December 6, 2022 and is therefore subject to the requirements of NSPS OOOOb. The following sections outline the applicability of the various sources outlined under NSPS Subpart OOOOb:

Centrifugal Compressors – The standards under this subpart apply to a single centrifugal compressor. There are four (4) centrifugal compressors being proposed with the HC3 project: two (2) regen compressors and two (2) residue compressors. One (1) of the regen compressors will be for the ethane system and will have a negligible VOC and GHG content and thus, excluded from this subpart. The remaining three (3) compressors will be subject to the standards of this subpart.

Reciprocating Compressors – The standards under this subpart apply to a single reciprocating compressor. The only reciprocating compressor proposed for HC3 will be for CO_2 and will have a negligible VOC content. Therefore, the standards do not apply.

Process Controllers – The standards under this subpart apply to a collection of natural gas-driven process controllers. There are no natural gas-driven process controllers associated with the existing Harmon Creek facility or the HC3 project thus, these standards do not apply.

Storage Vessels – A tank battery, defined as one or more storage vessels manifolded together for liquid transfer, with the potential to emit 6 tpy or more of VOC or 20 tpy or more of methane is a storage vessel affected facility under this subpart. Tank batteries with potential emissions below the thresholds aforementioned are not subject to this subpart provided the owner/operator maintains records of potential emissions for the life of the storage vessel. There are no new storage vessels associated with the HC3 project and therefore, will not be subject to the standards of this subpart.

Process Unit Equipment – A process unit equipment affected facility is the group of all equipment within a process unit at an onshore natural gas processing plant. The HC3 project will be constructed after December 6, 2022 and therefore, will be subject to the standards of this subpart.

Sweetening Unit – A sweetening unit under this subpart is defined as a process device that removes hydrogen sulfide and/or carbon dioxide from the sour natural gas stream. There are no sweetening units associated with the HC3 project and thus, these standards do not apply.

Pneumatic Pumps – The standards under this subpart apply to a collection of natural gas-driven pumps. There are no natural gas-driven pneumatic pumps associated with the existing Harmon Creek facility or HC3 project and thus, these standards do not apply.

Attachment B

RACT III Analysis

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

CHAPTER 129. STANDARDS FOR SOURCES ADDITIONAL RACT REQUIREMENTS FOR MAJOR SOURCES OF NOx AND VOCs FOR THE 2015 OZONE NAAQS

Written notification, 25 Pa. Code §§129.111 and 129.115(a)

25 Pa. Code Sections 129.111 and129.115(a) require that the owner and operator of an air contamination source subject to the final-form RACT III regulations submit a notification describing how you intend to comply with the final-form RACT III requirements, and other information spelled out in subsection 129.115(a). The owner or operator may use this template to notify DEP. Notification must be submitted in writing or electronically to the appropriate Regional Manager located at the appropriate DEP regional office. In addition to the notification required by §§ 129.111 and 129.115(a), you also need to submit an applicable analysis or RACT determination as per § 129.114(a) or (i).

Is the facility major for NOx?	**Yes** ☐ **No** ☒
Is the facility major for VOC?	**Yes** ☒ **No** ☐

FACILITY INFORMATION					
Facility Name	Harmon Creek Gas Plant				
Permit Number	63-01011	**PF ID if known** 819388			
Address Line1	123 Point Pleasant Rd				
Address Line2					
City	Bulger	**State**	PA	**Zip**	15019
Municipality	Smith		**County**	Washington	
OWNER INFORMATION					
Owner	MarkWest Liberty Midstream and Resources, L.L.C.				
Address Line1	1515 Arapahoe St.				
Address Line2	Tower 1, Suite 1600				
City	Denver	**State**	CO	**Zip**	80202
Email	nmwheldon@marathonpetroleum.com		Phone	(303) 542-0686	
CONTACT INFORMATION					
Permit Contact Name	Alexandra M. Juarez				
Permit Contact Title	Environmental Engineer				
Address Line	4600 J. Barry Court				
City	Canonsburg	**State**	PA	**Zip**	15317
Email	ajuarez@marathonpetroleum.com		Phone	(412) 815-8886	

Table 1 includes all air contamination sources that commenced operation on or before August 3rd, 2018. Air contamination sources determined to be exempt from permitting requirements are also included.

Table 1 - Source Information and RACT III Compliance, VOC

Source ID/ Plant ID	Source Name	Make	Location of Source	VOC PTE TPY	Exempt from RACT III (yes or no)	How do you intend to comply?	25 Pa Code RACT regulation, (list the applicable sections)
031 / H-1711	Cryo Plant 1 Regen Heater (11.84 MMBtu/hr)	Tulsa Heaters	Plant #1	0.98	Yes	N/A	§ 129.111(c)
037 / H-2711	Cryo Plant 2 Regen Heater (17.84 MMBtu/hr)	Tulsa Heaters	Plant #2	1.48	No	PRES	§ 129.112(c)2
038 / H-3711	Cryo Plant 3 Regen Heater (21.75 MMBtu/hr)	Tulsa Heaters	Plant #3	1.83	No	PRES	§ 129.112(c)2
033 / H-1767	De-Ethanizer HMO Heater 1 (48.15 MMBtu/hr)	Scelerin Heaters LLC	DeEth #1	4.01	No	PRES	§ 129.112(b)
034 / H-1768	De-Ethanizer HMO Heater 2 (48.15 MMBtu/hr)	Scelerin Heaters LLC	DeEth #1	4.01	No	PRES	§ 129.112(b)
039 / H-3767	De-Ethanizer 2 HMO Heater 1 (73.85 MMBtu/hr)	Tulsa Heaters	DeEth #2	6.21	No	PRES	§ 129.112(g)(1)(i)
040 / H-3768	De-Ethanizer 2 HMO Heater 2 (73.85 MMBtu/hr)	Tulsa Heaters	DeEth #2	6.21	No	PRES	§ 129.112(g)(1)(i)
036 / H-1769	Stabilization HMO Heater (11.99 MMBtu/hr)	Tulsa Heaters	Stabilizer #1	1.00	No	PRES	§ 129.112(c)2
035 / H-1775	De-Ethanizer Regen Heater (6.60 MMbtu/hr)	Tulsa Heaters	DeEth #1	0.55	Yes	N/A	§ 129.111(c)
C601	Process Flare	John Zink	Flare Pad	0.02	No	PRES	§ 129.112(c)8
102	Emergency Generator	Generac	Admin Building	0.02	Yes	N/A	§ 129.111(c)
102	Emergency Generator	Generac	Control Room	0.10	Yes	N/A	§ 129.111(c)
801	Pigging	N/A	Inlet	0.20	Yes	N/A	§ 129.111(c)
601	Compressor Rod Packing Venting	N/A	Throughout Facility	1.22	No	PRES	§ 129.112(c)2

MISC	Residue Compressor Dry Seal Venting	N/A	Throughout Facility	0.67, each	Yes	N/A	§ 129.111(c)
MISC	Regen Compressor Dry Seal Venting	N/A	Throughout Facility	0.70, each	Yes	N/A	§ 129.111(c)
MISC	Truck Loadout	N/A	Closed Darin Tank Bldg	1.06	No	PRES	§ 129.112(c)2
601	Planned Facility Blowdowns	N/A	Throughout Facility	3.17	No	CbC	§ 129.114(c)
MISC	Methanol Tanks	N/A	Various	0.36	Yes	N/A	§ 129.111(c)
--	Spectra Analyzers (Trivial Activity)	N/A	Throughout Facility	1.73 0.12, each	Yes	N/A	§ 129.111(c)
--	GC Buildings (Trivial Activity)	N/A	Throughout Facility	0.07	Yes	N/A	§ 129.111(c)
701	Connectors	N/A	Throughout Facility	3.54	No	CbC	§ 129.114(c)
701	Pump Seal	N/A	Throughout Facility	2.40	No	PRES	§ 129.112(c)2
701	Compressor	N/A	Throughout Facility	0.70	Yes	N/A	§ 129.111(c)
701	PSV	N/A	Throughout Facility	8.03	No	CbC	§ 129.114(c)
701	Valves	N/A	Throughout Facility	5.34	No	CbC	§ 129.114(c)

For the column with the title “How do you intend to comply”, compliance options are:

- Presumptive RACT requirement under §129.112 (**PRES**),
- Facility-wide averaging (**FAC**) §129.113,
- System-wide averaging (**SYS**) §129.113, or
- Case by case determination §129.114 (**CbC**).

Please provide the applicable subsection if source will comply with the presumptive requirement under §129.112.

RACT III Case-by-Case Proposal

Fugitive Component Groups

The plant-wide fugitive components have been grouped under one source for permitting purposes. However, under RACT the fugitive component groups are considered separate sources as follows:

a. Connectors
b. Pump Seals
c. Compressor
d. PSV
e. Valves

Compressors have potential VOC emissions less than 1.0 tpy and, thus, are exempt under 25 Pa. Code § 129.111(c). The Pump Seals have potential VOC emissions greater than 1.0 tpy and less than 2.7 tpy, and thus, comply with RACT by meeting 25 Pa. Code § 129.112(c)(2).

Connectors, PSVs, and Valves have potential VOC emissions greater than 2.7 tpy and thus, are subject to the case-by-case requirements in 25 Pa. Code § 129.114(c) which states: The owner or operator of a VOC air contamination source with the potential emission rate equal to or greater than 2.7 tons of VOC per year that is not subject to § 129.112 located at a major VOC emitting facility subject to § 129.111 shall propose a VOC RACT requirement or RACT emission limitation in accordance with subsection (d).

The following control technologies were considered as part of the case-by-case analysis for the Connectors and Valves component groups:

- Thermal Oxidation (TO)
- Regenerative Thermal Oxidation (RTO)
- Thermal Catalytic Oxidation (TCO)
- Carbon Adsorption
- Condensation
- Work Practice requirements

<u>Thermal Oxidation (TO) and Regenerative Thermal Oxidation (RTO)</u>

Thermal oxidation refers to the complete gas-phase combustion of VOCs to carbon dioxide and water vapor. Oxidation is achieved by heating the VOC exhaust in the presence of oxygen. Supplemental fuel (natural gas) is required to maintain combustion conditions. The destruction efficiency of thermal oxidation is typically 95% or greater with a combustion temperature of 1500 deg F and a retention time of 1.0 second. This is also dependent upon the quantity of VOC in the gas stream. For low-concentration VOC streams, a lower destruction efficiency can be expected. Thermal oxidation can be accomplished with or without heat recovery. Because these sources are throughout the plant, ductwork would have to be installed over every connector, PSV, and valve. The installation of ductwork over every connector, PSV, and valve is not technically feasible, and we have dismissed this option. There are no similar sources that are controlled in this manner.

<u>Thermal Catalytic Oxidation (TCO)</u>

Catalytic oxidation refers to complete combustion of VOCs to carbon dioxide and water through the use of an oxidation catalyst. Catalytic oxidation occurs at lower temperatures typically between 650 deg and 800 deg F. As with thermal oxidation, supplemental fuels (natural gas) is needed with dilute gas streams. Destruction efficiencies of 95% are typical. The catalyst slowly degrades over time and must be replaced on a periodic basis. Because these sources are throughout the plant, ductwork would have to be installed over every connector, PSV, and valve. The installation of ductwork over every connector, PSV, and valve is not technically feasible, and we have dismissed this option. There are no similar sources that are controlled in this manner.

Condensation

VOCs can be removed in the condensation process. This technology has been used in some cases to control high VOC concentration gas streams. In fact, in certain areas of the plant, where there are very low temperatures the gas is in liquid form. In gas streams consisting of a single VOC and no non-condensable gas, condensation occurs isothermally, or at a constant temperature. In gas streams consisting of non-condensables or VOCs with varied volatilities, condensation occurs along a temperature change. However, to achieve condensation of the vapor, ductwork would be required to capture the vented vapor from every connector, PSV, and valve and vessels for the condensation process would be required. As stated earlier, the installation of ductwork over every connector, PSV and valve is not technically feasible and condensation is not an option for these sources. There are no similar sources that are controlled in this manner.

Adsorption

VOCs can be removed using carbon or zeolites as adsorbents. However, these sources are throughout the plant and ductwork would be required over every connector, PSV, and valve. Installing ductwork over every connector, PSV, and valve within the facility is not technically feasible, and this option has been dismissed. There are no similar sources that are controlled in this manner.

Work Practice

The facility will be subject to the Equipment Leak Standard in 40 CFR Part 60 Subpart OOOOb (Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution in accordance with the provisions in 60.5400b. Additionally, as a best management practice, new PORVs installed at the facility are equipped with bottom dome piping, new and replacement valves are low-emission valves.

Conclusion

VOC RACT for the Connector, PSV, and Valve source groups shall be to operate using good air pollution practices and to conduct a Leak Detection and Repair (LDAR) program as recommended in 40 CFR Part 60 Subpart OOOOb and continue to follow MPLX's best management practices.

Blowdown Emissions

The maintenance blowdowns at the facility have potential VOC emissions greater than 2.7 tpy and thus, are subject to the case-by-case requirements in 25 Pa. Code § 129.114(c) which states: The owner or operator of a VOC air contamination source with the potential emission rate equal to or greater than 2.7 tons of VOC per year that is not subject to § 129.112 located at a major VOC emitting facility subject to § 129.111 shall propose a VOC RACT requirement or RACT emission limitation in accordance with subsection (d).

Vapor Recovery

Vapor Recovery Units (VRUs) are commonly used to reduce emissions from crude oil and condensate storage tanks, but where VRUs are already in place the vapor collection system can be modified to capture emissions from other low-pressure vent sources found onsite including pipeline pigging operations, compressor seal and blowdown vents, and dehydrator vents. VRUs are normally driven by an electric motor. The keys to cost-effective VRU projects are a steady source and adequate quantity of crude oil, condensate, or other low-pressure sources of organic vapors, along with an economic outlet for the collected products. The potential volume of vapors will depend on the makeup of the collection system and the quantity and types of sources it is connected to.

The main challenge with using vapor recovery to control vapors from facility maintenance blowdowns is the unsteady and high-pressure nature of flows. The depressurization of compressors for maintenance will result in a short duration of flow to the vapor recovery unit before returning to no flow. Thus, the VRU would either need to be idled during periods when there are no planned maintenance events or sweep gas would be required to keep the VRU operational when there is no flow from blowdowns. Frequent idling and starting of any motor results in more than normal wear on the unit and a short lifespan of the equipment in addition to increased maintenance. To ensure steady flow to the VRU, sweep gas would have to be added to the process and would result in an increased flow to the process flare.

Vapor Destruction

Vapor destruction is achieved through a high-temperature oxidation process used to burn waste gases containing combustible components such as volatile organic compounds (VOCs), natural gas (or methane), and carbon monoxide (CO). The waste gases are piped to a remote, usually elevated location, and burned in an open flame in ambient air using a specially designed burner tip, auxiliary fuel, and, in some cases, assist gases like steam or air to promote mixing for nearly complete (e.g., ≥ 98%) destruction of the combustible components in the waste gas.

Routing new blowdown vents to the process flare is a safe and achievable option to reduced VOC emissions.

Conclusion

Due to the infrequent nature of blowdown events at the facility and potentially high-pressures, MPLX proposes to route facility maintenance blowdowns to the process flare to achieve 98% destruction efficiency.

Attachment C

BAT Analysis

Best Available Technology Review

Existing Process Flare and Enclosed Combustor

MarkWest Liberty Midstream and Resources, L.L.C., a fully owned subsidy of MPLX, hereinafter referred to as MPLX, is seeking authorization to construct and operate the Harmon Creek 2 Cryo (HC2). During maintenance and emergency situations, MPLX will require the blowdown of equipment associated with HC2. MPLX plans to route such vapors to the existing process flare. Because the most recent version of the GP5 excludes the use of open flares, MPLX submitted a plan approval application seeking authorization to control HC2 with the existing process flare. Per request of the Department, a BAT analysis for the installation and operation of an enclosed combustion device (ECD) in addition to the existing process flare was included in the application. MPLX would like to note that the Harmon Creek Gas Plant will remain a minor source after the implementation of HC2.

One Enclosed Combustion Device

As described in the plan approval application, MPLX obtained a quote for an ECD adequately sized for the HC2 process. The ECD was guaranteed the same destruction and removal efficiency (DRE) as the existing plant flare; thus, no emission reductions would be achieved. Based on the required purge and pilot gas rates to safely operate the ECD, an emissions increase would result from the operation of the unit, as shown in Table 1. Therefore, the existing flare meets BAT for this project.

Further, the Department has requested that MPLX consider installing multiple smaller ECDs or installing one with a DRE of 99%. In response, MPLX has evaluated the technical, environmental, and economic feasibility of the Department's request. The change in emissions associated with the addition of an ECD with 99% DRE is shown in Table 1.

Table 1. Summary of facility-wide emissions and change in emissions using the existing process flare and adding an ECD with 98% or an ECD with 99% DRE.

	Existing Process Flare	*Existing Process Flare and One (1) ECD with 98% DRE*		*Existing Process Flare and One (1) ECD with 99% DRE*	
Pollutant	Facility-wide PTE	Facility-wide PTE	Change in Emissions	Facility-wide PTE	Change in Emissions
VOC	38.63	38.64	+0.01	36.62	-2.01
NOx	31.42	31.87	+0.45	31.87	+0.45
CO	50.38	52.42	+2.04	52.42	+2.04

As shown in Table 1, routing HC2 to an ECD with a VOC DRE of 99% would result in a reduction of 2.01 tpy of VOC for a capital cost of $25M or greater. However, CO and NOx emissions would increase at the facility by 2.04 and 0.45 tpy, respectively.

A well-known flare manufacturer, Cimarron, has cautioned against using 99% DRE for permits, despite test data demonstrating that their ECDs performed above 99.9% under controlled test conditions. NSPS OOOOa testing conducted by the manufacturer does not use natural gas as fuel and is conducted under controlled conditions. However, typical operations at an oil and gas facility vary from the control conditions. Thus, the recommended guarantee by most enclosed combustor manufacturers is 98% DRE for permitting purposes. MPLX prefers to use a DRE of 98% for conservatism because the Department may establish permit limits based on potential emissions provided in the application.

Further, Zeeco guaranteed the quoted enclosed combustor DRE at 98%. Even with a DRE of 99%, solely considering the estimated minimum capital cost of the project at $25M, the cost per ton savings over a ten-year period would equate to approximately $1.24M/ton VOC. However, there would be an increase in NOx and CO emissions, resulting in an increase of 0.48 tpy of criteria pollutants facility-wide.

Multiple Smaller Enclosed Combustion Devices

MPLX has evaluated the feasibility of installing multiple smaller ECDs at the facility as requested by the Department. Each ECD requires a significant footprint for equipment and piping and, per API standards, must be constructed at a specific height and distance from the process. To accommodate multiple ECDs at the facility, MPLX would be required to acquire more land, create new disturbed acreage, and undergo timely permitting processes related to such projects.

To comply with API Standard 537 on Flare Details for Natural Gas Industries, each ECD at a facility would require a separate flare header to maintain an open path from process vents to the flares. Each new flare header would require the construction of foundation, steel racks, and piping resulting in an estimated minimum cost of $5M. The estimated cost for a flare header does not include the cost of an ECD or installation. Also, new flare header piping would result in an increase in fugitive component counts and associated emissions.

With each additional ECD, additional emissions from the combustion of pilot and purge gas would be generated. The facility-wide emissions using the existing process flare and an enclosed combustor are summarized in Table 1. The emission increases associated with the ECD providing a DRE of 98% show the pilot and purge combustion emissions. Thus, if multiple enclosed combustors were operated, there would be more emissions than those presented in the table above.

Summary

Due to the considerable footprint of each ECD requiring more land, increased emissions from the combustion of pilot and purge gas and fugitive components associated with new flare header piping, and the significant cost associated with even one ECD, MPLX has determined that installing ECD(s) at the facility is not technically, environmentally, or economically feasible. Thus, the existing flare at the facility is determined to meet BAT for this project.

Reciprocating Compressor Rod Packing and Measurement Device Vents

Emissions associated with the three (3) reciprocating compressor rod packing vents needed to compress residue gas for Harmon Creek 2 results in a facility-wide increase of 0.20 tpy of VOC. The measurement device venting for HC2 results in a facility-wide increase of 0.26 tpy of VOC. Per #31 of 25 Pa Code §127.14(a)(8), rod packing and measurement device venting from this project are exempt from the Plan Approval requirements of §127.11 and §127.12 because the uncontrolled VOC emissions from the project are less than 2.7 tons on a 12-month rolling basis. In addition to exemption #8, the measurement devices are exempt from permitting under 25 Pa Code §127.14(a)(7) because the gas chromatographs (GCs) and moisture analyzers are considered laboratory equipment used exclusively for chemical or physical analyses.

At the request of the Department, MPLX is providing a BAT analysis on rod packing emissions associated with the three (3) reciprocating compressors. A search for “rod packing” was conducted in the RBLC Database from 1/2017 through 9/2022 for all pollutants and no results were returned. Therefore, MPLX relied on technical expertise from the compressor manufacturer and facility personnel.

MPLX contacted Ariel Corporation in May 2022 to explore options to reduce rod packing emissions associated with the compressors. Based on reference material provided and discussions with Ariel representatives, the standard Ariel packings meet or exceed today's industry-standard requirements, and ongoing research and development efforts ensure the best possible seal. The new reciprocating compressors will be equipped with what Ariel identifies as low-emission packing.

Finally, the Department has suggested that MPLX consider using carbon adsorption canisters to control rod packing and measurement vents. In discussions with technical experts, risks were identified in association with the use of carbon adsorption canisters. The downstream design pressure from rod packing vents is 1440 psi, and with the obstruction of a vent line, back pressure could result in a dangerous overpressure of a carbon canister.

One option considered is routing low-pressure measurement device vents to the closed drain where vapors are controlled by the process flare. One known risk is the possible contamination of the sensitive GC equipment due to potential flowback. However, this method is not practiced at MPLX facilities, and other potential challenges and risks are unknown. The estimated cost is approximately $200,000 per vent to route vent streams to the closed drain. Eight (8) measurement device vents are proposed for HC2, and the total installation cost would be approximately $1.6M to control 0.26 tpy VOC.

Routing rod packing vents to the closed drain is not an option due to the low pressure of the closed drain system, which is approximately 1 psi. As mentioned earlier, the downstream design pressure from the rod packing vents is 1440 psi.

Another option to reduce emissions from low-pressure vents is by routing vents to a vapor recovery unit (VRU). The estimated range to acquire and install a VRU is approximately $1-2M. Because these vents are located throughout the facility, multiple VRUs and significant amounts of piping would be required to recover these vapors. The cost per ton reduction from just one (1) VRU, without considering the operation and maintenance, over a ten-year period would range from approximately $218,000/ton to $436,000/ton.

The high cost to install an emissions control for an insignificant emission reduction of 0.46 tpy is not economically reasonable. As referenced in 25 Pa Code §127.14(a), a plan approval is not required for the rod packing or measurement device vents. MPLX meets BAT by complying with the OOOOa standard requiring rod packing replacement every 26,000 hours or every 36 months.

Attachment D

LDAR Program
28VHP Boilerplate Special Conditions

Fugitive Components
Support Documentation

28VHP Boilerplate Special Condition Language		MPLX Practices
A	The requirements of paragraphs F and G shall not apply (1) where the Volatile Organic Compound (VOC) has an aggregate partial pressure or vapor pressure of less than 0.044 pounds per square inch, absolute (psia) at 68°F or (2) operating pressure is at least 5 kilopascals (0.725 psi) below ambient pressure. Equipment excluded from this condition shall be identified in a list or by one of the methods described below to be made readily available upon request. The exempted components may be identified by one or more of the following methods: • piping and instrumentation diagram (PID); • a written or electronic database or electronic file; • color coding; • a form of weatherproof identification; or • designation of exempted process unit boundaries.	
B	Construction of new and reworked piping, valves, pump systems, and compressor systems shall conform to applicable American National Standards Institute (ANSI), American Petroleum Institute (API), American Society of Mechanical Engineers (ASME), or equivalent codes.	Construction of new and reworked piping, valves, pump systems, and compressor systems conforms with all applicable codes and is confirmed in construction bid language.
C	New and reworked underground process pipelines shall contain no buried valves such that fugitive emission monitoring is rendered impractical. New and reworked buried connectors shall be welded.	No new or reworked underground process pipelines are associated with Harmon Creek. Any new underground drain piping will be welded.
D	To the extent that good engineering practice will permit, new and reworked valves and piping connections shall be so located to be reasonably accessible for leak checking during plant operation. Difficult-to-monitor and unsafe-to-monitor valves, as defined by Title 30 Texas Administrative Code Chapter 115 (30 TAC Chapter 115), shall be identified in a list to be made readily available upon request. The difficult-to-monitor and unsafe-to-monitor valves may be identified by one or more of the methods described in subparagraph A above. If an unsafe to monitor component is not considered safe to monitor within a calendar year, then it shall be monitored as soon as possible during safe to monitor times. A difficult to monitor component for which quarterly monitoring is specified may instead be monitored annually.	To the extent possible, MPLX ensures that all valves and piping connections are reasonably accessible. There are no difficult-to-monitor or unsafe-to-monitor components at Harmon Creek. Should such components exist at a facility, they would be identified in a list that is available upon request.
E	New and reworked piping connections shall be welded or flanged. Screwed connections are permissible only on piping smaller than two-inch diameter.	MPLX construction practices are consistent with these conditions. Hydraulic testing of new or reworked piping connections is conducted prior to installation. Any modified piping would undergo field

	Gas or hydraulic testing of the new and reworked piping connections at no less than operating pressure shall be performed prior to returning the components to service or they shall be monitored for leaks using an approved gas analyzer within 15 days of the components being returned to service. Adjustments shall be made as necessary to obtain leak-free performance. Connectors shall be inspected by visual, audible, and/or olfactory means at least weekly by operating personnel walk-through. Each open-ended valve or line shall be equipped with an appropriately sized cap, blind flange, plug, or a second valve to seal the line. Except during sampling, both valves shall be closed. If the isolation of equipment for hot work or the removal of a component for repair or replacement results in an open ended line or valve, it is exempt from the requirement to install a cap, blind flange, plug, or second valve for 72 hours. If the repair or replacement is not completed within 72 hours, the permit holder must complete either of the following actions within that time period; (1) a cap, blind flange, plug, or second valve must be installed on the line or valve; or (2) the open-ended valve or line shall be monitored once for leaks above background for a plant or unit turnaround lasting up to 45 days with an approved gas analyzer and the results recorded. For all other situations, the open-ended valve or line shall be monitored once within the 72 hour period following the creation of the open ended line and monthly thereafter with an approved gas analyzer and the results recorded. For turnarounds and all other situations, leaks are indicated by readings of 500 ppmv and must be repaired within 24 hours or a cap, blind flange, plug, or second valve must be installed on the line or valve	nondestructive examination (NDE). Leak checks are performed prior to putting systems into service. Operations conducts daily AVO inspections. LDAR conducts weekly AVO inspections on pumps. MPLX's LDAR Program at the facility requires OEVs and OELs to be equipped with an appropriately sized cap, blind flange, plug, or a second valve to seal the line. MPLX's standard is to only allow OELs and/or OEVs to exist on equipment that is not in service and follows the lockout and tagout procedures.
F	Accessible valves shall be monitored by leak checking for fugitive emissions at least quarterly using an approved gas analyzer. Sealless/leakless valves (including, but not limited to, welded bonnet bellows and diaphragm valves) and relief valves equipped with a rupture disc upstream or venting to a control device are not required to be monitored. If a relief valve is equipped with rupture disc, a pressure-sensing device shall be installed between the relief valve and rupture disc to monitor disc integrity.	Valves are monitored quarterly using Method 21. Sealless/leakless valves are not part of the Harmon Creek processes. There will be no relief valves with rupture discs in VOC service. Any relief valves with a rupture disc are equipped with a pressure-sensing device. All valves and relief valves in VOC service are monitored quarterly at Harmon Creek.

	A check of the reading of the pressure-sensing device to verify disc integrity shall be performed at least quarterly and recorded in the unit log or equivalent. Pressure sensing devices that are continuously monitored with alarms are exempt from recordkeeping requirements specified in this paragraph. All leaking discs shall be replaced at the earliest opportunity but no later than the next process shutdown. The gas analyzer shall conform to requirements listed in Method 21 of 40 CFR part 60, appendix A. The gas analyzer shall be calibrated with methane. In addition, the response factor of the instrument for a specific VOC of interest shall be determined and meet the requirements of Section 8 of Method 21. If a mixture of VOCs is being monitored, the response factor shall be calculated for the average composition of the process fluid. A calculated average is not required when all of the compounds in the mixture have a response factor less than 10 using methane. If a response factor less than 10 cannot be achieved using methane, then the instrument may be calibrated with one of the VOC to be measured or any other VOC so long as the instrument has a response factor of less than 10 for each of the VOC to be measured. Replacements for leaking components shall be re-monitored within 15 days of being placed back into VOC service.	There are no relief valves equipped with rupture discs in VOC service at Harmon Creek. However, it is standard that any rupture discs at the facility are equipped with a transmitter or switch which would alarm if the disc failed. Transmitters/switches are considered critical and thus, would be inspected during critical instrumentation rounds. The gas analyzer used for monitoring equipment under this program meets Method 21 requirements. The resurvey requirements described in this section are consistent with MPLX's LDAR Program at the facility.
G	Except as may be provided for in the special conditions of this permit, all pump, compressor, and agitator seals shall be monitored with an approved gas analyzer at least quarterly or be equipped with a shaft sealing system that prevents or detects emissions of VOC from the seal. Seal systems designed and operated to prevent emissions or seals equipped with an automatic seal failure detection and alarm system need not be monitored. These seal systems may include (but are not limited to) dual pump seals with barrier fluid at higher pressure than process pressure, seals degassing to vent control systems kept in good working order, or seals equipped with an automatic seal failure detection and alarm system. Submerged pumps or sealless pumps (including, but not limited to, diaphragm, canned, or magnetic-driven pumps) may be used to satisfy the requirements of this condition and need not be monitored.	All pumps in VOC service are monitored via Method 21 monthly. Compressors in VOC service are monitored at least quarterly via OGI.
H	Damaged or leaking valves or connectors found to be emitting VOC in excess of 500 parts per million by volume (ppmv) or found by visual inspection to be leaking (e.g., dripping process fluids) shall be tagged and replaced or repaired.	Valves or connectors found to be emitting VOC in excess of 500 ppmv are tagged and replaced or repaired.

	Damaged or leaking pump, compressor, and agitator seals found to be emitting VOC in excess of 2,000 ppmv or found by visual inspection to be leaking (e.g., dripping process fluids) shall be tagged and replaced or repaired. A first attempt to repair the leak must be made within 5 days and a record of the attempt shall be maintained.	Upon detection of a leak from pump seals or compressor seals, the component is tagged and replaced or repaired. The first attempt repair requirements described in this section are consistent with MPLX's LDAR Program at the facility.
I	A leaking component shall be repaired as soon as practicable, but no later than 15 days after the leak is found. If the repair of a component would require a unit shutdown that would create more emissions than the repair would eliminate, the repair may be delayed until the next scheduled shutdown. All leaking components which cannot be repaired until a scheduled shutdown shall be identified for such repair by tagging within 15 days of the detection of the leak. A listing of all components that qualify for delay of repair shall be maintained on a delay of repair list. The cumulative daily emissions from all components on the delay of repair list shall be estimated by multiplying by 24 the mass emission rate for each component calculated in accordance with the instructions in 30 TAC 115.782 (c)(1)(B)(i)(II). The calculations of the cumulative daily emissions from all components on the delay of repair list shall be updated within ten days of when the latest leaking component is added to the delay of repair list. When the cumulative daily emission rate of all components on the delay of repair list times the number of days until the next scheduled unit shutdown is equal to or exceeds the total emissions from a unit shutdown as calculated in accordance with 30 TAC 115.782 (c)(1)(B)(i)(I), the TCEQ Regional Manager and any local programs shall be notified and may require early unit shutdown or other appropriate action based on the number and severity of tagged leaks awaiting shutdown. This notification shall be made within 15 days of making this determination.	The repair requirements described in this section are consistent with MPLX's LDAR Program at the facility. Emissions from a unit shutdown are evaluated to determine if a DOR is appropriate. DORs are identified with a weatherproof tag and tracked via the LeakDas database. 30 TAC 115.782 (c)(1)(B)(i)(II) requires mass emission rates to be calculated using the EPA correlation approach. MPLX uses the LeakDas database to track leaks, which calculates emissions using the EPA correlation approach. MPLX has reviewed DOR data and at no point has cumulative daily emissions from all components on the DOR list exceeded the emissions that would result from the next scheduled shutdown. MPLX will perform the calculation as required and make the appropriate notifications to PADEP.
J	Records of repairs shall include date of repairs, repair results, justification for delay of repairs, and corrective actions taken for all components. Records of instrument monitoring shall indicate dates and times, test methods, and instrument readings. The instrument monitoring record shall include the time that monitoring took place for no less than 95% of the instrument readings	The recordkeeping requirements described in this section are consistent with MPLX's LDAR Program at the facility. Operations conducts daily AVO inspections via walkthroughs and makes note of such inspections.

	recorded. Records of physical inspections shall be noted in the operator's log or equivalent.	
K	Alternative monitoring frequency schedules of 30 TAC '' 115.352 - 115.359 or National Emission Standards for Organic Hazardous Air Pollutants, 40 CFR Part 63, Subpart H, may be used in lieu of Items F through G of this condition.	
L	Compliance with the requirements of this condition does not assure compliance with requirements of 30 TAC Chapter 115, an applicable New Source Performance Standard (NSPS), or an applicable National Emission Standard for Hazardous Air Pollutants (NESHAPS) and does not constitute approval of alternative standards for these regulations.	

The Harmon Creek LDAR Program monitoring frequency and detection levels meet the 28VHP requirements and are shown in the table below:

Component Type	Monitoring Frequency	Detection Level (PPMV)
Compressor	Quarterly/Annually	10,000 (OGI) / 500
Connector	Quarterly/Annually	10,000 (OGI) / 500
Pressure Relief	Quarterly	500
Valve	Quarterly	500
Pump	Monthly	500

Attachment E

Methanol Questionnaire

Standard Questions Pertaining to Methanol Use

1. Will your facility use methanol for de-icing or as an antifreeze in the natural gas conveyance and/or treatment process? [25 Pa. Code §127.12(a)(2)]
   Yes.
2. Will your facility receive any natural gas that will have methanol in it? [25 Pa. Code §127.12(a)(2)]
   Based on the gas analysis provided to the Department on 6/16/2021, methanol was not present in detectable quantities in the facility inlet stream.

If "no" to 1 and 2, disregard remaining questions. If "yes" to either 1 or 2, please answer the remaining questions.

3. What will be the total volume of methanol used per calendar year at the facility? [25 Pa. Code §127.12(a)(2)]
   No greater than 5 gallons of methanol is used per year currently. MPLX calculated potential emissions based on a conservative throughput to account for HC2 and HC3.
4. What will be the total volume of methanol used per calendar year for each well that will send gas to the facility? [25 Pa. Code §127.12(a)(2)]
   Based upon analytical data, methanol was non-detect in the inlet stream in 2021.
5. Is the methanol used continuously throughout the year or seasonally? Please explain. [25 Pa. Code §127.12(a)(2)]
   Methanol is used periodically throughout the year as needed. The same is expected for HC2 and HC3.
6. Where is the methanol injected into the system? If at the facility, please identify each injection point in your process flow diagram. [25 Pa. Code §127.12(a)(2)]
   Methanol will continue to be injected from the injection pump upstream of the DeMethanizer, thus incorporating methanol into the plant process.
7. Please account for the final disposition of the methanol at your facility. Examples would include methanol contained in collected wastewater (produced water, or "slop tank"), remaining in the dried natural gas, contained in the rich glycol, and contained in the glycol sent to the reboiler. [25 Pa. Code §127.12(a)(2)]
   The final disposition of the methanol at the facility is in the amine closed drain or Y-grade product pipeline.
8. Please quantify your facility's annual methanol emissions including any fugitive emissions and stack emissions, e.g., flash tank and reboiler vents. Be sure to include the calculations and supporting documentation. [25 Pa. Code §127.12(a)(2)]
   Please see Detailed Emission Estimates provided in the Plan Approval application.

Response to First Technical Deficiency Letter
Submitted on June 27, 2024

MarkWest Liberty Midstream & Resources, L.L.C.
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(303) 825-0920 Fax

June 27, 2024

Devin P. Tomko, P.E./DPT
Air Quality Engineer
PA DEP SW Regional Office
400 Waterfront Drive
Pittsburgh, PA 15222

Re: Response to Technical Deficiencies
MarkWest Liberty Midstream & Resources, L.L.C. – Harmon Creek Gas Plant
Application for Plan approval PA-63-01011B
APS No. 1066962, AUTH No. 1471222
Smith Township, Washington County

Dear Devin P. Tomko, P.E./DPT:

MarkWest Liberty Midstream & Resources, L.L.C. (MPLX) is providing response to technical deficiencies identified in the letter received on May 28, 2024. Some of the requests from the Department relate to updates to the Best Available Technology (BAT) analysis and MPLX has been in contact with vendors to obtain quotes and details which are required to complete the BAT analysis. However, the information necessary to complete the requested evaluations have not yet been received. As such, MPLX will follow up with the remaining BAT analysis-related items as soon as possible.

The remaining requests have been addressed herein.

1. The available SDSs and product specifications have been attached to the email.
2. The updated Process Flow Diagram has been appended.
    a. Please find the list of existing sources to the Closed Drain and Amine Closed Drain systems below. The Harmon Creek 3 sources will be very similar to the existing sources and are still in the design phase.
        - Harmon Creek 1 and 2 Cryo Closed Drain Sources
          Residue Compressor Scrubber Drains
          Residue Gas Filter Coalescer Drains
          Dehy Inlet Filter Coalescer Drains
          Regen Gas Scrubber Drains
          Launcher/Receiver Drains
          Stabilizer Feed Filter Drain
          Stabilizer Compressor Scrubber Drains
        - Harmon Creek Deeth 1 Amine Closed Drain Sources
          Amine Flash Scrubber Drain
          Amine Flash Tank Drain
          Amine Pumps Seal Drain
          Amine Still PSV-1562
          Rich Amine Filter PSV-1465
          Rich Amine Filter Drain

Rich Amine Charcoal Filter PSV-1466
Rich Amine Charcoal Filter Drain
Rich Amine After Filter PSV-1467
Rich Amine After Filter Drain
Miscellaneous Amine Drains

- Harmon Creek 3 Cryo Closed Drain Sources
  Residue Compressor Scrubber Drains
  Dehy Inlet Filter Coalescer Drains
  Regen Gas Scrubber Drains
- Harmon Creek Deeth 2 Amine Closed Drain Sources
  Amine Flash Scrubber Drain
  Amine Flash Tank Drain
  Amine Pumps Seal Drain
  Amine Still PSV
  Rich Amine Filter PSV
  Rich Amine Filter Drain
  Rich Amine Charcoal Filter PSV
  Rich Amine Charcoal Filter Drain
  Rich Amine After Filter PSV
  Rich Amine After Filter Drain
  Miscellaneous Amine Drains

b. Please find the list of fugitive emissions that are routed to the existing plant flare attached.

3. The BAT analysis will be corrected to address the Harmon Creek 3 specific sources.
4. A detailed cost analysis will be included in the BAT analysis for each source control method that is determined to be technically feasible.
5. The updated BAT analysis will include all vendor quotes and manufacturer data used for the evaluation of control equipment.
6. The manufacturer for the CO2 reciprocating compressor is Ariel, model 60HZ-6PO. The rod packing leak rate is 0.75 SCFM as detailed in the attached Ariel information sheet.
7. The requested centrifugal compressor information has been summarized in the table below and the specification sheets are attached.

Service	Manufacturer	Model	Design Dry Seal Leak Rate
Residue	Siemens Energy	DATUM D08R6S	1.78 SCFM
Regeneration	Sundyne	LMC-311F	0.25 SCFM

8. The PSV inspections and maintenance are captured via operator rounds, the Leak Detection and Repair (LDAR) program, mechanical indicators, and testing as detailed below.

   MarkWest personnel perform daily walkthroughs at the Harmon Creek Gas Plant to identify leaking equipment, malfunctions, etc. An example of a daily rounds sheet is attached to the email for reference. The gas plant operators utilize audio, visual, and olfactory (AVO) methods during their walkthroughs to identify leaking equipment. The LDAR Program at the Harmon Creek Gas Plant includes quarterly Method 21 inspections on PSVs.

   In addition, PSVs that vent to atmosphere are covered with a yellow rain cap. If one of these PSVs vent, the rain cap would lift off from the vent line making it apparent to personnel that it has potentially lifted. Please note that the only PSVs that vent to atmosphere at the Harmon Creek Gas Plant are on the instrument air system and thus are not associated with VOC or methane emissions.

   The plant personnel also perform walkthroughs specifically to identify equipment that may be operating incorrectly and venting to the flare. Personnel look for evidence of freeze-ups, listen for unexpected gas flow through piping, and smell for evidence of leaks.

PSVs are tested on either a 5-year or 10-year schedule based on process safety management (PSM) guidelines. They are also re-tested after work requests for lifts are submitted.

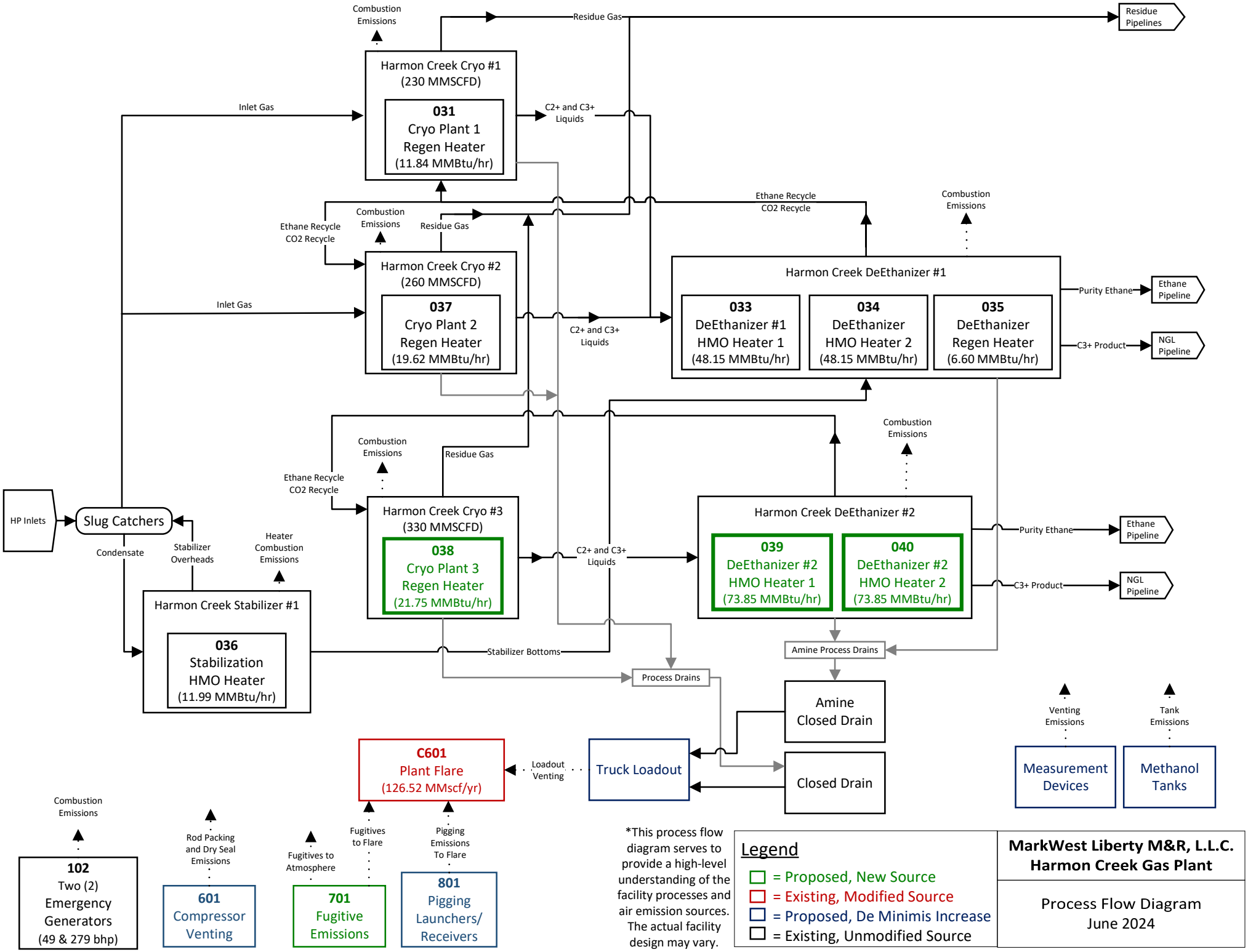
9. MPLX has reached out to vendors to further evaluate the flare BAT analysis and will provide the requested items and updated information once received.
    a. During maintenance and emergency situations, MPLX will require the blowdown of equipment associated with HC3 and De-Eth 2 for safety purposes. MPLX plans to route such vapors to the existing process flare. Because the most recent version of the GP5 excludes the use of open flares, the Department required MPLX to submit a plan approval application for Harmon Creek 2 for a case-by-case evaluation. Therefore, MPLX submitted a plan approval application seeking authorization to control HC3 with the existing process flare.
    b. MPLX will follow up with a BAT analysis evaluating feasibility of using an ECD with 99% DRE once information has been received from the vendor.
    c. MPLX has contacted Baker Furnace for more information and is waiting for a response.
    d. The normal operating pressure range of the existing plant flare header system is between 0 and 10 psig.
    e.
        i. The API Standard 537 - Flare Details for Natural Gas Industries is a copyrighted document and cannot be transmitted. However, MPLX can provide information on sections of the standard should the Department be seeking specific information.
        ii. Additional information on the footprint required for an ECD will be provided once details have been provided by the vendor.
10. MPLX is waiting to receive information from vendors for low pressure vent control options and will address the requested items in the updated BAT analysis.

Should you require additional information on the items included in this response, please contact me at (412) 815-8886 or via email at ajuarez@marathonpetroleum.com.

Sincerely,

Alexandra M. Juarez
Environmental Engineer
MPLX Gathering & Processing

Updated Process Flow Diagram



*This process flow diagram serves to provide a high-level understanding of the facility processes and air emission sources. The actual facility design may vary.

Legend

- ☐ = Proposed, New Source
- ☐ = Existing, Modified Source
- ☐ = Proposed, De Minimis Increase
- ☐ = Existing, Unmodified Source

MarkWest Liberty M&R, L.L.C.
Harmon Creek Gas Plant

Process Flow Diagram
June 2024

List of Fugitives Routed to the Plant Flare

Device Tag #	Equipment	Discharge Location
1250	DEETHANIZER FEED/BOTTOMS EXCHANGER (D1-E-1250) SS	FLARE
1351	DEETHANIZER FEED/BOTTOMS EXCHANGER (D1-E-1250) TS	FLARE
1251	DEETHANIZER REBOILER (D1-E-1251) SS	FLARE
1251A	DEETHANIZER REBOILER (D1-E-1251) TS	FLARE
1555	DEETHANIZER (D1-T-1555)	FLARE
1449	REFRIGERANT RECLAIMER (D1-V-1449)	FLARE
1457	DEETHANIZER REFLUX DRUM (D1-V-1457)	FLARE
1456	PROPANE PLUS PRODUCT SURGE TANK (D1-V-1456)	FLARE
1256A	ETHANE/HOT OIL EXCHANGER (D1-E-1256) SS	FLARE
1256B	ETHANE/HOT OIL EXCHANGER (D1-E-1256) TS	FLARE
1462	AMINE CONTACTOR (D1-T-1561)	FLARE
1468	INLET ETHANE FILTER/COALESCER (D1-F-1468)	FLARE
1463	AMINE FLASH TANK (D1-V-1463)	FLARE
1465	RICH AMINE FILTER (D1-F-1465)	FLARE
1466	RICH AMINE CHARCOAL FILTER (D1-F-1466)	FLARE
1467	RICH AMINE AFTER FILTER (D1-F-1467)	FLARE
1562	AMINE STILL WITH SURGE (D1-T-1562)	FLARE
1474	C2 DEHYDRATION DUST FILTER (D1-F-1474)	FLARE
1475	C2 DEHYDRATION DUST FILTER (D1-F-1474)	FLARE
1480	C2 DEHYDRATION INLET FILTER/COALESCER (D1-F-1480)	FLARE
1472	C2 DEHYDRATION ADSORBER (D1-F-1472)	FLARE
1473	C2 DEHYDRATION ADSORBER (D1-F-1473)	FLARE
1476	C2 REGENERATION GAS SCRUBBER (D1-V-1476)	FLARE
1479+	C2 REGEN SEAL GAS COALESCER (D1-F-1479)	FLARE
1775	C2 REGENERATION GAS HEATER (D1-H-1775)	FLARE
1257	ETHANE/ETHANE EXCHANGER (D1-E-1257) TS	FLARE
1458	ETHANE PRODUCT SURGE TANK (D1-V-1458)	FLARE
1253	DEETHANIZER CONDENSER (D1-E-1253) SS	FLARE
1453	REFRIGERANT SCRUBBER (D1-V-1453)	FLARE
1454A	REFRIGERANT RECLAIMER (D1-V-1454)	FLARE
1155	REFRIGERANT COMPRESSOR (D1-C-1155)	FLARE
1156	REFRIGERANT COMPRESSOR (D1-C-1156)	FLARE
1157	REFRIGERANT COMPRESSOR (D1-C-1157)	FLARE
1155B	REFRIGERANT COMPRESSOR SUCTION SCRUBBERS (D1-V-1455/6/7)	FLARE
1455	REFRIGERANT ECONOMIZER (D1-V-1455)	FLARE
1768	HOT OIL HEATER (D1-H-1768)	FLARE
1768B	HOT OIL EXPANSION TANK (D1-V-1768) & AMINE REBOILER (D1-E-1262).	FLARE
2768	HOT OIL HEATER (D1-H-2768)	FLARE
2768B	HOT OIL EXPANSION TANK (D1-V-2768) & AMINE REBOILER (D1-E-2262).	FLARE
2251	DEETHANIZER REBOILER (D1-E-2251) SS	FLARE
2251A	DEETHANIZER REBOILER (D1-E-2251) TS	FLARE

2555	DEETHANIZER (D1-T-2555)	FLARE
1501-102	1ST STAGE DISCHARGE BOTTLE (V-3) CO2 COMPRESSOR	FLARE
1501-103	2ND STAGE DISCHARGE COOLER (IC-2) CO2 COMPRESSOR	FLARE
1501-104	3RD STAGE DISCHARGE COOLER (AC) CO2 COMPRESSOR	FLARE
1501-105	PURGE GAS LINE	FLARE
0421	12"-E0-0162	FLARE
0421F	12"-E0-0163	FLARE
1640	ETHANE PLUS SURGE TANK (D1-V-1640)	FLARE
1402	WET CO2 FILTER (D1-F-1402)	FLARE
1501	1ST STAGE SUCTION SCRUBBER (V-1) CO2 COMPRESSOR	FLARE
1422	REGENERATION WATER FLASH TANK (D1-V-1422)	FLARE
PSV-101	EXPANDER/COMPRESSOR (EX/C-2121) LUBE OIL RESERVOIR (R-101)	FLARE
PSV-2140A	REFRIGERANT COMPRESSOR (C-2140) & OIL SEPARATOR (PV-1101)	FLARE
PSV-2141B	REFRIGERANT COMPRESSOR (C-2141) & OIL SEPARATOR (PV-1101)	FLARE
PSV-2142C	REFRIGERANT COMPRESSOR (C-2142) & OIL SEPARATOR (PV-1101)	FLARE
PSV-2151B	RESIDUE COMPRESSOR 1ST STAGE DISCHARGE BOTTLE (V-2151C)	FLARE
PSV-2151C	RESIDUE COMPRESSOR 2ND STAGE SUCTION SCRUBBER (V-2151D) / SUCTION BOTTLE (V-2151E)	FLARE
PSV-2152B	RESIDUE COMPRESSOR 1ST STAGE DISCHARGE BOTTLE (V-2152C)	FLARE
PSV-2152C	RESIDUE COMPRESSOR 2ND STAGE SUCTION SCRUBBER (V-2152D) / SUCTION BOTTLE (V-2152E)	FLARE
PSV-2153B	RESIDUE COMPRESSOR 1ST STAGE DISCHARGE BOTTLE (V-2153C)	FLARE
PSV-2153C	RESIDUE COMPRESSOR 2ND STAGE SUCTION SCRUBBER (V-2153D) / SUCTION BOTTLE (V-2153E)	FLARE
PSV-2221	GAS/GAS EXCHANGER (E-2221) HS & ANCILLARY EQUIPMENT (V-2421, E-2241 TS, E-2223 HS & E-2224 HS)	FLARE
PSV-2226B	RESIDUE GAS HEATER (E-2226) SS	FLARE
PSV-2321	PROCESS PIPING (2458-18"-GP-BO-CS)	FLARE
PSV-2411	REGEN SEAL GAS FILTER/COALESCER (F-2411)	FLARE
PSV-2441	REFRIGERANT SUCTION SCRUBBER (V-2441) & GAS CHILLER (E-2241) SS	FLARE
PSV-2442	REFRIGERANT ECONOMIZER (V-2442)	FLARE
PSV-2444	REFRIGERANT ACCUMULATOR (V-2444) & REFRIGERANT CONDENSERS (A-2343A/B/C)	FLARE
PSV-2460	FUEL GAS SCRUBBER (V-2460)	FLARE
PSV-2711	REGEN GAS HEATER (H-2711)	FLARE
PSV-2321A+	EXPANDER/COMPRESSOR DISCHARGE COOLER (A-2321)	FLARE
PSV-2824	CLOSED DRAIN TANK (TK-2824)	FLARE

Ariel Compressor
Specification Sheets &
Packing Information

Ariel Performance

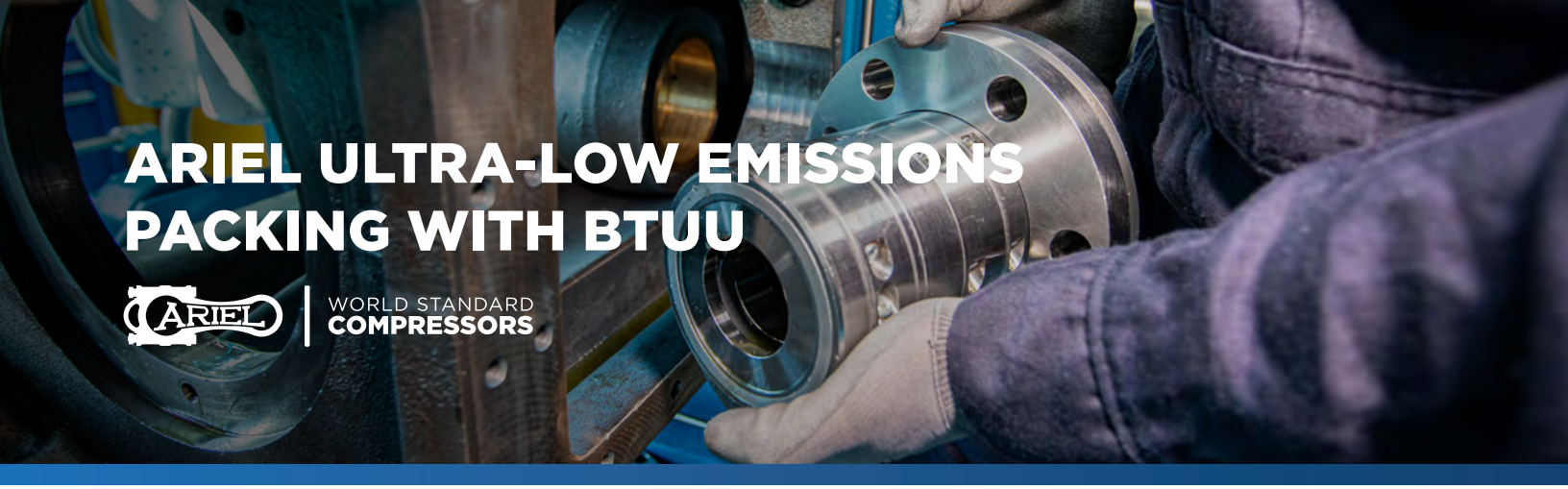
7.7.11.0	Company:	Customer:	
	Quote:	Inquiry:	
	Case 1: Design	Project:	

Compressor Data:

Elevation,ft:	1125.00	Barmtr,psia:	14.100	Ambient,F:	105.00	**Driver Data:**	
Frame:	JG/2	Stroke, in:	3.50	Rod Dia, in:	1.125	Type:	*VFD*
Max RL Tot, lbf:	18000	Max RL Tens, lbf:	9000	Max RL Comp, lbf:	10000	Mfg:	
Rated RPM:	1500	Rated BHP:	252.0	Rated PS FPM:	875.0	Model:	60 Hz - 6 Po
Calc RPM:	1176.0	BHP:	60	Calc PS FPM:	686.0	BHP:	75
						Avail:	75

SOUR GAS-1

Services	**Service 1**		
Gas Model	VMG-APRNGL2		
Stage Data:	**1**	**2**	**3**
Target Flow, MMSCFD	0.250	0.250	0.250
Flow Calc, MMSCFD	0.308	0.290	0.284
BHP per Stage	21.4	19.4	16.5
Specific Gravity	*1.4384*	*1.4887*	*1.5055*
Ratio of Sp Ht (N)	1.2707	1.2736	1.2864
Comp Suct (Zs)	0.9938	0.9831	0.9533
Comp Disch (Zd)	0.9916	0.9776	0.9429
Pres Suct Line, psig	*5.40*	N/A	N/A
Pres Suct Flg, psig	***5.20***	41.02	138.84
Pres Disch Flg, psig	42.56	142.95	357.28
Pres Disch Line, psig	N/A	N/A	350.00
Pres Ratio F/F	2.935	2.849	2.428
Temp Suct, F	123.00	120.00	120.00
Temp Clr Disch, F	120.00	120.00	120.00
Cylinder Data:	**Throw 1**	**Throw 2**	**Throw 2**
Cyl Model	8-7/8JG	6-1/2JG-CE	3-5/8JG-HE
Cyl Bore, in	8.500	6.500	3.625
Cyl RDP (API), psig	340.9	577.3	1154.5
Cyl MAWP, psig	375.0	635.0	1270.0
Cyl Action	DBL	CE	HE
Cyl Disp, CFM	268.0	76.7	24.6
Pres Suct Intl, psig	4.22	37.98	126.58
Temp Suct Intl, F	129	126	124
Pres Disch Intl, psig	45.28	150.62	383.60
Temp Disch Intl, F	297	290	276
HE Suct Gas Vel, FPM	5149	0	6111
HE Disch Gas Vel, FPM	4717	N/A	5346
HE Spcrs Used/Max	0/4	N/A	0/2
HE Vol Pkt Avail	1.59+76.45	N/A	1.00+42.47
Vol Pkt Used	0.00 (V) %	N/A %	0.00 (V) %
HE Min Clr, %	18.44	N/A	11.51
HE Total Clr, %	20.03	N/A	12.51
CE Suct Gas Vel, FPM	5059	5183	0
CE Disch Gas Vel, FPM	4634	4586	N/A
CE Spcrs Used/Max	0/4	0/0	N/A
CE Min Clr, %	19.03	13.34	N/A
CE Total Clr, %	19.03	13.34	N/A
Suct Vol Eff HE/CE, %	67.0/68.3	N/A/76.7	82.0/N/A
Disch Event HE/CE, ms	8.5/10.1	N/A/10.9	10.5/N/A
Suct Pseudo-Q HE/CE	5.6/5.4	N/A/4.8	7.1/N/A
Gas Rod Ld Comp, %	23.4 C	36.7 C	36.7 C
Gas Rod Ld Tens, %	25.4 T	28.9 T	28.9 T
Gas Rod Ld Total, %	25.7	34.9	34.9
Xhd Pin Deg/%Rvrsl lbf	176/94.4	169/45.2	169/45.2
Flow Calc, MMSCFD	0.308	0.290	0.284
Cyl BHP	21.4	19.4	16.5



ARIEL ULTRA-LOW EMISSIONS PACKING WITH BTUU

WORLD STANDARD COMPRESSORS

Lower Emissions Without Compromise

If you're looking for a packing system that is both long-lasting and reduces leakage, Ariel Ultra-Low Emissions Packing with BTUU delivers! Our solid ring technology provides thousands of hours of reliable, low-leakage operation between service intervals – containing processed gas by eliminating the leak paths of conventional segmented ring sets.

We stand behind our thorough data and research verifying that Ariel Ultra-Low Emissions Packing with BTUU will reduce your compressor emissions. We now offer our solid ring technology standard in all new units and upgrades due to its longevity and field-proven sealing capabilities.

Ariel Ultra Low Emissions Packing with BTUU Leakage Statement

Ariel has documented significant reduction in emissions when comparing uncut seal ring (BTUU/CUU) technology against traditional technologies, both in a controlled R&D environment, and in available field data. Ariel has measured BTUU leakage rates near zero to 0.75 SCFM per throw during the first year of operation. When applied properly, there are additional sealing performance improvements during idle pressurized conditions.

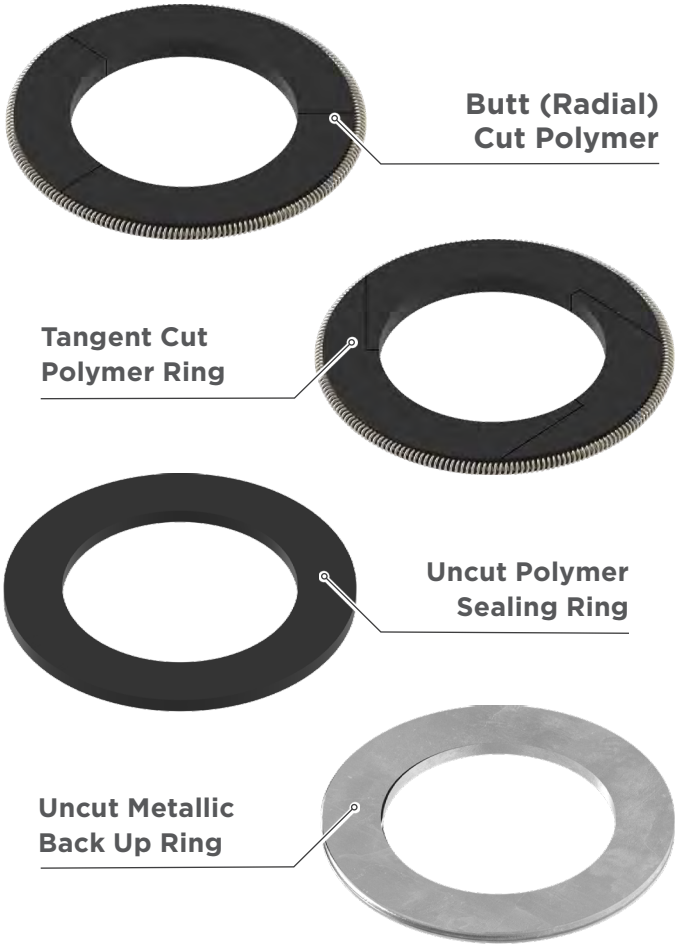
*Actual packing leakage rates depend on many variables, including but not limited to, equipment application, operating conditions, equipment maintenance, lubricants used, and piston rod and packing component wear.

The bottom line: Ariel Ultra Low Emissions Packing with BTUU leaks less than 0.75 scfm when properly applied, maintained, installed and operated.

WHAT IS "BTUU" TECHNOLOGY?

The BTUU ring set works by combining uncut and cut rings to create an exceedingly tight seal. The radial cut and tangent cut rings first break down the pressure, while the backup solid sealing ring and metallic ring provide structural support. In many applications, the solid, uncut rings compress under pressure, which creates additional sealing against the piston rod.

The Ariel Ultra Low Emissions Packing with BTUU features high-performance thermoplastic and metallic materials. These engineered materials are specifically chosen to operate reliably within their designed applications. The BTUU product family includes additional ring sets using solid ring technology called BTU, CU, and CUU, which employ different styles of cut rings and utilize the uncut final ring.



Environmental Benefits and Increased Revenue

Emissions result in potential lost gas delivery and revenue. The Ariel Ultra-Low Emissions Packing with BTUU has shown significant ROI, often delivering 99% or more of compressed gas. Ariel's products align to provide substantial customer benefits and send a clear message to stakeholders:

"The best compressors now come standard with packing built for low emissions."

Field Proven Success

Ariel continues to invest in research and development efforts to ensure the best possible seal, including modeling and testing packing in extreme operating conditions. We strive to do even better: developing designs and materials that further reduce emissions beyond industry standards. Ariel's ultimate goal is to deliver packing that minimizes emissions as close to zero as possible while extending the life of the packing.

For example, a customer with six JGT/4 compressors installed Ariel Ultra-Low Emission Packing with BTUU. After 28,000 operating hours, the leakage rates on the 24 packing cases showed an excellent reduction in the typical leakage and wear rates. The average leakage rate across the 24 packing cases was 0.45 scfm.

Centrifugal Compressor Specifications

SPECIFICATION SHEET

Purchaser	Enerflex	Quote No.	SC254350	Rev	1	Serial No.	
Owner/User	MPLX	Date	12-Apr-24	By	Fouraker	Inquiry No.	OP-125001
Service	Regeneration	Item No.	C-3111	Quantity	1	Model	LMC-311F
Location	USA	Purchase Order No.				Track No.	

OPERATING CONDITION

	Rated	Off Design 1	
Gas Handled	Natural Gas	Natural Gas	
MMSCFD (14.7 psia & 60°F Dry)			
Weight Flow (lb/min)	667	707	
INLET CONDITIONS			
Pressure (Psia)	845.7	845.7	
Temperature (°F)	120.0	120.0	
Relative Humidity (%)			
Molecular Weight (MW)	20.55	21.73	
Cp/Cv (Kavg)	1.235	1.223	
Compressibility (Z1 or Zavg)	0.874	0.856	
Volume Flow (ACFM)	208.7	205.1	
DISCHARGE CONDITIONS			
Pressure (Psia)	910.7	916.47	
Temperature (°F)	133.3	133.8	
Cp/Cv (Kavg)	1.235	1.223	
Compressibility (Z2 or Zavg)	0.877	0.856	
Required BHP, all losses included	102.0	108.2	
MAX HP, all losses included	149.7		
Predicted Surge +/- 10%, ACFM	109.2		
Adiabatic Head ft-lbf/lbm	2,842	2,859	
Adiabatic Efficiency (%)	61.9	62	
Speed (RPM)	12,279	12,279	

		Rated	Off Design 1	
Gas Analysis	**MW**	**Mol %**	**Mol %**	**Mol %**
N2	28.02	0.37	0.39	
CO2	44.01	0.08	0.15	
CH4	16.04	78.49	74.15	
C2H6	30.07	13.96	15.51	
C3H8	44.09	4.35	5.86	
IC4H10	58.12	0.48	0.64	
NC4H10	58.12	1.1	1.79	
IC5H12	72.15	0.24	0.38	
NC5H12	72.15	0.3	0.57	
C6H14	86.17	0.23	0.20	
C7H16	100.2	0.16	0.13	
H20	18.02	0.25	0.25	
Total		100.01	100.02	
Average		20.55	21.73	

TEST REQUIREMENTS

SHOP TEST		Required	Witnessed
Shop Inspection		Yes	Yes
Hydrostatic Test at (psig)		Yes	No
Helium Leak at (psig)		No	No
Mechanical Run for (hours)		No	No
Impeller Overspeed / Dye Penetrant		No	No
Performance Test with Shop Driver		Yes	No

SHOP TEST	Required	Witnessed
Use Shop Lube System	Yes	No
Use Job Seals	Yes	No
Use Shop Seismic Velocity Probe	Yes	No
Use Job Vibration Displacement Probes	No	No
Disassemble/Inspect Comp. after Test	No	No
Disassemble/Inspect Gearbox after Test	No	No
Lube Oil Functional Separate from unit	Yes	No

SITE DATA

Elevation (Feet) 1,700 Ambient Pressure (Psia) 13.81 Ambient Temperature (°F) -17/105

REMARKS

(1) When a gas analysis is provided, Sundyne utilizes our calculated MW, K and Z values.

SPECIFICATION SHEET

Purchaser	Enerflex	Quote No.	SC254350	Rev	1	Serial No.	
Owner/User	MPLX	Date	12-Apr-24	By	Fouraker	Inquiry No.	OP-125001
Service	Regeneration	Item No.	C-3111	Quantity	1	Model	LMC-311F
Location	USA	Purchase Order No.				Track No.	

CONSTRUCTION & MATERIALS

Max. Allowable Case Design Pressure 1361 @ 150 °F
Not an inlet or an operating point

Compressor Connections: 1/2 inch NPT
Impeller Diameter (in) 7.358 Diffuser Section (in) 0.2
Type Coupled

Nozzles	Size (in)	ANSI Rating	Facing	Finish (RMS)	Position
Suction	3	600#	RF	250-500	Side
Discharge	2	600#	RF	250-500	Side

Build Code **K**

Casing	Carbon Steel	Seal Parts	316SS
Seal Housing	17-4PH	Seal Gaskets	PTFE (Similar to Teflon®)
Diffuser	Carbon Steel	Comp. Gaskets	Fluorocarbon (Similar to Viton®)
Impeller	Titanium	Case Studs	A193, B-7
Shaft	4140	Seal Rot. Face	Tungsten Carbide
Sleeve	17-4PH	Seal Stat. Face	Carbon Graphite

GEARBOX

Input RPM 3550 Output RPM 12,279
Lubrication ISO 32 Synthetic
Heat Exch: Air Cooled Model
Shell Material Tube Material Finned CS

Lube Priming Pump? Yes Manufacturer Viking
Specials

MOTOR DRIVE by Sundyne

HP 125 SF 1.15 RPM 3550 Frame
Manufacturer ABB
Enclosure TEFC Insulation F
Volts/Phase/Cycles 460/3/60 FL Amps LR Amps
Specials: 841-XL, Class 1, Div 2, Gr C/D
Motor shipped loose for customer installation.

PROCESS SEALS

Type Tandem Mechanical Dry Gas
Manufacturer Flowserve GSS
Part Number: Lower Upper
Clean Cool Buffer Gas Required? No

Estimated Leakage: External ~0.25 SCFM
Internal SCFM

MOUNTING

Option A

TOTAL UTILITY CONSUMPTION

Cooling Water (gpm)	-	
Steam, Normal (lb/min)	-	
Steam, Maximum (lb/min)	-	
Instrument Air (SCFM)	-	
Power, Driver (HP)	125	
Power, Auxiliaries (HP)	2, 1	1kW heater

WEIGHTS (lbs)

Compressor	300	Gearbox	300
Aux	250	Horizontal Base	
Driver	1890		
Max. for Maintenance	1890		
	Total Shipping Weight		2740

PAINTING

Sundyne Standard 2 coat Paint

PREPARATION FOR SHIPPING

Sundyne Standard Domestic Boxing

REMARKS

Seal gas coalescing filter required to remove water from the seal gas to be provided and piped by others.

Quotation

Date:	15-May-2024
Quote Version:	1.1
Customer Reference:	MPLX - Harmon Creek 3, Residue Comps
SFDC No.:	SF232175697

DGS Data

Description	Actual Operating Conditions	DGS Design Limits	Units
Shaft seal diameter	4.750	N/A	in
Maximum continuous speed	14,912	200 m/s	RPM
100% Speed	14,202	200 m/s	RPM
Slow Roll	9,941	1,000	RPM
Max. operating sealing pressure	1214 (1520 MAWP)	3626	psiG
Static sealing pressure	902	3626	psiG
Max seal supply gas temp.	320	320	°F
Min seal supply gas temp.	-30	-30	°F
Nature of gas	Natural Gas (pipeline)		
Mole weight			

Primary & Secondary Seal Flow

OPERATING CONDITIONS	EXPECTED (NL/Min)/SCFM		GUARANTEED (NL/Min)/SCFM	
Gas seal Size: 4.750"	INBOARD	OUTBOARD	INBOARD	OUTBOARD
100%				
1214 psiG @ 14202 RPM	**23.5 / 0.82**		**47.0 / 1.64**	
15 psiG (Min) @ 14202 RPM		**1.0 / 0.04**		**2.0 / 0.08**
MCOS				
1214 psiG @ 14912 RPM	**25.5 / 0.89**		**51.0 / 1.78**	
SOP				
902 psiG @ 0 RPM	**9.7 / 0.34**		**19.4 / 0.68**	

Intermediate Labyrinth Flow

(One compressor end)	MINI EXPECTED		MAXI EXPECTED	
Nitrogen flow under the labyrinth	NL/Min	SCFM	NL/Min	SCFM
based on pressure of 0,05 BarD	n/a	n/a	n/a	n/a
If flow control	n/a	n/a		

Separation Seal Flow

Nitrogen flow under carbon rings:	EXPECTED (NL/Min)/SCFM		GUARANTEED (NL/Min)/SCFM	
	DYNAMIC	STATIC	DYNAMIC	STATIC
Pressure control Based on pressure of 0,2 barD / 5 PSID	139.1/4.9	493.6/17.3	208.7/7.3	740.3/25.9
If flow control	56/2			

MIN: 0.37#/min

NORMAL: 0.56#/min

MAX:1.98 #/min

Quotation

Date:	15-May-2024
Quote Version:	1.1
Customer Reference:	MPLX - Harmon Creek 3, Residue Comps
SFDC No.:	SF232175697

Siemens Dry Gas Seal Value Proposition

The biggest value from a Siemens DGS is that they have been designed with Siemens compressor engineers and for optimal use with Siemens compressors. Siemens DGS are part of the tier one category of DGS and are fully compliant with Siemens compressor standards. In addition, Siemens DGS have been in service for 25 years and are utilized as part of all major client's assets around the world.

Siemens DGS Benefits	
Siemens DGS is equal to or better than other tier one competitors	30M+ in field run hours, Hundreds of years of combined DGS experience, Technical and business expertise in-house since 1990 and additions from competitors
Zero Emissions and Low Emissions DGS versions	Siemens Dual Pressurized DGS are a perfect zero emissions option. Siemens Dual Tandem seals are our low emissions seal with face leakage rates that meet 2 SCFM standards
OEM validated seal rotor dynamic studies	Siemens DGS is optimized for use with Siemens compressors and just as efficient with other branded compressors
Warranty Validation	OEM compressor warranty can be extended when Siemens branded DGS is included
Fully capable repair centers	Located strategically around the globe, they are experts in DGS repair and not just Siemens brand
A product fully backed by the Siemens Brand	No other DGS manufacturer has the same level of OEM backing
Wide DGS product suite	Standard L-Line for Datum style compressors, Compact design for small cavity compressors and oil seal replacement, Merlin design for high pressure applications and latest design standards and full line of barrier seals
Dedicated global engineering team	When standard Siemens DGS don't apply, we have a full engineering and testing group to handle any requirement
Fully compliant with latest standards	API 617 and API 692, IEC and ATEX
Plug & Play option for DGS exchange	Swap out other DGS brands with Siemens without need for modifications

Safety Data Sheets and Operator Round Sheet
Submitted on June 27, 2024

These were submitted as attachments to the email including the technical deficiency response

Only 1 of the 161 pages of the Operator Round Sheet has been provided in this version as it is representative of the type of inspections performed

Ethane

Non-Restricted (All Destinations)

Specifications for G&P products are based on most stringent contract specifications and any applicable regulatory requirements.

Specification	MIN	MAX	TYP	LCL	UCL	TXT	FTN
Methane {ASTM D2163} (vol. %)		1.00					
Ethane {ASTM D2163} (vol. %)	95.00						
Total C3s and Heavier {ASTM D2163} (vol. %)		3.50					
Total Oxygenates {ASTM D7423} (ppm (wt.))		100.00					
Total Sulfur {ASTM D6667} (ppm (wt.))		30.00					
Copper Strip Corrosion Rating {ASTM D1838}		1					1
Moisture Content {ASTM D5454} (ppm (wt.))		10.00					
Carbon Dioxide (CO2) (Online) {GPA 2177} (ppm (wt.)) Carbon Dioxide (CO2) (Online) {SpectraSensor} (ppm (wt.)) Carbon Dioxide (CO2) {GPA 2177} (ppm (wt.))		1000.00					2

Destination
Non-Restricted (All Destinations)

Reference Source	Standard	Version
Gathering & Processing	G&P East Ethane - All Destinations	2021

Spec Sheet Footnote:

Product released from an individual G&P facility may not meet all of the specifications listed in this spec sheet. Marketing will manage shipments to ensure that any product not meeting these specs is mixed with on-spec product such that the resulting mixture will meet all specifications.

Footnotes:

(1) 1 hour at 37.8°C (100°F)

(2) Pipeline specifications list ASTM D2504 for CO2. Per ASTM, this method is suitable for setting specifications, for use as an internal quality control tool and for use in development or research work. This method is not used at G&P facilities for product certification.

ATTENTION: Printed and convenience copies should be used with caution. The user of this document must ensure the current approved version of the document is being used.

SAFETY DATA SHEET

SDS ID NO.: 104MPLX001 **Revision date** 09/23/2020

1. IDENTIFICATION

Product Name	Ethane
Product code	104MPLX001
Chemical family	Hydrocarbon Gas
Recommended use	Fuel.
Restrictions on use	All others.
Manufacturer, Importer, or Responsible Party Name and Address	**MPLX LP** **200 E. Hardin Street** **Findlay, OH 45840**
SDS Information	1-419-421-3070 (M-F; 8-5 EST)
24 Hour Emergency Telephone	CHEMTREC: 1-800-424-9300

2. HAZARD IDENTIFICATION

OSHA Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Classification

Flammable gases	Category 1
Gases under pressure	Compressed Gas
Simple asphyxiant	-
Specific target organ toxicity (single exposure)	Category 3

Hazards Not Otherwise Classified (HNOC)
Contact with product may cause frostbite.

Label Elements

Danger

Extremely flammable gas
Contains gas under pressure; may explode if heated
May displace oxygen and cause rapid suffocation
May cause drowsiness or dizziness
Contact with rapidly expanding gas may cause frostbite

Appearance Colorless Compressed Gas **Physical State** Gas **Odor** Odorless

Precautionary Statements - Prevention

Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Avoid breathing gas/vapors
Use only outdoors or in a well-ventilated area

Precautionary Statements - Response
Leaking gas fire: Do not extinguish, unless leak can be stopped safely
Eliminate all ignition sources if safe to do so
If inhaled: Remove person to fresh air and keep comfortable for breathing.
Call a poison center or doctor if you feel unwell

Precautionary Statements - Storage
Store in a well-ventilated place. Keep container tightly closed
Protect from sunlight
Store locked up

Precautionary Statements - Disposal
Dispose of contents/container at an approved waste disposal plant

3. COMPOSITION/INFORMATION ON INGREDIENTS

Composition Information

Name	CAS Number	% Concentration
Ethane	74-84-0	96-100
Propane	74-98-6	0-3
Ethylene	74-85-1	0-2
Propylene	115-07-1	0-1
Methane	74-82-8	0-1

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

4. FIRST AID MEASURES

First aid measures

General advice In case of accident or if you feel unwell, seek medical advice immediately (show directions for use or safety data sheet if possible).

Inhalation Remove to fresh air. If not breathing, utilize bag valve mask or other form of barrier device to institute rescue breathing. If breathing is difficult, ensure airway is clear, give oxygen and continue to monitor. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR). Get immediate medical attention.

Skin contact If product has caused frostbite, remove contaminated clothing. Thaw frost bitten areas slowly with lukewarm water or by wrapping affected areas with blankets. Do not rub affected areas. Let circulation reestablish itself naturally, exercising area if possible. Get medical attention.

Eye contact Flush with large amounts of tepid water for at least 15 minutes. Gently remove contact lenses while flushing. Eyelids should beheld away from the eyeball to ensure thorough rinsing. If frostbite is suspected (cloudy lens or greyish white tissue around the eye) get immediate medical attention.

Ingestion Ingestion not likely. If swallowed, immediately call a poison control center or physician.

Most important signs and symptoms, both short-term and delayed with overexposure

Adverse effects Asphyxiant gas. High concentrations in the immediate area can displace oxygen causing the feeling of suffocation and can cause headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue from oxygen deprivation. Contact with product may cause frostbite.

Indication of any immediate medical attention and special treatment needed

Notes to physician

This material (or a component) sensitizes the myocardium to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material. Administration of sympathomimetic drugs should be avoided. Treat symptomatically. Administer supplemental oxygen as needed.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media

For small fires, Class B fire extinguishing media such as CO2 or dry chemical can be used. For large fires use water spray or fog. Firefighting should be attempted only by those who are adequately trained and equipped with proper protective equipment.

Unsuitable extinguishing media

DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.

Specific hazards arising from the chemical

This product has been determined to be an extremely flammable gas per the OSHA Hazard Communication Standard and should be handled accordingly. Sealed containers may rupture when heated. Gas and/or vapors may accumulate along the ground, settle in low lying areas or be moved by ventilation and ignited by many sources such as pilot lights, sparks, electric motors, static discharge, or other ignition sources at locations distant from material handling. Flashback can occur along vapor trail. For additional fire related information see NFPA 30 or the Emergency Response Guidebook 115.

Hazardous combustion products

Smoke, carbon monoxide, and other products of incomplete combustion.

Explosion data

Sensitivity to mechanical impact: No.

Sensitivity to static discharge: Yes.

Special protective equipment and precautions for firefighters

Firefighters should wear full protective clothing and positive-pressure self-contained breathing apparatus (SCBA) with a full face-piece, as appropriate. Since this gas could burn with a near invisible flame in daylight, approach with caution. Isolate hazard area. If safe to do so, stop the flow of gas and allow fire to burn out. Extinguishing the flame before shutting off the supply can cause the formation of explosive mixtures. In some cases it may be preferred to allow the flame to continue to burn. Keep surrounding area cool with water spray from a distance and prevent further ignition of combustible material.

Additional firefighting tactics

FIRES INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after the fire is out. Do not direct water at source of leak or safety devices; icing may occur. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles: if this is impossible, withdraw from area and let fire burn.

EVACUATION: Consider initial downwind evacuation for at least 1000 feet. If tank, rail car or tank truck is involved in a fire, ISOLATE for 5280 feet (1 mile) in all directions; also, consider initial evacuation of 5280 feet (1 mile) in all directions.

NFPA Health 1 Flammability 4 Instability 0 Special Hazard -

6. ACCIDENTAL RELEASE MEASURES

Personal precautions

Keep people away from and upwind of spill/leak. Isolate and evacuate area. Shut off source if safe to do so. Eliminate all ignition sources. Use spark-proof tools and explosion-proof equipment. Distant ignition and flashback are possible. Monitor area for flammable or explosive atmosphere. Before entry, especially into confined areas, check atmosphere with

an appropriate monitor.

Protective equipment Use personal protection measures as recommended in Section 8.

Emergency procedures Advise authorities and National Response Center (800-424-8802) if the product has entered a water course or sewer. Notify local health and pollution control agencies, if appropriate.

Environmental precautions If leaking, take appropriate steps to disperse gas.

Methods and materials for containment Prevent further leakage or spillage if safe to do so.

Methods and materials for cleaning up Shut off gas supply, if safe to do so. Allow equipment to depressurize. Isolate area until gas has dispersed.

7. HANDLING AND STORAGE

Safe handling precautions Avoid breathing fumes, gas, or vapors. Use only outdoors or with adequate ventilation. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. Gas and/or vapors may accumulate along the ground, settle in low lying areas or be moved by ventilation and ignited by many sources such as pilot lights, sparks, electric motors, static discharge, or other ignition sources at locations distant from material handling. Flashback may occur along vapor trails. Use only non-sparking tools. Use appropriate grounding and bonding practices. Use personal protection recommended in Section 8. Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. Do not cut, drill, grind or weld on empty containers since explosive residues may remain. Comply with all applicable EPA, OSHA, NFPA and consistent state and local requirements.

Storage conditions Store in properly closed containers that are appropriately labeled and in a cool, well-ventilated area. Keep product and empty container away from heat and sources of ignition. Do not puncture or incinerate container.

Incompatible materials Strong oxidizing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Name	ACGIH TLV	OSHA PELS	NIOSH IDLH
Ethane 74-84-0	Simple asphyxiant	-	-
Propane 74-98-6	Simple asphyxiant	TWA: 1000 ppm TWA: 1800 mg/m^3	2100 ppm
Ethylene 74-85-1	200 ppm TWA	-	-
Propylene 115-07-1	500 ppm TWA	-	IDLH: 3400 ppm
Methane 74-82-8	Simple asphyxiant	-	-

Notes: No further information available.

Engineering measures Local or general exhaust required in an enclosed area or when there is inadequate ventilation. Use mechanical ventilation equipment that is explosion-proof. Monitor atmospheric oxygen levels.

Personal protective equipment

Eye protection Goggles or faceshield may be needed when handling pressurized gases.

Skin and body protection Wear insulated gloves when handling pressurized gases to prevent skin contact and frostbite or freeze burn. Contact the glove manufacturer for specific advice on glove selection and breakthrough times.

Respiratory protection Use atmosphere supplying respirators in the event of oxygen deficiency, when material produces gases and/or vapors that exceed permissible limits, or when excessive gases and/or vapors are generated. Observe respirator assigned protection factors (APFs) criteria cited in federal OSHA 29 CFR 1910.134.

Note: Air purifying respirators are not to be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturers instructions), in oxygen deficient atmospheres, (less than 19.5% oxygen) or under conditions that are immediately dangerous to life and health (IDLH).

Hygiene measures Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Do not smoke while handling.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Colorless Compressed Gas
Physical State	Gas
Color	Colorless
Odor	Odorless
Odor Threshold	No data available.

Property	**Values (method)**
pH	Not applicable
Melting Point / Freezing Point	-172 °C / -278 °F
Initial Boiling Point / Boiling Range	-89 °C / -128 °F
Flash Point	-135 °C / -211 °F
Evaporation Rate	No data available.
Flammability (solid, gas)	Extremely flammable gas
Flammability Limit in Air (%):	
Upper Flammability Limit:	12.5%
Lower Flammability Limit:	3%
Explosion Limits	No data available.
Vapor Pressure	558 psi @ 21°C (70°F)
Vapor Density	1 (air =1)
Specific Gravity / Relative Density	0.357
Water Solubility	No data available.
Partition Coefficient	No data available.
Autoignition Temperature	472 °C / 882 °F
Decomposition Temperature	No data available.
Kinematic Viscosity	No data available.
VOC Content (%)	No data available.
Bulk Density	Not applicable

10. STABILITY AND REACTIVITY

Reactivity The product is non-reactive under normal conditions.

Chemical stability The material is stable at 70°F (21°C), 760 mmHg pressure.

Possibility of hazardous reactions None under normal processing.

Hazardous polymerization Will not occur.

Conditions to avoid Sources of heat or ignition.

Incompatible materials Strong oxidizing agents.

Hazardous decomposition products None known under normal conditions of use.

11. TOXICOLOGICAL INFORMATION

Potential short-term adverse effects from overexposures

Inhalation May cause central nervous system depression with nausea, headache, dizziness, vomiting, and incoordination. In high concentration the gas may cause suffocation. Victim may not be aware of asphyxiation.

Eye contact Gas or vapor is generally non-irritating to eyes. Contact with rapidly expanding gas may cause frostbite.

Skin contact Gas or vapor is generally non-irritating to skin. Contact with rapidly expanding gas may cause frostbite.

Ingestion Ingestion not likely.

Acute toxicological data

Name	Oral LD50	Dermal LD50	Inhalation LC50
Ethane 74-84-0	-	-	658 mg/L (Rat) 4 h
Propane 74-98-6	-	-	> 1,464 mg/L (Rat) 15 min
Ethylene 74-85-1	-	-	> 11,473 mg/m^3 (Male rat) 5 h
Propylene 115-07-1	-	-	658 mg/L (Rat) 4 h
Methane 74-82-8	-	-	326 mg/m^3 (Mouse) 2 h

Immediate and delayed effects as well as chronic effects from short and long-term exposure

METHANE and ETHANE: Exposure to high levels of these gases produce weak central nervous system (CNS) depressant effects without significant potential for systemic toxicity. At very high levels they act as asphyxiant gases by diluting and displacing oxygen. Symptoms of persons exposed to oxygen deficient atmospheres include headache, dizziness, incoordination, cyanosis and narcosis. Extremely high concentrations can produce unconsciousness followed by death.

PROPANE: Laboratory animal studies indicate exposure to extremely high levels of propane (1 to 10 vol.% in air) may cause cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.

ETHYLENE: At extremely high levels ethylene gas acts as a general anesthetic and central nervous system depressant.

PROPYLENE: At extremely high levels propylene gas acts as a general anesthetic and central nervous system depressant. Studies in laboratory animals indicate evidence of mild, reversible hydrocarbon nephropathy in male rats exposed to levels of 1000-4,500 ppm propylene for 90-days.

Adverse effects related to the physical, chemical and toxicological characteristics

Signs and symptoms Asphyxiant gas. High concentrations in the immediate area can displace oxygen causing the feeling of suffocation and can cause headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue from oxygen deprivation. Contact with product may cause frostbite.

Acute toxicity None known.

Skin corrosion/irritation None known.

Serious eye damage/eye irritation None known.

Sensitization None known.

Mutagenic effects None known.

Carcinogenicity None known.

Name	ACGIH (Class)	IARC (Class)	NTP	OSHA
Ethylene 74-85-1	Not Classifiable (A4)	Not Classifiable (3)	Not Listed	Not Listed
Propylene 115-07-1	Not Listed	Not Classifiable (3)	Not Listed	Not Listed

Reproductive toxicity None known.

Specific Target Organ Toxicity (STOT) - single exposure May cause drowsiness or dizziness.

Specific Target Organ Toxicity (STOT) - repeated exposure None known.

Aspiration hazard Not applicable.

12. ECOLOGICAL INFORMATION

Ecotoxicity Not classified in terms of aquatic toxicity.

Persistence and degradability Expected to be inherently biodegradable.

Bioaccumulation Not expected to bioaccumulate in aquatic organisms.

Mobility in soil Expected to rapidly partition to air.

Other adverse effects No information available.

13. DISPOSAL CONSIDERATIONS

Description of waste residues No information available.

Safe handling of wastes Handle in accordance with applicable local, state, and federal regulations. Use personal protection measures as required. Use appropriate grounding and bonding practices. Use only non-sparking tools. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. No smoking.

Disposal of wastes / methods of disposal The user is responsible for determining if any discarded material is a hazardous waste (40 CFR 262.11). Dispose of in accordance with federal, state and local regulations.

Contaminated packaging disposal Empty containers should be completely drained and then discarded or recycled, if possible. Do not cut, drill, grind or weld on empty containers since explosive residues may be present. Dispose of in accordance with federal, state and local regulations.

14. TRANSPORT INFORMATION

DOT

UN/Identification No: UN 1035
UN Proper Shipping Name: Ethane
Transport Hazard Class(es): 2.1
Packing Group: Not applicable

IATA

UN/Identification No:	UN 1035
UN Proper Shipping Name:	Ethane
Transport Hazard Class(es):	2.1
Packing Group:	Not applicable

IMDG

UN/Identification No:	UN 1035
UN Proper Shipping Name:	Ethane
Transport Hazard Class(es):	2.1
Packing Group:	Not applicable
EmS No:	F-D, S-U
Marine Pollutant:	No

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable

15. REGULATORY INFORMATION

Regulatory Information

US TSCA Chemical Inventory This product and/or its components are listed on the TSCA Chemical Inventory or are exempt.

Canada DSL/NDSL Inventory This product and/or its components are listed either on the Domestic Substances List (DSL) or are exempt.

EPA Superfund Amendment & Reauthorization Act (SARA)

SARA Section 302 This product does not contain any component(s) included on EPA's Extremely Hazardous Substance (EHS) List above the de minimis threshold.

SARA Section 304 This product does not contain any component(s) identified as an EHS or a CERCLA Hazardous substance above the de minimis threshold.

SARA Section 311/312 The following EPA hazard categories apply to this product:

Flammable
Gas under pressure
Simple asphyxiant
Specific target organ toxicity
Hazard Not Otherwise Classified (HNOC)-Health

SARA Section 313 This product may contain component(s), which if in exceedance of the de minimus threshold, may be subject to the reporting requirements of SARA Title III Section 313 Toxic Release Reporting (Form R).

Name	CERCLA/SARA 313 Emission reporting
Ethylene 74-85-1	1.0 % de minimis concentration
Propylene 115-07-1	1.0 % de minimis concentration

U.S. State Regulations

California Proposition 65 This product does not contain chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

For more information, go to www.P65Warnings.ca.gov.

State Right-To-Know Regulations The following component(s) of this material are identified on the regulatory lists below:

Name	New Jersey Right-To-Know	Pennsylvania Right-To-Know	Massachusetts Right-To Know
Ethane 74-84-0	Listed	Listed	Listed
Propane 74-98-6	Listed	Listed	Listed
Ethylene 74-85-1	Listed	Listed	Listed
Propylene 115-07-1	Listed	Listed	Listed
Methane 74-82-8	Listed	Listed	Listed

16. OTHER INFORMATION

Prepared by Toxicology & Product Safety

NFPA

Revision Notes

Revision date 09/23/2020

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information is intended as guidance for safe handling, use, processing, storage, transportation, accidental release, clean-up and disposal and is not considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

NOTE: Naturally Occurring Radioactive Material (NORM), i.e. gases and particles, are found in trace amounts in crude oil and some derived products. Worker risks from NORM can be minimized by determining where NORM is present and controlling the handling of NORM contaminated wastes and processing, transport or storage equipment (e.g. lines, filters, pumps and reaction units) in compliance with OSHA's Standard on Ionizing Radiation 29CFR 1910.1096. During the processing of crude oil and certain petroleum products, NORM may accumulate in sediments, scales and sludge found in processing equipment (e.g. lines, filters, pumps and reaction units), and consequently may present an inhalation or ingestion hazard. For additional information on managing NORM, please refer to API's Bulletin E2 entitled, "Bulletin on Management of Naturally Occurring Radioactive Material in Oil and Gas Production".

SAFETY DATA SHEET

SDS ID NO.: 106MPLX001 **Revision date** 09/23/2020

1. IDENTIFICATION

Product Name	Natural Gas
Synonym	Methane; Residue gas; Finished gas
Product code	106MPLX001
Chemical family	Hydrocarbon Gas
Recommended use	Fuel.
Restrictions on use	All others.
Manufacturer, Importer, or Responsible Party Name and Address	**MPLX LP** **200 E. Hardin Street** **Findlay, OH 45840**
SDS Information	1-419-421-3070 (M-F; 8-5 EST)
24 Hour Emergency Telephone	CHEMTREC: 1-800-424-9300

2. HAZARD IDENTIFICATION

OSHA Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Classification

Flammable gases	Category 1
Gases under pressure	Compressed Gas
Simple asphyxiant	-
Reproductive toxicity	Category 2
Specific target organ toxicity (single exposure)	Category 3

Hazards Not Otherwise Classified (HNOC)
Contact with product may cause frostbite.

Label Elements

Danger

Extremely flammable gas
Contains gas under pressure; may explode if heated
May displace oxygen and cause rapid suffocation
Suspected of damaging fertility or the unborn child
May cause drowsiness or dizziness
Contact with rapidly expanding gas may cause frostbite

Appearance Clear, Colorless Gas	**Physical State** Gas	**Odor** Odorless to sweet

Precautionary Statements - Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Avoid breathing gas/vapors
Use only outdoors or in a well-ventilated area
Wear protective gloves/protective clothing/eye protection/face protection

Precautionary Statements - Response
Leaking gas fire: Do not extinguish, unless leak can be stopped safely
Eliminate all ignition sources if safe to do so
IF exposed or concerned: Get medical attention
If inhaled: Remove person to fresh air and keep comfortable for breathing.
Call a poison center or doctor if you feel unwell

Precautionary Statements - Storage
Store in a well-ventilated place. Keep container tightly closed
Protect from sunlight
Store locked up

Precautionary Statements - Disposal
Dispose of contents/container at an approved waste disposal plant

3. COMPOSITION/INFORMATION ON INGREDIENTS

Composition Information

Name	CAS Number	% Concentration
Natural Gas	8006-14-2	100
Methane	74-82-8	> 70
Ethane	74-84-0	< 25
Nitrogen	7727-37-9	< 20
Carbon Dioxide	124-38-9	< 12
Propane	74-98-6	< 5
Pentane (mixed isomers)	109-66-0	< 2.5
Butane (mixed isomers)	106-97-8	< 2
n-Hexane	110-54-3	< 0.5

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

4. FIRST AID MEASURES

First aid measures

General advice In case of accident or if you feel unwell, seek medical advice immediately (show directions for use or safety data sheet if possible).

Inhalation Remove to fresh air. If not breathing, utilize bag valve mask or other form of barrier device to institute rescue breathing. If breathing is difficult, ensure airway is clear, give oxygen and continue to monitor. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR). Get immediate medical attention.

Skin contact If product has caused frostbite, remove contaminated clothing. Thaw frost bitten areas slowly with lukewarm water or by wrapping affected areas with blankets. Do not rub affected areas. Let circulation reestablish itself naturally, exercising area if possible. Get immediate medical attention.

Eye contact Flush with large amounts of tepid water for at least 15 minutes. Gently remove contact lenses while flushing. Eyelids should beheld away from the eyeball to ensure thorough

rinsing. If frostbite is suspected (cloudy lens or greyish white tissue around the eye) get immediate medical attention.

Ingestion Ingestion not likely. If swallowed, immediately call a poison control center or physician.

Most important signs and symptoms, both short-term and delayed with overexposure

Adverse effects Asphyxiant gas. High concentrations in the immediate area can displace oxygen causing the feeling of suffocation and can cause headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue from oxygen deprivation. Contact with product may cause frostbite.

Indication of any immediate medical attention and special treatment needed

Notes to physician This material (or a component) sensitizes the myocardium to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material. Administration of sympathomimetic drugs should be avoided. Treat symptomatically. Administer supplemental oxygen as needed.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media For small fires, Class B fire extinguishing media such as CO2, dry chemical, foam or water spray can be used. For large fires, water spray, fog or foam can be used. Firefighting should be attempted only by those who are adequately trained and equipped with proper protective equipment.

Unsuitable extinguishing media DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.

Specific hazards arising from the chemical This product has been determined to be an extremely flammable gas per the OSHA Hazard Communication Standard and should be handled accordingly. Vapors may travel along the ground or be moved by ventilation and ignited by many sources such as pilot lights, sparks, electric motors, static discharge, or other ignition sources at locations distant from material handling. Flashback can occur along vapor trail. For additional fire related information see NFPA 30 or the Emergency Response Guidebook 115. May accumulate electrostatic charge and ignite or explode. Sealed containers may rupture when heated. A phenomena known as boiling liquid expanding vapor explosions (Bleve) can occur when a liquid in a pressurized container comes in close proximity to a fire and reaches a temperature well above its boiling point. A catastrophic failure of the vessel can occur, resulting in flying equipment fragments, a shock wave and a fireball causing serious damage and death.

Hazardous combustion products Smoke, carbon monoxide, and other products of incomplete combustion.

Explosion data

Sensitivity to mechanical impact: No.

Sensitivity to static discharge: Yes.

Special protective equipment and precautions for firefighters Firefighters should wear full protective clothing and positive-pressure self-contained breathing apparatus (SCBA) with a full face-piece, as appropriate. Since this gas could burn with a near invisible flame in daylight, approach with caution. Isolate hazard area. If safe to do so, stop the flow of gas and allow fire to burn out. Extinguishing the flame before shutting off the supply can cause the formation of explosive mixtures. In some cases it may be preferred to allow the flame to continue to burn. Keep surrounding area cool with water spray from a distance and prevent further ignition of combustible material. Avoid use of solid water streams. Contact with water and liquefied product can cause increased vaporization. Use extreme caution when fighting petroleum gas fires.

Additional firefighting tactics FIRES INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after the fire is out. Do not direct water at source of leak or safety devices; icing may occur. Withdraw immediately in case of rising sound from venting safety devices

or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles: if this is impossible, withdraw from area and let fire burn.

EVACUATION: Consider initial downwind evacuation for at least 1000 feet. If tank, rail car or tank truck is involved in a fire, ISOLATE for 5280 feet (1 mile) in all directions; also, consider initial evacuation of 5280 feet (1 mile) in all directions.

NFPA	Health 1	Flammability 4	Instability 0	Special Hazard -

6. ACCIDENTAL RELEASE MEASURES

Personal precautions

Keep people away from and upwind of spill/leak. Isolate and evacuate area. Shut off source if safe to do so. Eliminate all ignition sources. Use spark-proof tools and explosion-proof equipment. Distant ignition and flashback are possible. Monitor area for flammable or explosive atmosphere. Before entry, especially into confined areas, check atmosphere with an appropriate monitor.

Protective equipment

Use personal protection measures as recommended in Section 8.

Emergency procedures

Advise authorities and National Response Center (800-424-8802) if the product has entered a water course or sewer. Notify local health and pollution control agencies, if appropriate.

Environmental precautions

If leaking, take appropriate steps to disperse gas.

Methods and materials for containment

Prevent further leakage or spillage if safe to do so.

Methods and materials for cleaning up

Shut off gas supply, if safe to do so. Allow equipment to depressurize. Isolate area until gas has dispersed.

7. HANDLING AND STORAGE

Safe handling precautions

Avoid breathing fumes, gas, or vapors. Use only outdoors or with adequate ventilation. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. Gas and/or vapors may accumulate along the ground, settle in low lying areas or be moved by ventilation and ignited by many sources such as pilot lights, sparks, electric motors, static discharge, or other ignition sources at locations distant from material handling. Flashback may occur along vapor trails. Use only non-sparking tools. Use appropriate grounding and bonding practices. Use personal protection recommended in Section 8. Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. Do not cut, drill, grind or weld on empty containers since explosive residues may remain. Comply with all applicable EPA, OSHA, NFPA and consistent state and local requirements.

Storage conditions

Store in properly closed containers that are appropriately labeled and in a cool, well-ventilated area. Keep product and empty container away from heat and sources of ignition. Do not puncture or incinerate container.

Incompatible materials

Strong oxidizing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Name	ACGIH TLV	OSHA PELS	NIOSH IDLH
Methane 74-82-8	Simple asphyxiant	-	-

Ethane 74-84-0	Simple asphyxiant	-	-
Nitrogen 7727-37-9	Simple asphyxiant	-	-
Carbon Dioxide 124-38-9	5000 ppm TWA 30000 ppm STEL	TWA: 5000 ppm TWA: 9000 mg/m^3	40000 ppm
Propane 74-98-6	Simple asphyxiant	TWA: 1000 ppm TWA: 1800 mg/m^3	2100 ppm
Pentane (mixed isomers) 109-66-0	1000 ppm TWA	TWA: 1000 ppm TWA: 2950 mg/m^3	1500 ppm
Butane (mixed isomers) 106-97-8	1000 ppm STEL	-	1600 ppm
n-Hexane 110-54-3	50 ppm TWA Skin - potential significant contribution to overall exposure by the cutaneous route	TWA: 500 ppm TWA: 1800 mg/m^3	1100 ppm

Notes: No further information available.

Engineering measures Local or general exhaust required in an enclosed area or when there is inadequate ventilation. Use mechanical ventilation equipment that is explosion-proof. Monitor atmospheric oxygen levels.

Personal protective equipment

Eye protection Goggles or faceshield may be needed when handling pressurized gases.

Skin and body protection Wear insulated gloves when handling pressurized gases to prevent skin contact and frostbite or freeze burn. Contact the glove manufacturer for specific advice on glove selection and breakthrough times.

Respiratory protection Use atmosphere supplying respirators in the event of oxygen deficiency, when material produces gases and/or vapors that exceed permissible limits, or when excessive gases and/or vapors are generated. Observe respirator assigned protection factors (APFs) criteria cited in federal OSHA 29 CFR 1910.134. Self-contained breathing apparatus should be used for fire fighting.

Note: Air purifying respirators are not to be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturers instructions), in oxygen deficient atmospheres, (less than 19.5% oxygen) or under conditions that are immediately dangerous to life and health (IDLH).

Hygiene measures Use mechanical ventilation equipment that is explosion-proof. Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Do not smoke while handling.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance Clear, Colorless Gas
Physical State Gas
Color Colorless
Odor Odorless to sweet
Odor Threshold No data available.

Property	Values (method)
pH	Not applicable
Melting Point / Freezing Point	No data available.
Initial Boiling Point / Boiling Range	-162 °C / -259 °F (methane)
Flash Point	No data available.
Evaporation Rate	No data available.
Flammability (solid, gas)	Extremely flammable gas

Flammability Limit in Air (%):
Upper Flammability Limit: 17
Lower Flammability Limit: 3.8
Explosion Limits No data available.
Vapor Pressure No data available.
Vapor Density 0.54-0.82 (air=1)
Specific Gravity / Relative Density No data available.
Water Solubility No data available.
Partition Coefficient No data available.
Autoignition Temperature 482-632 °C / 900-1170 °F
Decomposition Temperature No data available.
Kinematic Viscosity No data available.
VOC Content (%) No data available.

10. STABILITY AND REACTIVITY

Reactivity The product is non-reactive under normal conditions.

Chemical stability Stable under recommended storage conditions.

Possibility of hazardous reactions None under normal processing.

Hazardous polymerization Will not occur.

Conditions to avoid Sources of heat or ignition.

Incompatible materials Strong oxidizing agents.

Hazardous decomposition products None known under normal conditions of use.

11. TOXICOLOGICAL INFORMATION

Potential short-term adverse effects from overexposures

Inhalation May cause central nervous system depression with nausea, headache, dizziness, vomiting, and incoordination. In high concentration the gas may cause suffocation. Victim may not be aware of asphyxiation.

Eye contact Vapor may cause irritation. Contact with rapidly expanding gas may cause frostbite.

Skin contact Gas or vapor is generally non-irritating to skin. Contact with rapidly expanding gas may cause frostbite.

Ingestion Ingestion not likely.

Acute toxicological data

Name	Oral LD50	Dermal LD50	Inhalation LC50
Natural Gas 8006-14-2	-	-	658 mg/L (Rat) 4 h
Methane 74-82-8	-	-	326 mg/m^3 (Mouse) 2 h
Ethane 74-84-0	-	-	658 mg/L (Rat) 4 h
Propane 74-98-6	-	-	> 1,464 mg/L (Rat) 15 min
Pentane (mixed isomers) 109-66-0	> 2000 mg/kg (Rat)	-	364 mg/L (Rat) 4 h
Butane (mixed isomers) 106-97-8	-	-	658 mg/L (Rat) 4 h
n-Hexane 110-54-3	15000 mg/kg (Rat)	3000 mg/kg (Rabbit)	48000 ppm (Rat) 4 h

Immediate and delayed effects as well as chronic effects from short and long-term exposure

METHANE and ETHANE: Exposure to high levels of these gases produce weak central nervous system (CNS) depressant effects without significant potential for systemic toxicity. At very high levels they act as asphyxiant gases by diluting and displacing oxygen. Symptoms of persons exposed to oxygen deficient atmospheres include headache, dizziness, incoordination, cyanosis and narcosis. Extremely high concentrations can produce unconsciousness followed by death.

NITROGEN: Nitrogen is a simple asphyxiant gas without significant potential for systemic toxicity. At very high concentrations, it acts as an asphyxiant gas by diluting and displacing oxygen. Symptoms of persons exposed to oxygen deficient atmospheres include headache, dizziness, incoordination, cyanosis and narcosis. Extremely high concentrations can produce unconsciousness followed by death.

CARBON DIOXIDE: Carbon dioxide is a simple asphyxiant and has no warning properties (such as odor). Inhalation of high concentrations can produce mild narcotic effects and stimulation of the respiratory centers. Eye, nose and throat irritation can occur at very high exposure concentrations. Poisoning may affect the lungs, heart, kidney and central nervous system. Sleepiness, mental confusion, giddiness, lassitude (weakness), noise in the ear, weakened reflexes, tremors, flaccid paralysis, coma, and death may all occur from carbon dioxide poisoning.

PROPANE, BUTANE and PENTANE: Laboratory animal studies indicate exposure to extremely high levels (1 to 10 vol.% in air) may cause cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.

N-HEXANE: Short-term overexposure to n-hexane vapor may cause headache, nausea, vomiting, dizziness, lightheadedness, loss of consciousness, coma, and even death in humans. Respiratory effects of overexposure may include nose, throat, and lung irritation, coughing, wheezing, and shortness of breath. Direct and prolonged contact with liquid may cause dryness and redness of the skin. Long-term or repeated overexposure to n-hexane can cause peripheral nerve damage. Initial signs are numbness of the fingers and toes. Motor/muscle weakness can occur in the digits, but may also involve muscles of the arms, forearms, and thighs. Onset of these signs may be delayed for several months to a year after initial exposure. Repeated and sustained inhalation exposure to high vapor concentrations of n-hexane resulted in degenerative changes in the testes and reduced sperm count in male laboratory rats.

Adverse effects related to the physical, chemical and toxicological characteristics

Signs and symptoms	Asphyxiant gas. High concentrations in the immediate area can displace oxygen causing the feeling of suffocation and can cause headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue from oxygen deprivation. Contact with product may cause frostbite.
Acute toxicity	None known.
Skin corrosion/irritation	None known.
Serious eye damage/eye irritation	None known.
Sensitization	None known.
Mutagenic effects	None known.
Carcinogenicity	None known.
Reproductive toxicity	Suspected of damaging fertility or the unborn child.
Specific Target Organ Toxicity (STOT) - single exposure	May cause drowsiness or dizziness.
Specific Target Organ Toxicity (STOT) - repeated exposure	None known.
Aspiration hazard	Not applicable.

12. ECOLOGICAL INFORMATION

Ecotoxicity This product is not expected to be harmful to aquatic organisms.

Name	Fish	Crustacea	Algae/aquatic plants
Pentane (mixed isomers) 109-66-0	96-hr LC50 >1 - <10 mgL Rainbow trout	48-hr EC50 = 9.7 mg/L Daphnia magna	-
n-Hexane 110-54-3	96-hr LC50 = 2.5 mg/l Fathead minnow	-	-

Persistence and degradability Readily biodegradable in the environment.

Bioaccumulation Not expected to bioaccumulate in aquatic organisms.

Mobility in soil Due to physical property, the mobility of this material is expected to be negligible.

Other adverse effects No information available.

13. DISPOSAL CONSIDERATIONS

Description of waste residues No information available.

Safe handling of wastes Handle in accordance with applicable local, state, and federal regulations. Use personal protection measures as required. Use appropriate grounding and bonding practices. Use only non-sparking tools. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. No smoking.

Disposal of wastes / methods of disposal The user is responsible for determining if any discarded material is a hazardous waste (40 CFR 262.11). Dispose of in accordance with federal, state and local regulations.

Contaminated packaging disposal Empty containers should be completely drained and then discarded or recycled, if possible. Do not cut, drill, grind or weld on empty containers since explosive residues may be present. Dispose of in accordance with federal, state and local regulations.

14. TRANSPORT INFORMATION

DOT

UN/Identification No: UN 1971
UN Proper Shipping Name: Natural Gas, Compressed
Transport Hazard Class(es): 2.1
Packing Group: Not applicable

IATA

UN/Identification No: UN 1971
UN Proper Shipping Name: Natural Gas, Compressed
Transport Hazard Class(es): 2.1
Packing Group: Not applicable

IMDG

UN/Identification No: UN 1971
UN Proper Shipping Name: Natural Gas, Compressed
Transport Hazard Class(es): 2.1
Packing Group: Not applicable
EmS No: F-D, S-U
Marine Pollutant: No

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable

15. REGULATORY INFORMATION

Regulatory Information

US TSCA Chemical Inventory This product and/or its components are listed on the TSCA Chemical Inventory or are exempt.

Canada DSL/NDSL Inventory This product and/or its components are listed either on the Domestic Substances List (DSL) or are exempt.

EPA Superfund Amendment & Reauthorization Act (SARA)

SARA Section 302 This product does not contain any component(s) included on EPA's Extremely Hazardous Substance (EHS) List above the de minimis threshold.

SARA Section 304 This product may contain component(s) identified either as an EHS or a CERCLA Hazardous substance which in case of a spill or release may be subject to SARA reporting requirements:

Name	Hazardous Substances RQs
n-Hexane 110-54-3	5000 lb 2270 kg

SARA Section 311/312 The following EPA hazard categories apply to this product:

Flammable
Gas under pressure
Simple asphyxiant
Reproductive toxicity
Specific target organ toxicity
Hazard Not Otherwise Classified (HNOC)-Health

SARA Section 313 This product may contain component(s), which if in exceedance of the de minimus threshold, may be subject to the reporting requirements of SARA Title III Section 313 Toxic Release Reporting (Form R).

Name	CERCLA/SARA 313 Emission reporting
n-Hexane 110-54-3	1.0 % de minimis concentration

U.S. State Regulations

California Proposition 65 This product can expose you to chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm.

Name	California Proposition 65
n-Hexane 110-54-3	Male reproductive toxicity, initial date 12/15/17

For more information, go to www.P65Warnings.ca.gov.

State Right-To-Know Regulations The following component(s) of this material are identified on the regulatory lists below:

Name	New Jersey Right-To-Know	Pennsylvania Right-To-Know	Massachusetts Right-To Know
Natural Gas 8006-14-2	Not Listed	Listed	Listed
Methane 74-82-8	Listed	Listed	Listed
Ethane 74-84-0	Listed	Listed	Listed
Nitrogen 7727-37-9	Listed	Listed	Listed
Carbon Dioxide	Listed	Listed	Listed

124-38-9			
Propane 74-98-6	Listed	Listed	Listed
Pentane (mixed isomers) 109-66-0	Listed	Listed	Listed
Butane (mixed isomers) 106-97-8	Listed	Listed	Listed
n-Hexane 110-54-3	Listed	Listed	Listed

16. OTHER INFORMATION

Prepared by Toxicology & Product Safety

NFPA

Revision Notes

Revision date 09/23/2020

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information is intended as guidance for safe handling, use, processing, storage, transportation, accidental release, clean-up and disposal and is not considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SAFETY DATA SHEET

SDS ID NO.: 113MPLX001 **Revision date** 09/27/2023

1. IDENTIFICATION

Product Name	Natural Gas Condensate (Low RVP)
Synonym	Low RVP natural gas condensate
Product code	113MPLX001
Chemical family	Hydrocarbon Mixture
Recommended use	Feedstock.
Restrictions on use	All others.
Manufacturer, Importer, or Responsible Party Name and Address	**MPLX LP** **200 E. Hardin Street** **Findlay, OH 45840**
SDS information	1-419-421-3070 (M-F; 8-5 EST)
24 Hour Emergency Telephone	CHEMTREC: 1-800-424-9300

2. HAZARD IDENTIFICATION

OSHA Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Classification

Flammable liquids	Category 1
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2A
Germ cell mutagenicity	Category 1B
Carcinogenicity	Category 1A
Reproductive toxicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Specific target organ toxicity (repeated exposure)	Category 1 Category 2
Aspiration toxicity	Category 1
Chronic aquatic toxicity	Category 2

Hazards Not Otherwise Classified (HNOC)
Static accumulating flammable liquid

2.2. Label Elements

Danger

EXTREMELY FLAMMABLE LIQUID AND VAPOR
May accumulate electrostatic charge and ignite or explode
Causes skin irritation
Causes serious eye irritation
May cause genetic defects
May cause cancer
Suspected of damaging fertility or the unborn child
May cause respiratory irritation
May cause drowsiness or dizziness
Causes damage to organs (blood, blood-forming organs, immune system) through prolonged or repeated exposure

May cause damage to organs (nervous system, hearing organs) through prolonged or repeated exposure.
May be fatal if swallowed and enters airways
Toxic to aquatic life with long lasting effects

Appearance Dark Liquid **Physical State** Liquid **Odor** Aromatic

Precautionary Statements - Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools.
Take precautionary measures against static discharge
Do not eat, drink or smoke when using this product
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear protective gloves/protective clothing/eye protection/face protection
Wash hands and forearms thoroughly after handling.
Avoid release to the environment

Precautionary Statements - Response
If exposed, concerned or you feel unwell: Get medical attention
If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical attention
If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
If skin irritation occurs: Get medical attention
Wash contaminated clothing before reuse
If inhaled: Remove person to fresh air and keep comfortable for breathing.
Call a poison center or doctor if you feel unwell
If swallowed: Immediately call a poison center or doctor
Do NOT induce vomiting
In case of fire: Use appropriate media to extinguish
Collect spillage

Precautionary Statements - Storage
Store in a well-ventilated place. Keep container tightly closed
Keep cool
Store locked up

Precautionary Statements - Disposal
Dispose of contents/container at an approved waste disposal plant

3. COMPOSITION/INFORMATION ON INGREDIENTS

Composition Information

Chemical Name	CAS Number	% Concentration
Natural Gas Condensates	68919-39-1	100
Hexane Isomers (other than n-Hexane)	107-83-5	7-70

Octane (mixed isomers)	111-65-9	1-50
Butane (mixed isomers)	106-97-8	0-48
Propane	74-98-6	1-42
Heptane (mixed isomers)	142-82-5	4-38
Pentane (mixed isomers)	109-66-0	0-37
Naphthalene	91-20-3	0-31
Xylene (mixed isomers)	1330-20-7	0-12
n-Hexane	110-54-3	0-10
Toluene	108-88-3	0-8
Nonane (mixed isomers)	111-84-2	1-7
Cyclohexane	110-82-7	0.3-5.5
Benzene	71-43-2	0-5
1,3,5-Trimethylbenzene	108-67-8	0-4
1,2,4 Trimethylbenzene	95-63-6	0-3
Ethylbenzene	100-41-4	0-1
Cumene	98-82-8	0-1

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

4. FIRST AID MEASURES

First aid measures

General advice

In case of accident or if you feel unwell, seek medical advice immediately (show directions for use or safety data sheet if possible).

Inhalation

Remove to fresh air. If not breathing, utilize bag valve mask or other form of barrier device to institute rescue breathing. If breathing is difficult, ensure airway is clear, give oxygen and continue to monitor. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR). Keep affected person warm and at rest. If symptoms occur get medical attention.

Skin contact

Immediately wash exposed skin with plenty of soap and water while removing contaminated clothing and shoes. Get medical attention if irritation persists. Place contaminated clothing in closed container until cleaned or discarded. If clothing is to be laundered, inform the person performing the operation of contaminant's hazardous properties.

Eye contact

Flush immediately with large amounts of water for at least 15 minutes. Gently remove contacts while flushing. Eyelids should be held away from the eyeball to ensure thorough rinsing. Gently remove contacts while flushing. Get medical attention if irritation persists.

Ingestion

Do not induce vomiting. If spontaneous vomiting occurs, keep head below hips, or if patient is lying down, turn body and head to side to prevent aspiration and monitor for breathing difficulty. Never give anything by mouth to an unconscious person. Keep affected person warm and at rest. Get immediate medical attention.

Most important signs and symptoms, both short-term and delayed with overexposure

Adverse effects

Causes irritation of eyes, skin and mucous membranes. Symptoms may include redness, itching, and inflammation. May cause nausea, vomiting, diarrhea, and signs of nervous system depression: headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue. Aspiration hazard. May cause coughing, chest pains, shortness of breath, pulmonary edema and/or chemical pneumonitis. Prolonged or repeated exposure may cause adverse effects to the blood, blood-forming organs, immune system, nervous system, and hearing organs. Repeated or prolonged skin contact may cause drying, reddening, itching and cracking.

Indication of any immediate medical attention and special treatment needed

Notes to physician

INHALATION: This material (or a component) sensitizes the myocardium to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material. Administration of sympathomimetic drugs should be avoided.

INGESTION: This material represents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media

For small fires, Class B fire extinguishing media such as CO2, dry chemical, foam or water spray can be used. For large fires, water spray, fog or foam can be used. Firefighting should be attempted only by those who are adequately trained and equipped with proper protective equipment.

Unsuitable extinguishing media

Do not use straight water streams to avoid spreading fire.

Specific hazards arising from the chemical

This product has been determined to be an extremely flammable liquid per the OSHA Hazard Communication Standard and should be handled accordingly. May accumulate electrostatic charge and ignite or explode. Vapors may travel along the ground or be moved by ventilation and ignited by many sources such as pilot lights, sparks, electric motors, static discharge, or other ignition sources at locations distant from material handling. Flashback can occur along vapor trail. For additional fire related information, see NFPA 30 or the Emergency Response Guidebook 128.

Hazardous combustion products

Smoke, carbon monoxide, and other products of incomplete combustion.

Explosion data

Sensitivity to mechanical impact: No.

Sensitivity to static discharge: Yes.

Special protective equipment and precautions for firefighters

Firefighters should wear full protective clothing and positive-pressure self-contained breathing apparatus (SCBA) with a full face-piece, as appropriate. Avoid using straight water streams. Water may be ineffective in extinguishing low flash point fires, but can be used to cool exposed surfaces. Avoid excessive water spray application. Water spray and foam must be applied carefully to avoid frothing and from as far a distance as possible. Keep run-off water out of sewers and water sources.

Additional firefighting tactics

FIRES INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after the fire is out. Do not direct water at source of leak or safety devices; icing may occur. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles: if this is impossible, withdraw from area and let fire burn.

EVACUATION: Consider initial downwind evacuation for at least 1000 feet. If tank, rail car or tank truck is involved in a fire, ISOLATE for 5280 feet (1 mile) in all directions; also, consider initial evacuation of 5280 feet (1 mile) in all directions.

NFPA Health 1 Flammability 4 Instability 0 Special Hazard -

6. ACCIDENTAL RELEASE MEASURES

Personal precautions

Keep people away from and upwind of spill/leak. Isolate and evacuate area. Shut off source if safe to do so. Eliminate all ignition sources. Use spark-proof tools and explosion-proof equipment. Leaks may self-ignite due to static accumulation. Distant ignition and flashback are possible. Monitor area for flammable or explosive atmosphere. Before entry, especially into confined areas, check atmosphere with an appropriate monitor.

Protective equipment

Use personal protection measures as recommended in Section 8.

Emergency procedures

Advise authorities and National Response Center (800-424-8802) if the product has

entered a water course or sewer. Notify local health and pollution control agencies, if appropriate.

Environmental precautions Avoid release to the environment. Avoid subsoil penetration.

Methods and materials for containment Contain liquid with sand or soil. Prevent spilled material from entering storm drains, sewers, and open waterways.

Methods and materials for cleaning up Use suitable absorbent materials such as vermiculite, sand, or clay to clean up residual liquids. Recover and return free product to proper containers. When recovering free liquids ensure all equipment is grounded and bonded. Use only non-sparking tools.

7. HANDLING AND STORAGE

Safe handling precautions Avoid contact with skin, eyes and clothing. Avoid breathing vapors or mists. Use only with adequate ventilation. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. Vapors may travel along the ground or be moved by ventilation. Flashback may occur along vapor trails. Use only non-sparking tools. Use appropriate grounding and bonding practices. Static accumulating flammable liquid. Bonding and grounding may be insufficient to eliminate the hazard from static electricity. Use personal protection measures as recommended in Section 8. Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. Do not cut, drill, grind or weld on empty containers since explosive residues may remain. Refer to applicable EPA, OSHA, NFPA and consistent state and local requirements.

Components of this product are basically non-conductors of electricity and can become electrostatically charged during mixing, filtering or pumping at high flow rates. If this charge reaches a sufficiently high level, sparks can form that may ignite the vapors of flammable liquids. Sudden release of hot organic vapors or mists from process equipment operating at elevated temperature and pressure, or sudden ingress of air into vacuum equipment, may result in ignitions without the presence of obvious ignition sources.

Storage conditions Store in properly closed containers that are appropriately labeled and in a cool, well-ventilated area. Do not store near an open flame, heat or other sources of ignition.

Incompatible materials Strong oxidizing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Chemical Name	ACGIH TLV	OSHA PELS	NIOSH IDLH
Hexane Isomers (other than n-Hexane) 107-83-5	500 ppm TWA 1000 ppm STEL	-	-
Butane (mixed isomers) 106-97-8	1000 ppm STEL	-	1600 ppm
Propane 74-98-6	Simple asphyxiant	TWA: 1000 ppm TWA: 1800 mg/m^3	2100 ppm
Pentane (mixed isomers) 109-66-0	1000 ppm TWA	TWA: 1000 ppm TWA: 2950 mg/m^3	1500 ppm
Naphthalene 91-20-3	10 ppm TWA Skin - potential significant contribution to overall exposure by the cutaneous route	TWA: 10 ppm TWA: 50 mg/m^3	250 ppm
Xylene (mixed isomers) 1330-20-7	20 ppm TWA	TWA: 100 ppm TWA: 435 mg/m^3	900 ppm
Toluene 108-88-3	20 ppm TWA OTO - potential to cause hearing impairment alone or in combination with noise	TWA: 200 ppm Ceiling: 300 ppm	500 ppm

Octane (mixed isomers) 111-65-9	300 ppm TWA	TWA: 500 ppm TWA: 2350 mg/m³	1000 ppm
Nonane (mixed isomers) 111-84-2	200 ppm TWA	-	-
Cyclohexane 110-82-7	100 ppm TWA	TWA: 300 ppm TWA: 1050 mg/m³	1300 ppm
n-Hexane 110-54-3	50 ppm TWA Skin - potential significant contribution to overall exposure by the cutaneous route	TWA: 500 ppm TWA: 1800 mg/m³	1100 ppm
Benzene 71-43-2	0.5 ppm TWA 2.5 ppm STEL Skin - potential significant contribution to overall exposure by the cutaneous route	TWA: 1 ppm STEL: 5 ppm TWA: 10 ppm (applies to industry segments exempt from the benzene standard) (see 29 CFR 1910.1028)	500 ppm
1,3,5-Trimethylbenzene 108-67-8	10 ppm TWA	-	-
1,2,4 Trimethylbenzene 95-63-6	10 ppm TWA	-	-
Cumene 98-82-8	5 ppm TWA	TWA: 50 ppm TWA: 245 mg/m³ Skin	900 ppm
Ethylbenzene 100-41-4	20 ppm TWA	TWA: 100 ppm TWA: 435 mg/m³	800 ppm

Notes: No further information available.

Engineering measures Local or general exhaust required in an enclosed area or when there is inadequate ventilation. Use mechanical ventilation equipment that is explosion-proof.

Personal protective equipment

Eye protection Use goggles or face-shield if the potential for splashing exists.

Skin and body protection Use nitrile rubber, Viton® or PVA gloves for repeated or prolonged skin exposure. Glove suitability is based on workplace conditions and usage. Contact the glove manufacturer for specific advice on glove selection and breakthrough times.

Respiratory protection Use a NIOSH approved organic vapor chemical cartridge or supplied air respirators when there is the potential for airborne exposures to exceed permissible exposure limits or if excessive vapors are generated. Observe respirator assigned protection factors (APFs) criteria cited in federal OSHA 29 CFR 1910.134. Self-contained breathing apparatus should be used for fire fighting.

Hygiene measures Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance Dark Liquid
Physical State Liquid
Color Dark - straw
Odor Aromatic
Odor Threshold No data available.

Property	Values (method)
pH	Not applicable
Melting Point / Freezing Point	No data available.
Initial Boiling Point / Boiling Range	24-388 °C / 75-730 °F (ASTM D86)
Flash Point	-21 to -11.5 °C / -6 to 11 °F (ASTM D56)
Evaporation Rate	No data available.

Flammability (solid, gas)	Not applicable.
Flammability Limit in Air (%):	
Upper Flammability Limit:	No data available.
Lower Flammability Limit:	No data available.
Explosion Limits	No data available.
Vapor Pressure	0.8-27.8 psi @ 37.8°C
Vapor Density	2.4-4.4
Specific Gravity / Relative Density	0.54-0.71
Water Solubility	No data available.
Partition Coefficient	No data available.
Autoignition Temperature	No data available.
Decomposition Temperature	No data available.
Kinematic Viscosity	No data available.
VOC Content (%)	No data available.
Density	4.4-6.8 lbs/gal

10. STABILITY AND REACTIVITY

Reactivity The product is non-reactive under normal conditions.

Chemical stability The material is stable at 70°F (21°C), 760 mmHg pressure.

Possibility of hazardous reactions None under normal processing.

Hazardous polymerization Will not occur.

Conditions to avoid Excessive heat, sources of ignition, open flame.

Incompatible materials Strong oxidizing agents.

Hazardous decomposition products None known under normal conditions of use.

11. TOXICOLOGICAL INFORMATION

Potential short-term adverse effects from overexposures

Inhalation May cause irritation of respiratory tract. May cause drowsiness or dizziness. Breathing high concentrations of this material in a confined space or by intentional abuse can cause irregular heartbeats which can cause death.

Eye contact Irritating to eyes. Contact may cause pain and severe reddening and inflammation of the conjunctiva.

Skin contact Irritating to skin. Effects may become more serious with repeated or prolonged contact. May be absorbed through the skin in harmful amounts.

Ingestion May be fatal if swallowed or vomited and enters airways. May cause irritation of the mouth, throat and gastrointestinal tract.

Acute toxicological data

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50
Natural Gas Condensates 68919-39-1	> 2000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 5.2 mg/L (Rat) 4 h
Hexane Isomers (other than n-Hexane) 107-83-5	> 5000 mg/kg (Rat)	-	-
Octane (mixed isomers) 111-65-9	>2000 mg/kg (Rat)	-	118 g/m^3 (Rat) 4 h
Butane (mixed isomers) 106-97-8	-	-	658 mg/L (Rat) 4 h
Propane	-	-	> 1,464 mg/L (Rat) 15 min

74-98-6			
Heptane (mixed isomers) 142-82-5	-	3000 mg/kg (Rabbit)	103 g/m³ (Rat) 4 h
Pentane (mixed isomers) 109-66-0	> 2000 mg/kg (Rat)	-	364 mg/L (Rat) 4 h
Naphthalene 91-20-3	533 mg/kg (Mouse)	> 2000 mg/kg (Rabbit)	> 340 mg/m³ (Rat) 1 h
Xylene (mixed isomers) 1330-20-7	> 2000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 5.04 mg/L (Rat) 4 h
n-Hexane 110-54-3	15000 mg/kg (Rat)	3000 mg/kg (Rabbit)	48000 ppm (Rat) 4 h
Toluene 108-88-3	> 2000 mg/kg (Rat)	8390 mg/kg (Rabbit)	12.5 mg/L (Rat) 4 h
Nonane (mixed isomers) 111-84-2	-	-	17 mg/L (Male rat) 4 h
Cyclohexane 110-82-7	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	13.9 mg/L (Rat) 4 h
Benzene 71-43-2	> 2000 mg/kg (Rat)	> 5000 mg/kg (Rabbit)	> 20 mg/l (Rat) 4 h
1,3,5-Trimethylbenzene 108-67-8	8970 mg/kg (Rat)	-	24,000 mg/m³ (Rat) 4 h
1,2,4 Trimethylbenzene 95-63-6	3280 mg/kg (Rat)	> 3160 mg/kg (Rabbit)	18,000 mg/m³ (Rat) 4 h
Cumene 98-82-8	> 2000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 20 mg/L (Rat) 6 h
Ethylbenzene 100-41-4	> 2000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	17.2 mg/L (Rat) 4 h

Immediate and delayed effects as well as chronic effects from short and long-term exposure

PROPANE, BUTANE and PENTANE: Laboratory animal studies indicate exposure to extremely high levels (1 to 10 vol.% in air) may cause cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.

NAPHTHALENE: Excessive exposure to naphthalene may cause nausea, vomiting, diarrhea, blood in the urine, and a yellow color to the skin. Lifetime inhalation exposure of laboratory rodents to naphthalene resulted in cancers of the respiratory tract in male and female rats. A small increase in cancer of the lung was observed in female mice, but no evidence of lung cancer was observed in male mice. Long-term exposure to excessive airborne naphthalene concentrations may result in destruction of red blood cells, a condition referred to as hemolytic anemia.

XYLENE: Overexposure to airborne xylene may cause upper respiratory tract irritation, headache, cyanosis, blood serum changes, nervous system damage and narcosis. Impaired neurological function has been reported in workers exposed to solvents including xylene. Laboratory animal studies have shown evidence of impaired hearing after prolonged exposure high airborne concentrations. Laboratory animal studies suggest some changes in reproductive organs after exposure to high airborne concentrations of xylene without an effect on reproduction. Skeletal and visceral malformations, developmental delays, and increased fetal resorptions were observed in laboratory animals after extremely high airborne concentrations with evidence of maternal toxicity. Adverse effects on the liver, kidney, and bone marrow were observed in laboratory animals after prolonged and repeated exposure to high airborne concentrations of xylene.

TOLUENE: Inhalation abuse of toluene at high concentrations has been associated with adverse effects on the liver, kidney and nervous system, and can cause nervous system depression, cardiac arrhythmias, and death. Studies of workers indicate long-term exposure may be related to impaired color vision and hearing. Some studies of workers suggest long-term exposure may be associated with neurobehavioral and mental functional changes. Laboratory animal studies indicate some changes in reproductive organs after exposure to high airborne concentrations, but no significant effects on mating performance or reproduction were observed. Positive findings include small increases in minor skeletal and visceral malformations and developmental delays following maternal exposure to high concentrations. Adverse effects on the liver, kidney, thymus and nervous system of laboratory animal were observed after very high levels of prolonged and repeated exposure.

CYCLOHEXANE: Cyclohexane may be fatal if swallowed and enters the airways. Short-term exposure to excessive concentrations can irritate the nose and throat, and cause coughing, wheezing, headache, dizziness, nausea, vomiting, lightheadedness, drowsiness, and unconsciousness. Repeated and prolonged contact with liquid may cause drying and cracking of the skin.

N-HEXANE: Short-term overexposure to n-hexane vapor may cause headache, nausea, vomiting, dizziness, lightheadedness, loss of consciousness, coma, and even death in humans. Respiratory effects of overexposure may include nose, throat, and lung irritation, coughing, wheezing, and shortness of breath. Direct and prolonged contact with liquid may cause dryness and redness

of the skin. Long-term or repeated overexposure to n-hexane can cause peripheral nerve damage. Initial signs are numbness of the fingers and toes. Motor/muscle weakness can occur in the digits, but may also involve muscles of the arms, forearms, and thighs. Onset of these signs may be delayed for several months to a year after initial exposure. Repeated and sustained inhalation exposure to high vapor concentrations of n-hexane resulted in degenerative changes in the testes and reduced sperm count in male laboratory rats.

BENZENE: Benzene exposure may cause skin, eye and respiratory irritation. Excessive exposures may cause central nervous system effects. Numerous studies of workers exposed to airborne benzene for prolonged or repeated periods show strong evidence that overexposure can cause cancer of the blood, AML (acute myeloid leukemia), along with other disorders indicating damage to the blood forming organs including aplastic anemia, leukopenia, thrombocytopenia, and the development of myelodysplastic syndrome. Some studies of pregnant women occupationally exposed to benzene suggest associations with an increased risk of miscarriage, stillbirth, reduced birth weight, and gestational age. Prolonged and repeated exposure to benzene has induced chromosomal aberrations in circulating human lymphocytes, in bone marrow cells of laboratory animals, and in sperm cells of both humans and laboratory animals.

1,2,4-TRIMETHYLBENZENE: Contact with eyes can cause serious eye irritation, redness, and pain. Brief inhalation exposure to high vapor concentrations may cause respiratory irritation. Overexposure by inhalation and ingestion can cause confusion, dizziness, drowsiness, headache, vomiting, cough, and sore throat. Long-term overexposure has been associated with asthmatic bronchitis. Direct prolonged skin contact can cause irritation, redness and dry skin.

ETHYLBENZENE: Lifetime exposure studies of rodents to ethylbenzene reported elevated kidney tumors in male and female rats exposed to the highest concentration tested. Tumors of the lungs were elevated in male mice and in the livers of females exposed at the highest concentration tested. Effects on the liver, kidney, lung, thyroid, and pituitary of these animals as well. Laboratory animal studies (rats) demonstrated hearing loss in combination with exposure to noise.

CUMENE: High airborne concentrations of cumene may cause irritation of the eyes, skin, and respiratory tract. Excessive exposures may cause central nervous system effects. Lifetime inhalation exposure of mice to cumene resulted in lung tumors in both males and females and liver tumors in females. Rats similarly exposed to cumene exhibited male-specific kidney tumors.

Adverse effects related to the physical, chemical and toxicological characteristics

Signs and symptoms Causes irritation of eyes, skin and mucous membranes. Symptoms may include redness, itching, and inflammation. May cause nausea, vomiting, diarrhea, and signs of nervous system depression: headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue. Aspiration hazard. May cause coughing, chest pains, shortness of breath, pulmonary edema and/or chemical pneumonitis. Prolonged or repeated exposure may cause damage to organs. Repeated or prolonged skin contact may cause drying, reddening, itching and cracking.

Acute toxicity None known.

Skin corrosion/irritation Causes skin irritation.

Serious eye damage/eye irritation Causes serious eye irritation.

Sensitization None known.

Mutagenic effects May cause genetic defects.

Carcinogenicity May cause cancer.

Chemical Name	ACGIH (Class)	IARC (Class)	NTP	OSHA
Naphthalene 91-20-3	Confirmed animal carcinogen (A3)	Possible human carcinogen (2B)	Reasonably anticipated to be a human carcinogen	Not Listed
Xylene (mixed isomers) 1330-20-7	Not classifiable (A4)	Not classifiable (3)	Not Listed	Not Listed
Toluene 108-88-3	Not classifiable (A4)	Not classifiable (3)	Not Listed	Not Listed
Benzene 71-43-2	Confirmed human carcinogen (A1)	Carcinogenic to humans (1)	Known to be human carcinogen	Known carcinogen
Ethylbenzene 100-41-4	Confirmed animal carcinogen (A3)	Possible human carcinogen (2B)	Not Listed	Not Listed

Cumene 98-82-8	Not Listed	Possible human carcinogen (2B)	Reasonably anticipated to be a human carcinogen	Not Listed

Reproductive toxicity Suspected of damaging fertility or the unborn child.

Specific Target Organ Toxicity (STOT) - single exposure May cause respiratory irritation. May cause drowsiness or dizziness.

Specific Target Organ Toxicity (STOT) - repeated exposure Causes damage to organs (blood, blood-forming organs, immune system) through prolonged or repeated exposure. May cause damage to organs (nervous system, hearing organs) through prolonged or repeated exposure.

Aspiration hazard May be fatal if swallowed or vomited and enters airways.

12. ECOLOGICAL INFORMATION

Ecotoxicity This product should be considered toxic to aquatic organisms, with the potential to cause long lasting adverse effects in the aquatic environment.

Chemical Name	Fish	Crustacea	Algae/aquatic plants
Natural Gas Condensates 68919-39-1	96-hr Ll50 = 1-10 mg/l	-	72-hr EC50 = 56 mg/l Algae
Pentane (mixed isomers) 109-66-0	96-hr LC50 = 1-10 mg/l Rainbow trout	48-hr EC50 = 9.7 mg/L Daphnia magna	-
Naphthalene 91-20-3	96-hr LC50 = 0.91-2.82 mg/l Rainbow trout (static) 96-hr LC50 = 1.99 mg/l Fathead minnow (static)	48-hr LC50 = 1.6 mg/l Daphnia magna	-
Xylene (mixed isomers) 1330-20-7	96-hr LC50 = 8 mg/l Rainbow trout	48-hr LC50 = 3.82 mg/l Daphnia magna	72-hr EC50 = 11 mg/l Algae
Toluene 108-88-3	96-hr LC50 <= 10 mg/l Rainbow trout	48-hr EC50 = 5.46-9.83 mg/l Daphnia magna 48-hr EC50 = 11.5 mg/l Daphnia magna (Static)	72-hr EC50 = 12.5 mg/l Algae
Octane (mixed isomers) 111-65-9	-	48-hr LC50 = 0.38 mg/l Daphnia magna	-
Nonane (mixed isomers) 111-84-2	-	48-hr LC50 = 0.64 mg/l Daphnia magna	-
Cyclohexane 110-82-7	96-hr LC50 = 3.96-5.18 mg/l Fathead minnow	48-hr EC50 = 1.7-3.5 mg/L Bay shrimp	72-hr EC50 = 500 mg/l Algae
n-Hexane 110-54-3	96-hr LC50 = 2.5 mg/l Fathead minnow	-	-
Benzene 71-43-2	96-hr LC50 = 5.3 mg/l Rainbow trout (flow-through)	48-hr EC50 = 8.76-15.6 mg/l Daphnia magna (Static)	72-hr EC50 = 29 mg/l Algae
1,3,5-Trimethylbenzene 108-67-8	96-hr LC50 = 9.89-15 mg/l Goldfish	-	-
1,2,4 Trimethylbenzene 95-63-6	96-hr LC50 = 7.19-8.28 mg/l Fathead minnow (flow-through)	48-hr EC50 = 6.14 mg/L Daphnia magna	-
Cumene 98-82-8	96-hr LC50 = 6.04-6.61 mg/l Fathead minnow (Flow-through) 96-hr LC50 = 2.7 mg/l Rainbow trout (semi-static)	48-hr EC50 = 7.9-14.1 mg/l Daphnia magna (static)	72-hr EC50 = 2.6 mg/l Algae
Ethylbenzene 100-41-4	96-hr LC50 = 4 mg/L Rainbow trout	48-hr EC50 = 1-4 mg/L Daphnia magna	72-hr EC50 = 1.7-7.6 mg/l Algae

Persistence and degradability Expected to be inherently biodegradable.

Bioaccumulation	Has the potential to bioaccumulate.
Mobility in soil	May partition into air, soil and water.
Other adverse effects	No information available.

13. DISPOSAL CONSIDERATIONS

Description of waste residues	This material may be a flammable liquid waste.
Safe handling of wastes	Handle in accordance with applicable local, state, and federal regulations. Use personal protection measures as required. Use appropriate grounding and bonding practices. Use only non-sparking tools. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. No smoking.
Disposal of wastes / methods of disposal	The user is responsible for determining if any discarded material is a hazardous waste (40 CFR 262.11). Dispose of in accordance with federal, state and local regulations.
Contaminated packaging disposal	Empty containers should be completely drained and then discarded or recycled, if possible. Do not cut, drill, grind or weld on empty containers since explosive residues may be present. Dispose of in accordance with federal, state and local regulations.

14. TRANSPORT INFORMATION

DOT

UN/Identification No:	UN 1268
UN Proper Shipping Name:	Petroleum Distillates, N.O.S.
Transport Hazard Class(es):	3
Packing Group:	I

NOTE: UN3295 Hydrocarbons, Liquid, N.O.S may be substituted for the UN number shown above as long as the substitution is consistent on package markings, shipping papers, and emergency response information

IATA

UN/Identification No:	UN 1268
UN Proper Shipping Name:	Petroleum Distillates, N.O.S.
Transport Hazard Class(es):	3
Packing Group:	I
ERG code:	3H

IMDG

UN/Identification No:	UN 1268
UN Proper Shipping Name:	Petroleum Distillates, N.O.S.
Transport Hazard Class(es):	3
Packing Group:	I
EmS No:	F-E, S-E
Marine Pollutant:	Yes

15. REGULATORY INFORMATION

Regulatory Information

US TSCA Chemical Inventory	This product and/or its components are listed on the TSCA Chemical Inventory or are exempt.
Canada DSL/NDSL Inventory	This product and/or its components are listed either on the Domestic Substances List (DSL) or are exempt.

EPA Superfund Amendment & Reauthorization Act (SARA)

SARA Section 302 This product does not contain any component(s) included on EPA's Extremely Hazardous Substance (EHS) List above the de minimis threshold.

SARA Section 304 This product may contain component(s) identified either as an EHS or a CERCLA Hazardous substance which in case of a spill or release may be subject to SARA reporting requirements:

Chemical Name	Hazardous Substances RQs
Naphthalene 91-20-3	100 lb 45.4 kg
Xylene (mixed isomers) 1330-20-7	100 lb 45.4 kg
Toluene 108-88-3	1000 lb 454 kg
Cyclohexane 110-82-7	1000 lb 454 kg
n-Hexane 110-54-3	5000 lb 2270 kg
Benzene 71-43-2	10 lb 4.54 kg
Cumene 98-82-8	5000 lb 2270 kg
Ethylbenzene 100-41-4	1000 lb 454 kg

SARA Section 311/312 The following EPA hazard categories apply to this product:

Flammable
Hazard Not Otherwise Classified (HNOC)-Physical
Skin corrosion or irritation
Serious eye damage or eye irritation
Germ cell mutagenicity
Carcinogenicity
Reproductive toxicity
Specific target organ toxicity
Aspiration hazard

SARA Section 313 This product may contain component(s), which if in exceedance of the de minimus threshold, may be subject to the reporting requirements of SARA Title III Section 313 Toxic Release Reporting (Form R).

Chemical Name	CERCLA/SARA 313 Emission reporting
Naphthalene 91-20-3	0.1 % de minimis concentration
Xylene (mixed isomers) 1330-20-7	1.0 % de minimis concentration
Toluene 108-88-3	1.0 % de minimis concentration
Cyclohexane 110-82-7	1.0 % de minimis concentration
n-Hexane 110-54-3	1.0 % de minimis concentration
Benzene 71-43-2	0.1 % de minimis concentration
1,2,4 Trimethylbenzene 95-63-6	1.0 % de minimis concentration
Cumene 98-82-8	0.1 % de minimis concentration
Ethylbenzene	0.1 % de minimis concentration

100-41-4	

U.S. State Regulations

California Proposition 65 This product can expose you to chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm.

Chemical Name	California Proposition 65
Naphthalene 91-20-3	Carcinogen, initial date 04/19/2002
Toluene 108-88-3	Developmental toxicity, initial date 01/01/1991
n-Hexane 110-54-3	Male reproductive toxicity, initial date 12/15/17
Benzene 71-43-2	Carcinogen, initial date 02/27/1987 Male developmental toxicity, initial date 12/26/1997
Cumene 98-82-8	Carcinogen, initial date 04/06/10
Ethylbenzene 100-41-4	Carcinogen, initial date 06/11/2004

For more information, go to www.P65Warnings.ca.gov.

State Right-To-Know Regulations The following component(s) of this material are identified on the regulatory lists below:

Chemical Name	New Jersey Right-To-Know	Pennsylvania Right-To-Know	Massachusetts Right-To Know
Hexane Isomers (other than n-Hexane) 107-83-5	Listed	Listed	Listed
Butane (mixed isomers) 106-97-8	Listed	Listed	Listed
Propane 74-98-6	Listed	Listed	Listed
Pentane (mixed isomers) 109-66-0	Listed	Listed	Listed
Naphthalene 91-20-3	Listed	Listed	Listed
Xylene (mixed isomers) 1330-20-7	Listed	Listed	Listed
Toluene 108-88-3	Listed	Listed	Listed
Octane (mixed isomers) 111-65-9	Listed	Listed	Listed
Nonane (mixed isomers) 111-84-2	Listed	Listed	Listed
Cyclohexane 110-82-7	Listed	Listed	Listed
n-Hexane 110-54-3	Listed	Listed	Listed
Benzene 71-43-2	Listed	Listed	Listed
1,3,5-Trimethylbenzene 108-67-8	Listed	Not Listed	Listed
1,2,4 Trimethylbenzene 95-63-6	Listed	Listed	Listed
Cumene 98-82-8	Listed	Listed	Listed
Ethylbenzene 100-41-4	Listed	Listed	Listed

16. OTHER INFORMATION

Prepared by Toxicology & Product Safety

NFPA

Revision Notes

Revision date 09/27/2023

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information is intended as guidance for safe handling, use, processing, storage, transportation, accidental release, clean-up and disposal and is not considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SAFETY DATA SHEET

SDS ID NO.: 111MPLX001 **Revision date** 09/23/2020

1. IDENTIFICATION

Product Name	Natural Gas Liquids
Synonym	NGL; Y-Grade; Demethanized raw feed mix
Product code	111MPLX001
Chemical family	Hydrocarbon Mixture
Recommended use	Intermediate Stream.
Restrictions on use	All others.
Manufacturer, Importer, or Responsible Party Name and Address	**MPLX LP** **200 E. Hardin Street** **Findlay, OH 45840**
SDS Information	1-419-421-3070 (M-F; 8-5 EST)
24 Hour Emergency Telephone	CHEMTREC: 1-800-424-9300

2. HAZARD IDENTIFICATION

OSHA Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Classification

Flammable gases	Category 1
Gases under pressure	Liquefied Gas
Simple asphyxiant	-
Germ cell mutagenicity	Category 1B
Carcinogenicity	Category 1A
Reproductive toxicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Specific target organ toxicity (repeated exposure)	Category 2
Chronic aquatic toxicity	Category 2

Hazards Not Otherwise Classified (HNOC)
Static accumulating flammable liquid
May release hydrogen sulfide gas
Liquid product may cause freeze burn

Label Elements

Danger

Extremely flammable gas
Contains gas under pressure; may explode if heated
May accumulate electrostatic charge and ignite or explode
May release highly toxic hydrogen sulfide gas that quickly fatigues the sense of smell
May displace oxygen and cause rapid suffocation
May cause drowsiness or dizziness
Contact with liquid may cause frostbite
May cause genetic defects
May cause cancer
Suspected of damaging fertility or the unborn child

May cause damage to organs (nervous system) through prolonged or repeated exposure
Toxic to aquatic life with long lasting effects

Appearance Colorless Gas **Physical State** Gas **Odor** Mild hydrocarbon to Rotten egg

Precautionary Statements - Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Do not breathe gas/vapors
Use only outdoors or in a well-ventilated area
Wear protective gloves/protective clothing/eye protection/face protection
Wash hands and any possibly exposed skin thoroughly after handling
Avoid release to the environment

Precautionary Statements - Response
If exposed, concerned or you feel unwell: Get medical attention
If inhaled: Remove person to fresh air and keep comfortable for breathing.
Call a poison center or doctor if you feel unwell
Leaking gas fire: Do not extinguish, unless leak can be stopped safely
Eliminate all ignition sources if safe to do so
Collect spillage

Precautionary Statements - Storage
Store in a well-ventilated place. Keep container tightly closed
Protect from sunlight
Store locked up

Precautionary Statements - Disposal
Dispose of contents/container at an approved waste disposal plant

3. COMPOSITION/INFORMATION ON INGREDIENTS

Composition Information

Name	CAS Number	% Concentration
Natural Gas, Raw Liquid Mix	64741-48-6	100
Butane (mixed isomers)	106-97-8	0-95
Propane	74-98-6	3-82
Pentane (mixed isomers)	109-66-0	0-77
Ethane	74-84-0	0-67
Hexane (mixed isomers)	110-54-3	0-66
Heptane (mixed isomers)	142-82-5	0-30
Carbon Dioxide	124-38-9	0-4
Methane	74-82-8	0-2.5
Benzene	71-43-2	<1
Toluene	108-88-3	<1
Xylene (mixed isomers)	1330-20-7	<1
Hydrogen sulfide	7783-06-4	<0.06

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

4. FIRST AID MEASURES

First aid measures

General advice

In case of accident or if you feel unwell, seek medical advice immediately (show directions for use or safety data sheet if possible).

Inhalation

Remove to fresh air. If not breathing, utilize bag valve mask or other form of barrier device to institute rescue breathing. If breathing is difficult, ensure airway is clear, give oxygen and continue to monitor. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR). Get immediate medical attention.

Skin contact

If liquefied product has caused frostbite, remove contaminated clothing. Thaw frost bitten areas slowly with lukewarm water or by wrapping affected areas with blankets. Do not rub affected areas. Let circulation reestablish itself naturally, exercising area if possible. Get immediate medical attention.

Eye contact

Flush with large amounts of tepid water for at least 15 minutes. Gently remove contact lenses while flushing. Eyelids should beheld away from the eyeball to ensure thorough rinsing. If frostbite is suspected (cloudy lens or greyish white tissue around the eye) get immediate medical attention.

Ingestion

If swallowed, immediately call a poison control center or physician. Do not induce vomiting. If spontaneous vomiting occurs, keep head below hips, or if patient is lying down, turn body and head to side to prevent aspiration and monitor for breathing difficulty.

Most important signs and symptoms, both short-term and delayed with overexposure

Adverse effects

Asphyxiant gas. High concentrations in the immediate area can displace oxygen causing the feeling of suffocation and can cause headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue from oxygen deprivation. Hydrogen sulfide can cause respiratory paralysis and death, depending on the concentration and duration of exposure. Do not rely on ability to smell vapors, since loss of smell rapidly occurs. Effects of overexposure include irritation of the nose and throat, nausea, vomiting, diarrhea, abdominal pain and signs of nervous system depression (e.g. headache, drowsiness, dizziness, loss of coordination and fatigue), irregular heartbeats, pulmonary edema, weakness and convulsions. Contact with product may cause frostbite. Prolonged or repeated exposure may cause adverse effects to the nervous system.

Indication of any immediate medical attention and special treatment needed

Notes to physician

Inhalation exposure can produce toxic effects. Treat intoxications as hydrogen sulfide exposures. 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. Monitor for respiratory distress. If cough or difficulty inbreathing develops, evaluate for upper respiratory tract inflammation, bronchitis, and pneumonitis. This material (or a component) sensitizes the myocardium to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material. Administration of sympathomimetic drugs should be avoided.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media

For small fires, Class B fire extinguishing media such as CO_2 or dry chemical can be used. For large fires use water spray or fog. Firefighting should be attempted only by those who are adequately trained and equipped with proper protective equipment.

Unsuitable extinguishing media

DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.

Specific hazards arising from the chemical

This product has been determined to be an extremely flammable gas per the OSHA Hazard Communication Standard and should be handled accordingly. May accumulate electrostatic

charge and ignite or explode. Sealed containers may rupture when heated. A phenomena known as boiling liquid expanding vapor explosions (Bleve) can occur when a liquid in a pressurized container comes in close proximity to a fire and reaches a temperature well above its boiling point. A catastrophic failure of the vessel can occur, resulting in flying equipment fragments, a shock wave and a fireball causing serious damage and death. For additional fire related information see NFPA 30 or the Emergency Response Guidebook 115.

Hazardous combustion products Smoke, carbon monoxide, and other products of incomplete combustion.

Explosion data

Sensitivity to mechanical impact: No.

Sensitivity to static discharge: Yes.

Special protective equipment and precautions for firefighters Firefighters should wear full protective clothing and positive-pressure self-contained breathing apparatus (SCBA) with a full face-piece, as appropriate. Isolate hazard area. If safe to do so, stop the flow of gas and allow fire to burn out. Extinguishing the flame before shutting off the supply can cause the formation of explosive mixtures. In some cases it may be preferred to allow the flame to continue to burn. Use extreme caution when fighting liquefied petroleum gas fires. Keep surrounding area cool with water spray from a distance and prevent further ignition of combustible material. Avoid use of solid water streams. Contact with water and liquefied product can cause increased vaporization.

Additional firefighting tactics FIRES INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after the fire is out. Do not direct water at source of leak or safety devices; icing may occur. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles: if this is impossible, withdraw from area and let fire burn.

EVACUATION: Consider initial downwind evacuation for at least 1000 feet. If tank, rail car or tank truck is involved in a fire, ISOLATE for 5280 feet (1 mile) in all directions; also, consider initial evacuation of 5280 feet (1 mile) in all directions.

NFPA	Health 1	Flammability 4	Instability 0	Special Hazard -

6. ACCIDENTAL RELEASE MEASURES

Personal precautions Keep people away from and upwind of spill/leak. Isolate and evacuate area. Shut off source if safe to do so. Eliminate all ignition sources. Use spark-proof tools and explosion-proof equipment. Leaks may self-ignite due to static accumulation. Distant ignition and flashback are possible. Monitor area for flammable or explosive atmosphere. Before entry, especially into confined areas, check atmosphere with an appropriate monitor.

Protective equipment Use personal protection measures as recommended in Section 8.

Emergency procedures Advise authorities and National Response Center (800-424-8802) if the product has entered a water course or sewer. Notify local health and pollution control agencies, if appropriate.

Environmental precautions If leaking, take appropriate steps to disperse gas.

Methods and materials for containment Prevent further leakage or spillage if safe to do so.

Methods and materials for cleaning up Shut off gas supply, if safe to do so. Allow equipment to depressurize. Isolate area until gas has dispersed.

7. HANDLING AND STORAGE

Safe handling precautions

Avoid breathing fumes, gas, or vapors. Use only outdoors or with adequate ventilation. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. Gas and/or vapors may accumulate along the ground, settle in low lying areas or be moved by ventilation and ignited by many sources such as pilot lights, sparks, electric motors, static discharge, or other ignition sources at locations distant from material handling. Flashback may occur along vapor trails. Use only non-sparking tools. Use appropriate grounding and bonding practices. Bonding and grounding may be insufficient to eliminate the hazard from static electricity. Use personal protection recommended in Section 8. Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. Do not cut, drill, grind or weld on empty containers since explosive residues may remain. Comply with all applicable EPA, OSHA, NFPA and consistent state and local requirements.

Components of this product are basically non-conductors of electricity and can become electrostatically charged during mixing, filtering or pumping at high flow rates. If this charge reaches a sufficiently high level, sparks can form that may ignite the vapors of flammable liquids. Sudden release of hot organic vapors or mists from process equipment operating at elevated temperature and pressure, or sudden ingress of air into vacuum equipment, may result in ignitions without the presence of obvious ignition sources.

Harmful concentrations of hydrogen sulfide (H2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. Stay upwind and vent open hatches before unloading. Sulfur containing products may cause polysulfide deposits (iron sulfide) to form inside iron storage tanks. These pyrophoric deposits, upon exposure to air, can ignite spontaneously.

Storage conditions

Store in properly closed containers that are appropriately labeled and in a cool, well-ventilated area. Keep product and empty container away from heat and sources of ignition. Do not puncture or incinerate container.

Incompatible materials

Strong oxidizing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Name	ACGIH TLV	OSHA PELS	NIOSH IDLH
Butane (mixed isomers) 106-97-8	1000 ppm STEL	-	1600 ppm
Propane 74-98-6	Simple asphyxiant	TWA: 1000 ppm TWA: 1800 mg/m³	2100 ppm
Pentane (mixed isomers) 109-66-0	1000 ppm TWA	TWA: 1000 ppm TWA: 2950 mg/m³	1500 ppm
Ethane 74-84-0	Simple asphyxiant	-	-
Hexane (mixed isomers) 110-54-3	50 ppm TWA Skin - potential significant contribution to overall exposure by the cutaneous route	TWA: 500 ppm TWA: 1800 mg/m³	1100 ppm
Heptane (mixed isomers) 142-82-5	400 ppm TWA 500 ppm STEL	TWA: 500 ppm TWA: 2000 mg/m³	750 ppm
Carbon Dioxide 124-38-9	5000 ppm TWA 30000 ppm STEL	TWA: 5000 ppm TWA: 9000 mg/m³	40000 ppm
Methane 74-82-8	Simple asphyxiant	-	-
Benzene 71-43-2	0.5 ppm TWA 2.5 ppm STEL Skin - potential significant contribution to overall exposure	TWA: 10 ppm (applies to industry segments exempt from the benzene standard) TWA: 1 ppm	500 ppm

	by the cutaneous route	STEL: 5 ppm (see 29 CFR 1910.1028)	
Toluene 108-88-3	20 ppm TWA	TWA: 200 ppm Ceiling: 300 ppm	500 ppm
Xylene (mixed isomers) 1330-20-7	100 ppm TWA 150 ppm STEL	TWA: 100 ppm TWA: 435 mg/m^3	900 ppm
Hydrogen sulfide 7783-06-4	1 ppm TWA 5 ppm STEL	Ceiling: 20 ppm Peak: 50 ppm	100 ppm

Notes: No further information available.

Engineering measures Local or general exhaust required in an enclosed area or when there is inadequate ventilation. Use mechanical ventilation equipment that is explosion-proof. Monitor atmospheric oxygen levels.

Personal protective equipment

Eye protection Goggles or faceshield may be needed when handling pressurized gases.

Skin and body protection Wear insulated gloves when handling pressurized gases to prevent skin contact and frostbite or freeze burn. Contact the glove manufacturer for specific advice on glove selection and breakthrough times.

Respiratory protection Use atmosphere supplying respirators in the event of oxygen deficiency, when material produces vapors that exceed permissible limits, or when excessive vapors are generated. Observe respirator assigned protection factors (APFs) criteria cited in federal OSHA 29 CFR 1910.134.

Note: Air purifying respirators are not to be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturers instructions), in oxygen deficient atmospheres, (less than 19.5% oxygen) or under conditions that are immediately dangerous to life and health (IDLH).

Hygiene measures Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Do not smoke while handling.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Colorless Gas
Physical State	Gas
Color	Colorless
Odor	Mild hydrocarbon to Rotten egg
Odor Threshold	No data available.

Property	**Values (method)**
pH	Not applicable
Melting Point / Freezing Point	No data available.
Initial Boiling Point / Boiling Range	No data available.
Flash Point	< -40 °C / < -40 °F (estimated)
Evaporation Rate	No data available.
Flammability (solid, gas)	Highly Flammable Gas
Flammability Limit in Air (%):	
Upper Flammability Limit:	No data available.
Lower Flammability Limit:	No data available.
Explosion Limits	No data available.
Vapor Pressure	150-200 psia @ 40°C (estimated)
Vapor Density	>1
Specific Gravity / Relative Density	0.7 (0.4-0.7 estimated)
Water Solubility	No data available.
Partition Coefficient	No data available.
Autoignition Temperature	No data available.

Decomposition Temperature No data available.
Kinematic Viscosity No data available.
VOC Content (%) No data available.

10. STABILITY AND REACTIVITY

Reactivity The product is non-reactive under normal conditions.

Chemical stability Stable under recommended storage conditions.

Possibility of hazardous reactions None under normal processing.

Hazardous polymerization Will not occur.

Conditions to avoid Sources of heat or ignition.

Incompatible materials Strong oxidizing agents.

Hazardous decomposition products None known under normal conditions of use.

11. TOXICOLOGICAL INFORMATION

Potential short-term adverse effects from overexposures

Inhalation May cause central nervous system depression with nausea, headache, dizziness, vomiting, and incoordination. In high concentration the gas may cause suffocation. Victim may not be aware of asphyxiation. May release highly toxic hydrogen sulfide gas that quickly fatigues the sense of smell. Concentrations of >1000 ppm will cause immediate unconsciousness and death through respiratory paralysis.

Eye contact Gas or vapor is generally non-irritating to eyes. Direct contact with liquefied product can cause freeze burn or frostbite.

Skin contact Gas or vapor is generally non-irritating to skin. Direct contact with liquefied product can cause freeze burn or frostbite.

Ingestion Aspiration into lungs may cause chemical pneumonia and lung damage.

Acute toxicological data

Name	Oral LD50	Dermal LD50	Inhalation LC50
Butane (mixed isomers) 106-97-8	-	-	658 mg/L (Rat) 4 h
Propane 74-98-6	-	-	> 1,464 mg/L (Rat) 15 min
Pentane (mixed isomers) 109-66-0	> 2000 mg/kg (Rat)	-	364 mg/L (Rat) 4 h
Ethane 74-84-0	-	-	658 mg/L (Rat) 4 h
Hexane (mixed isomers) 110-54-3	15000 mg/kg (Rat)	3000 mg/kg (Rabbit)	48000 ppm (Rat) 4 h
Heptane (mixed isomers) 142-82-5	-	3000 mg/kg (Rabbit)	103 g/m^3 (Rat) 4 h
Methane 74-82-8	-	-	326 mg/m^3 (Mouse) 2 h
Benzene 71-43-2	> 2000 mg/kg (Rat)	> 5000 mg/kg (Rabbit)	> 20 mg/l (Rat) 4 h
Toluene 108-88-3	> 2000 mg/kg (Rat)	8390 mg/kg (Rabbit)	12.5 mg/L (Rat) 4 h
Xylene (mixed isomers) 1330-20-7	> 2000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 5.04 mg/L (Rat) 4 h
Hydrogen sulfide 7783-06-4	-	-	444 ppm (Rat) 4 h

Immediate and delayed effects as well as chronic effects from short and long-term exposure

PROPANE, BUTANE and PENTANE: Laboratory animal studies indicate exposure to extremely high levels (1 to 10 vol.% in air) may cause cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.

METHANE and ETHANE: Exposure to high levels of these gases produce weak central nervous system (CNS) depressant effects without significant potential for systemic toxicity. At very high levels they act as asphyxiant gases by diluting and displacing oxygen. Symptoms of persons exposed to oxygen deficient atmospheres include headache, dizziness, incoordination, cyanosis and narcosis. Extremely high concentrations can produce unconsciousness followed by death.

N-HEXANE: Short-term overexposure to n-hexane vapor may cause headache, nausea, vomiting, dizziness, lightheadedness, loss of consciousness, coma, and even death in humans. Respiratory effects of overexposure may include nose, throat, and lung irritation, coughing, wheezing, and shortness of breath. Direct and prolonged contact with liquid may cause dryness and redness of the skin. Long-term or repeated overexposure to n-hexane can cause peripheral nerve damage. Initial signs are numbness of the fingers and toes. Motor/muscle weakness can occur in the digits, but may also involve muscles of the arms, forearms, and thighs. Onset of these signs may be delayed for several months to a year after initial exposure. Repeated and sustained inhalation exposure to high vapor concentrations of n-hexane resulted in degenerative changes in the testes and reduced sperm count in male laboratory rats.

CARBON DIOXIDE: Carbon dioxide is a simple asphyxiant and has no warning properties (such as odor). Inhalation of high concentrations can produce mild narcotic effects and stimulation of the respiratory centers. Eye, nose and throat irritation can occur at very high exposure concentrations. Poisoning may affect the lungs, heart, kidney and central nervous system. Sleepiness, mental confusion, giddiness, lassitude (weakness), noise in the ear, weakened reflexes, tremors, flaccid paralysis, coma, and death may all occur from carbon dioxide poisoning.

BENZENE: Benzene exposure may cause skin, eye and respiratory irritation. Excessive exposures may cause central nervous system effects. Numerous studies of workers exposed to airborne benzene for prolonged or repeated periods show strong evidence that overexposure can cause cancer of the blood, AML (acute myeloid leukemia), along with other disorders indicating damage to the blood forming organs including aplastic anemia, leukopenia, thrombocytopenia, and the development of myelodysplastic syndrome. Some studies of pregnant women occupationally exposed to benzene suggest associations with an increased risk of miscarriage, stillbirth, reduced birth weight, and gestational age. Prolonged and repeated exposure to benzene has induced chromosomal aberrations in circulating human lymphocytes, in bone marrow cells of laboratory animals, and in sperm cells of both humans and laboratory animals.

TOLUENE: Inhalation abuse of toluene at high concentrations has been associated with adverse effects on the liver, kidney and nervous system, and can cause nervous system depression, cardiac arrhythmias, and death. Studies of workers indicate long-term exposure may be related to impaired color vision and hearing. Some studies of workers suggest long-term exposure may be associated with neurobehavioral and mental functional changes. Laboratory animal studies indicate some changes in reproductive organs after exposure to high airborne concentrations, but no significant effects on mating performance or reproduction were observed. Positive findings include small increases in minor skeletal and visceral malformations and developmental delays following maternal exposure to high concentrations. Adverse effects on the liver, kidney, thymus and nervous system of laboratory animal were observed after very high levels of prolonged and repeated exposure.

XYLENE: Overexposure to airborne xylene may cause upper respiratory tract irritation, headache, cyanosis, blood serum changes, nervous system damage and narcosis. Impaired neurological function has been reported in workers exposed to solvents including xylene. Laboratory animal studies have shown evidence of impaired hearing after prolonged exposure high airborne concentrations. Laboratory animal studies suggest some changes in reproductive organs after exposure to high airborne concentrations of xylene without an effect on reproduction. Skeletal and visceral malformations, developmental delays, and increased fetal resorptions were observed in laboratory animals after extremely high airborne concentrations with evidence of maternal toxicity. Adverse effects on the liver, kidney, and bone marrow were observed in laboratory animals after prolonged and repeated exposure to high airborne concentrations of xylene.

HYDROGEN SULFIDE: Hydrogen sulfide has a strong, unpleasant odor resembling that of rotten eggs. Odor, however, is not a reliable means for detecting potentially dangerous concentration of the gas, as the sense of smell diminishes very rapidly at concentrations of 50 ppm or higher. Eye irritation has been reported at 4 ppm. Irritation of the respiratory tract may occur at 50 ppm. Hydrogen sulfide gas may be fatal if inhaled in sufficient concentrations. Immediate loss of consciousness and death resulting from respiratory paralysis has occurred at concentrations as low as 500 ppm.

Adverse effects related to the physical, chemical and toxicological characteristics

Signs and symptoms Asphyxiant gas. High concentrations in the immediate area can displace oxygen causing

the feeling of suffocation and can cause headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue from oxygen deprivation. Hydrogen sulfide can cause respiratory paralysis and death, depending on the concentration and duration of exposure. Do not rely on ability to smell vapors, since loss of smell rapidly occurs. Effects of overexposure include irritation of the nose and throat, nausea, vomiting, diarrhea, abdominal pain and signs of nervous system depression (e.g. headache, drowsiness, dizziness, loss of coordination and fatigue), irregular heartbeats, pulmonary edema, weakness and convulsions. Contact with product may cause frostbite. Prolonged or repeated exposure may cause damage to organs.

Acute toxicity None known.

Skin corrosion/irritation None known.

Serious eye damage/eye irritation None known.

Sensitization None known.

Mutagenic effects May cause genetic defects.

Carcinogenicity May cause cancer.

Name	ACGIH (Class)	IARC (Class)	NTP	OSHA
Benzene 71-43-2	Confirmed human carcinogen (A1)	Carcinogenic to humans (1)	Known to be human carcinogen	Known carcinogen
Toluene 108-88-3	Not classifiable (A4)	Not classifiable (3)	Not Listed	Not Listed
Xylene (mixed isomers) 1330-20-7	Not classifiable (A4)	Not classifiable (3)	Not Listed	Not Listed

Reproductive toxicity Suspected of damaging fertility or the unborn child.

Specific Target Organ Toxicity (STOT) - single exposure May cause drowsiness or dizziness.

Specific Target Organ Toxicity (STOT) - repeated exposure May cause damage to organs (nervous system) through prolonged or repeated exposure.

Aspiration hazard Potential for aspiration if swallowed.

12. ECOLOGICAL INFORMATION

Ecotoxicity This product should be considered toxic to aquatic organisms, with the potential to cause long lasting adverse effects in the aquatic environment.

Name	Fish	Crustacea	Algae/aquatic plants
Pentane (mixed isomers) 109-66-0	96-hr LC50 >1 - <10 mgL Rainbow trout	48-hr EC50 = 9.7 mg/L Daphnia magna	-
Hexane (mixed isomers) 110-54-3	96-hr LC50 = 2.5 mg/l Fathead minnow	-	-
Heptane (mixed isomers) 142-82-5	96-hr LC50 = 375 mg/L Tilapia	-	-
Benzene 71-43-2	96-hr LC50 = 5.3 mg/l Rainbow trout (flow-through)	48-hr EC50 = 8.76-15.6 mg/l Daphnia magna (Static)	72-hr EC50 = 29 mg/l Algae
Toluene 108-88-3	96-hr LC50 <= 10 mg/l Rainbow trout	48-hr EC50 = 5.46-9.83 mg/l Daphnia magna 48-hr EC50 = 11.5 mg/l Daphnia magna (Static)	72-hr EC50 = 12.5 mg/l Algae
Xylene (mixed isomers) 1330-20-7	96-hr LC50 = 8 mg/l Rainbow trout	48-hr LC50 = 3.82 mg/l Daphnia magna	72-hr EC50 = 11 mg/l Algae

Hydrogen sulfide 7783-06-4	96-hr LC50 = 0.016 mg/l Fathead minnow 96-hr LC50 = 0.013 mg/l Rainbow trout	-	-

Persistence and degradability Expected to be inherently biodegradable.

Bioaccumulation Has the potential to bioaccumulate.

Mobility in soil Expected to rapidly partition to air.

Other adverse effects No information available.

13. DISPOSAL CONSIDERATIONS

Description of waste residues No information available.

Safe handling of wastes Handle in accordance with applicable local, state, and federal regulations. Use personal protection measures as required. Use appropriate grounding and bonding practices. Use only non-sparking tools. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. No smoking.

Disposal of wastes / methods of disposal The user is responsible for determining if any discarded material is a hazardous waste (40 CFR 262.11). Dispose of in accordance with federal, state and local regulations.

Contaminated packaging disposal Empty containers should be completely drained and then discarded or recycled, if possible. Do not cut, drill, grind or weld on empty containers since explosive residues may be present. Dispose of in accordance with federal, state and local regulations.

14. TRANSPORT INFORMATION

DOT

UN/Identification No:	UN 1075
UN Proper Shipping Name:	Liquefied Petroleum Gas
Transport Hazard Class(es):	2.1
Packing Group:	Not applicable

IATA

UN/Identification No:	UN 1075
UN Proper Shipping Name:	Liquefied Petroleum Gas
Transport Hazard Class(es):	2.1
Packing Group:	Not applicable
ERG code:	10L

IMDG

UN/Identification No:	UN 1075
UN Proper Shipping Name:	Liquefied Petroleum Gas
Transport Hazard Class(es):	2.1
Packing Group:	Not applicable
EmS No:	F-D, S-U
Marine Pollutant:	Yes

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable

15. REGULATORY INFORMATION

Regulatory Information

US TSCA Chemical Inventory This product and/or its components are listed on the TSCA Chemical Inventory or are

exempt.

Canada DSL/NDSL Inventory This product and/or its components are listed either on the Domestic Substances List (DSL) or are exempt.

EPA Superfund Amendment & Reauthorization Act (SARA)

SARA Section 302 This product may contain component(s) that have been listed on EPA's Extremely Hazardous Substance (EHS) List:

Name	CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs
Hydrogen sulfide	500

SARA Section 304 This product may contain component(s) identified either as an EHS or a CERCLA Hazardous substance which in case of a spill or release may be subject to SARA reporting requirements:

Name	Hazardous Substances RQs
Hexane (mixed isomers) 110-54-3	5000 lb 2270 kg
Benzene 71-43-2	10 lb 4.54 kg
Toluene 108-88-3	1000 lb 454 kg
Xylene (mixed isomers) 1330-20-7	100 lb 45.4 kg
Hydrogen sulfide 7783-06-4	100 lb 45.4 kg

SARA Section 311/312 The following EPA hazard categories apply to this product:

Flammable
Gas under pressure
Hazard Not Otherwise Classified (HNOC)-Physical
Simple asphyxiant
Germ cell mutagenicity
Carcinogenicity
Reproductive toxicity
Specific target organ toxicity
Hazard Not Otherwise Classified (HNOC)-Health

SARA Section 313 This product may contain component(s), which if in exceedance of the de minimus threshold, may be subject to the reporting requirements of SARA Title III Section 313 Toxic Release Reporting (Form R).

Name	CERCLA/SARA 313 Emission reporting
Hexane (mixed isomers) 110-54-3	1.0 % de minimis concentration
Benzene 71-43-2	0.1 % de minimis concentration
Toluene 108-88-3	1.0 % de minimis concentration
Xylene (mixed isomers) 1330-20-7	1.0 % de minimis concentration
Hydrogen sulfide 7783-06-4	1.0 % de minimis concentration

U.S. State Regulations

California Proposition 65 This product can expose you to chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm.

Name	California Proposition 65
Hexane (mixed isomers) 110-54-3	Male reproductive toxicity, initial date 12/15/17 (n-Hexane)
Benzene 71-43-2	Carcinogen, initial date 02/27/87 Male developmental toxicity, initial date 12/26/97
Toluene 108-88-3	Developmental toxicity, initial date 01/01/91

For more information, go to www.P65Warnings.ca.gov.

State Right-To-Know Regulations The following component(s) of this material are identified on the regulatory lists below:

Name	New Jersey Right-To-Know	Pennsylvania Right-To-Know	Massachusetts Right-To Know
Butane (mixed isomers) 106-97-8	Listed	Listed	Listed
Propane 74-98-6	Listed	Listed	Listed
Pentane (mixed isomers) 109-66-0	Listed	Listed	Listed
Ethane 74-84-0	Listed	Listed	Listed
Hexane (mixed isomers) 110-54-3	Listed	Listed	Listed
Heptane (mixed isomers) 142-82-5	Listed	Listed	Listed
Carbon Dioxide 124-38-9	Listed	Listed	Listed
Methane 74-82-8	Listed	Listed	Listed
Benzene 71-43-2	Listed	Listed	Listed
Toluene 108-88-3	Listed	Listed	Listed
Xylene (mixed isomers) 1330-20-7	Listed	Listed	Listed
Hydrogen sulfide 7783-06-4	Listed	Listed	Listed

16. OTHER INFORMATION

Prepared by Toxicology & Product Safety

NFPA

Revision Notes

Revision date 09/23/2020

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the

date of its publication. The information is intended as guidance for safe handling, use, processing, storage, transportation, accidental release, clean-up and disposal and is not considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

GENERAL TERMS AND CONDITIONS

13. QUALITY

Rover shall not be obligated to accept Gas for Transportation which does not meet these quality provisions:

13.1 Gas received shall be merchantable Natural Gas; shall be free of water and hydrocarbons in liquid form; shall contain not more than 7 pounds of water vapor per MMcf unless otherwise agreed to in advance by Rover, one-quarter (¼) grain of hydrogen sulphide per one hundred (100) cubic feet and twenty (20) grains of total sulphur per one hundred (100) cubic feet, two percent (2%) of carbon dioxide and three percent (3%) of nitrogen (by volume), and fifty (50) parts per million of oxygen; shall not contain any active bacteria or bacterial agent, including but not limited to sulphate reducing bacteria and acid producing bacteria; shall not contain any hazardous or toxic substances; and shall not exceed one hundred twenty degrees (120°) Fahrenheit in temperature.

13.2 The Gas shall have a total or gross heating value of not less than nine hundred sixty-seven (967) Btu and not more than one thousand one hundred (1,100) Btu per cubic foot at the Points of Receipt. Rover may increase or decrease the heat content of said Gas before delivery thereof to Shipper provided that such increase or decrease will not result in a total heating value above one thousand one hundred (1,100) or below nine hundred sixty-seven (967) Btu per cubic foot.

13.3 Deliveries of Gas at the Points of Receipt shall be at a pressure sufficient to enter Rover's pipeline system at such point and deliveries of Gas at the Points of Delivery shall be at such pressure as may exist in Rover's pipeline at such point from time to time, unless otherwise agreed in accordance with Section 2 of Rate Schedule FTS.

13.4 Shipper shall indemnify Rover from any loss, cost, damage or expense incurred by Rover as a direct or indirect result of Shipper's failure to comply with the provisions of this Section 12, except to the extent such loss, damage, expense, claim, suit, action or proceeding is the result of Rover's negligence, bad faith or willful misconduct or is the direct result of Rover's deliberate decision to take Shipper's nonconforming Gas.

13.5 Where operationally feasible, Rover may, from time to time, on a not unduly discriminatory basis, accept non-conforming Gas to the extent it is able to blend Gas received at Points of Receipt, as long as Rover reasonably anticipates, in its sole judgment, that such blended Gas will not cause operational or downstream problems at its Points of Delivery.

SAFETY DATA SHEET
THE DOW CHEMICAL COMPANY

Product name: UCARSOL™ AP SOLVENT 814

Issue Date: 12/28/2017
Print Date: 12/29/2017

THE DOW CHEMICAL COMPANY encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. IDENTIFICATION

Product name: UCARSOL™ AP SOLVENT 814

Recommended use of the chemical and restrictions on use
Identified uses: Carbon dioxide removal. We recommend that you use this product in a manner consistent with the listed use. If your intended use is not consistent with the stated use, please contact your sales or technical service representative.

COMPANY IDENTIFICATION
THE DOW CHEMICAL COMPANY
2030 WILLARD H DOW CENTER
MIDLAND MI 48674-0000
UNITED STATES

Customer Information Number: 800-258-2436
SDSQuestion@dow.com

EMERGENCY TELEPHONE NUMBER
24-Hour Emergency Contact: CHEMTREC +1 800-424-9300
Local Emergency Contact: 800-424-9300

2. HAZARDS IDENTIFICATION

Hazard classification
This material is hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29CFR 1910.1200.
Skin corrosion - Category 1B
Serious eye damage - Category 1
Respiratory sensitisation - Category 1
Skin sensitisation - Category 1
Reproductive toxicity - Category 2

Label elements
Hazard pictograms

Signal word: **DANGER!**

Hazards
Causes severe skin burns and eye damage.
May cause an allergic skin reaction.
May cause allergy or asthma symptoms or breathing difficulties if inhaled.
Suspected of damaging fertility or the unborn child.

Precautionary statements

Prevention
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
Wash skin thoroughly after handling.
Contaminated work clothing should not be allowed out of the workplace.
Wear protective gloves/ protective clothing/ eye protection/ face protection.
In case of inadequate ventilation wear respiratory protection.

Response
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
IF exposed or concerned: Get medical advice/ attention.
If skin irritation or rash occurs: Get medical advice/ attention.
Wash contaminated clothing before reuse.

Storage
Store locked up.

Disposal
Dispose of contents/ container to an approved waste disposal plant.

Other hazards
No data available

3. COMPOSITION/INFORMATION ON INGREDIENTS

This product is a mixture.

Component	CASRN	Concentration
Substituted amine (1)	Trade secret	60.0 - 100.0 %
Piperazine	110-85-0	> 15.0 %
Water	7732-18-5	>= 7.0 - <= 9.0 %

4. FIRST AID MEASURES

Description of first aid measures
General advice:
First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.

Inhalation: Move person to fresh air. If not breathing, give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask, etc). If breathing is difficult, oxygen should be administered by qualified personnel. Call a physician or transport to a medical facility.

Skin contact: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing. Seek medical attention if symptoms occur or irritation persists. Wash clothing before reuse. Discard items which cannot be decontaminated, including leather articles such as shoes, belts and watchbands. Suitable emergency safety shower facility should be immediately available.

Eye contact: Wash immediately and continuously with flowing water for at least 30 minutes. Remove contact lenses after the first 5 minutes and continue washing. Obtain prompt medical consultation, preferably from an ophthalmologist. Suitable emergency eye wash facility should be immediately available.

Ingestion: Do not induce vomiting. Give one cup (8 ounces or 240 ml) of water or milk if available and transport to a medical facility. Do not give anything by mouth unless the person is fully conscious.

Most important symptoms and effects, both acute and delayed: Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), any additional important symptoms and effects are described in Section 11: Toxicology Information.

Indication of any immediate medical attention and special treatment needed
Notes to physician: Maintain adequate ventilation and oxygenation of the patient. May cause respiratory sensitization or asthma-like symptoms. Bronchodilators, expectorants and antitussives may be of help. Treat bronchospasm with inhaled beta2 agonist and oral or parenteral corticosteroids. Chemical eye burns may require extended irrigation. Obtain prompt consultation, preferably from an ophthalmologist. If burn is present, treat as any thermal burn, after decontamination. Due to irritant properties, swallowing may result in burns/ulceration of mouth, stomach and lower gastrointestinal tract with subsequent stricture. Aspiration of vomitus may cause lung injury. Suggest endotracheal/esophageal control if lavage is done. No specific antidote. Treatment of exposure

should be directed at the control of symptoms and the clinical condition of the patient. Excessive exposure may aggravate preexisting asthma and other respiratory disorders (e.g. emphysema, bronchitis, reactive airways dysfunction syndrome).

5. FIREFIGHTING MEASURES

Suitable extinguishing media: Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. Alcohol resistant foams (ATC type) are preferred. General purpose synthetic foams (including AFFF) or protein foams may function, but will be less effective.

Unsuitable extinguishing media: Do not use direct water stream. May spread fire.

Special hazards arising from the substance or mixture
Hazardous combustion products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Nitrogen oxides. Carbon monoxide. Carbon dioxide.

Unusual Fire and Explosion Hazards: Violent steam generation or eruption may occur upon application of direct water stream to hot liquids.

Advice for firefighters
Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Burning liquids may be extinguished by dilution with water. Do not use direct water stream. May spread fire. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage.

Special protective equipment for firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). Avoid contact with this material during fire fighting operations. If contact is likely, change to full chemical resistant fire fighting clothing with self-contained breathing apparatus. If this is not available, wear full chemical resistant clothing with self-contained breathing apparatus and fight fire from a remote location. For protective equipment in post-fire or non-fire clean-up situations, refer to the relevant sections.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures: Evacuate area. Refer to section 7, Handling, for additional precautionary measures. Keep upwind of spill. Ventilate area of leak or spill. Keep personnel out of low areas. Only trained and properly protected personnel must be involved in clean-up operations. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.

Environmental precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

Methods and materials for containment and cleaning up: Small spills: Absorb with materials such as: Non-combustible material. Clay. Vermiculite. Zorb-all®. Do NOT use absorbent materials such as: Ground corn cobs. Moist organic absorbents. Peat moss. Cellulose. Sawdust. Large spills:

Contain spilled material if possible. Collect in suitable and properly labeled containers. See Section 13, Disposal Considerations, for additional information.

7. HANDLING AND STORAGE

Precautions for safe handling: Do not get in eyes. Do not swallow. Avoid breathing vapor. Avoid contact with skin and clothing. Avoid prolonged or repeated contact with skin. Wash thoroughly after handling. Keep container closed. Use with adequate ventilation. Do not use sodium nitrite or other nitrosating agents in formulations containing this product. Suspected cancer-causing nitrosamines could be formed. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION. Spills of these organic materials on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion.

Conditions for safe storage: Store in accordance with good manufacturing practices. Use only with adequate ventilation. Do not store in: Aluminum. Copper. Copper alloys. Galvanized containers. Zinc. Additional storage and handling information on this product may be obtained by calling your sales or customer service contact.

Storage stability

Storage Period:
Bulk
18 Month
Metal drums.
36 Month

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters
If exposure limits exist, they are listed below. If no exposure limits are displayed, then no values are applicable.

Component	Regulation	Type of listing	Value/Notation
Piperazine	ACGIH	TWA Inhalable fraction and vapor	0.03 ppm, piperazine
	ACGIH	TWA	Skin and respiratory sensitiser

An Occupational Exposure Limit is available for one of the ingredients of this product. Please consult your business representativefor assistance with exposure assessment and monitoring programs.

Exposure controls
Engineering controls: Use engineering controls to maintain airborne level below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, use only with adequate ventilation. Local exhaust ventilation may be necessary for some operations.

Individual protection measures
Eye/face protection: Use chemical goggles.
Skin protection

Hand protection: Use gloves chemically resistant to this material. Examples of preferred glove barrier materials include: Chlorinated polyethylene. Polyethylene. Ethyl vinyl alcohol laminate ("EVAL"). Examples of acceptable glove barrier materials include: Butyl rubber. Natural rubber ("latex"). Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). Polyvinyl chloride ("PVC" or "vinyl"). Viton. Polyvinyl alcohol ("PVA"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Other protection: Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task.

Respiratory protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, use an approved respirator. Selection of air-purifying or positive-pressure supplied-air will depend on the specific operation and the potential airborne concentration of the material. For emergency conditions, use an approved positive-pressure self-contained breathing apparatus.

The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	
Physical state	Liquid.
Color	Colorless to yellow
Odor	Ammoniacal
Odor Threshold	No test data available
pH	No test data available
Melting point/range	Not applicable
Freezing point	-48 °C (-54 °F) *Literature* Pour point
Boiling point (760 mmHg)	126 °C (259 °F) *Literature*
Flash point	**closed cup** 102 °C (216 °F) *ASTM D 93*
Evaporation Rate (Butyl Acetate = 1)	0.5 *Literature*
Flammability (solid, gas)	Not applicable to liquids
Lower explosion limit	No test data available
Upper explosion limit	No test data available
Vapor Pressure	4.6 mmHg at 20 °C (68 °F) *Literature*
Relative Vapor Density (air = 1)	2.8 *Literature*
Relative Density (water = 1)	1.045 at 20 °C (68 °F) / 20 °C *Literature*
Water solubility	100 % at 20 °C (68 °F) *Literature*

Partition coefficient: n-octanol/water	No data available
Auto-ignition temperature	304 - 307 °C (579 - 585 °F) *Literature*
Decomposition temperature	No test data available
Kinematic Viscosity	No test data available
Explosive properties	No data available
Oxidizing properties	No data available
Molecular weight	Not applicable
Molecular formula	Trade secret

NOTE: The physical data presented above are typical values and should not be construed as a specification.

10. STABILITY AND REACTIVITY

Reactivity: No data available

Chemical stability: Stable under recommended storage conditions. See Storage, Section 7.

Possibility of hazardous reactions: Polymerization will not occur.

Conditions to avoid: Exposure to elevated temperatures can cause product to decompose.

Incompatible materials: Avoid contact with: Acrylates. Alcohols. Aldehydes. Ketones. Nitrites. Strong acids. Strong oxidizers. Avoid contact with metals such as: Aluminum. Copper. Copper alloys. Galvanized metals. Zinc. Avoid unintended contact with: Halogenated hydrocarbons. Avoid contact with absorbent materials such as: Ground corn cobs. Moist organic absorbents. Peat moss. Sawdust.

Hazardous decomposition products: Decomposition products depend upon temperature, air supply and the presence of other materials.

11. TOXICOLOGICAL INFORMATION

Toxicological information appears in this section when such data is available.

Acute toxicity

Acute oral toxicity
Low toxicity if swallowed. Swallowing may result in burns of the mouth and throat. Swallowing may result in gastrointestinal irritation or ulceration. May cause nausea and vomiting. May cause abdominal discomfort or diarrhea.
Single dose oral LD50 has not been determined.

Acute dermal toxicity
Prolonged skin contact is unlikely to result in absorption of harmful amounts.
The dermal LD50 has not been determined.

Acute inhalation toxicity
At room temperature, exposure to vapor is minimal due to low volatility. If material is heated or aerosol/mist is produced, concentrations may be attained that are sufficient to cause respiratory irritation and other effects. Asthma-like symptoms may include coughing, difficult breathing and a feeling of tightness in the chest. Occasionally, breathing difficulties may be life threatening.
As product: The LC50 has not been determined.

Skin corrosion/irritation
Brief contact may cause skin burns. Symptoms may include pain, severe local redness and tissue damage.

Serious eye damage/eye irritation
May cause severe irritation with corneal injury which may result in permanent impairment of vision, even blindness. Chemical burns may occur.

Sensitization
Skin contact may cause an allergic skin reaction.

May cause allergic respiratory reaction.

Specific Target Organ Systemic Toxicity (Single Exposure)
Material is corrosive. Material is not classified as a respiratory irritant; however, upper respiratory tract irritation or corrosivity may be expected.

Specific Target Organ Systemic Toxicity (Repeated Exposure)
For the minor component(s):
Excessive exposure may cause neurologic signs and symptoms.

Carcinogenicity
For the minor component(s): Did not cause cancer in laboratory animals.

Teratogenicity
For the minor component(s): Has caused birth defects in laboratory animals only at doses toxic to the mother. Has been toxic to the fetus in laboratory animals at doses toxic to the mother. For the major component(s): Did not cause birth defects or other effects in the fetus even at doses which caused toxic effects in the mother.

Reproductive toxicity
For the minor component(s): In animal studies, has been shown to interfere with reproduction. In animal studies, has been shown to interfere with fertility.

Mutagenicity
In vitro genetic toxicity studies were negative for component(s) tested. Genetic toxicity studies in animals were negative for component(s) tested.

Aspiration Hazard
Based on physical properties, not likely to be an aspiration hazard.

COMPONENTS INFLUENCING TOXICOLOGY:

Substituted amine (1)

Acute oral toxicity
LD50, Rat, male and female, 4,680 mg/kg

Acute dermal toxicity
Prolonged skin contact is unlikely to result in absorption of harmful amounts.

LD50, Rabbit, > 2,000 mg/kg No deaths occurred at this concentration.

Acute inhalation toxicity
No deaths occurred following exposure to a saturated atmosphere.

Piperazine

Acute oral toxicity
LD50, Rat, 2,600 mg/kg

Acute dermal toxicity
LD50, Rabbit, > 5,000 mg/kg

Acute inhalation toxicity
LC0, Rat, 4 Hour, vapour, 2 mg/l

12. ECOLOGICAL INFORMATION

Ecotoxicological information appears in this section when such data is available.

Toxicity

Substituted amine (1)

Acute toxicity to fish
Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50/EL50/LL50 >100 mg/L in the most sensitive species tested).
LC50, Leuciscus idus (Golden orfe), static test, 96 Hour, 1,466 mg/l, DIN 38412
LC50, Pimephales promelas (fathead minnow), static test, 96 Hour, 1,200 mg/l, OECD Test Guideline 203 or Equivalent

Acute toxicity to aquatic invertebrates
EC50, Daphnia magna (Water flea), static test, 48 Hour, 2,330 mg/l, OECD Test Guideline 202 or Equivalent

Acute toxicity to algae/aquatic plants
EC50, Desmodesmus subspicatus (green algae), static test, 72 Hour, Growth rate inhibition, > 100 mg/l, OECD Test Guideline 201 or Equivalent

Piperazine

Acute toxicity to fish
Material is slightly toxic to aquatic organisms on an acute basis (LC50/EC50 between 10 and 100 mg/L in the most sensitive species tested).
LC50, Poecilia reticulata (guppy), semi-static test, 96 Hour, > 1,800 mg/l, OECD Test Guideline 203 or Equivalent

Acute toxicity to aquatic invertebrates
EC50, Daphnia magna (Water flea), static test, 48 Hour, 21 mg/l, OECD Test Guideline 202

Acute toxicity to algae/aquatic plants
EC50, Pseudokirchneriella subcapitata (green algae), static test, 72 Hour, Growth rate inhibition, > 1,000 mg/l, OECD Test Guideline 201 or Equivalent

Toxicity to bacteria
IC50, Bacteria, 16 Hour, > 5,000 mg/l

Chronic toxicity to aquatic invertebrates
NOEC, Daphnia magna (Water flea), semi-static test, 21 d, 12.5 mg/l

Persistence and degradability

Substituted amine (1)
Biodegradability: Material is readily biodegradable. Passes OECD test(s) for ready biodegradability. Material is ultimately biodegradable (reaches > 70% mineralization in OECD test(s) for inherent biodegradability).
10-day Window: Pass
Biodegradation: 96 %
Exposure time: 18 d
Method: OECD Test Guideline 301A or Equivalent

Theoretical Oxygen Demand: 2.29 mg/mg

Biological oxygen demand (BOD)

Incubation Time	BOD
5 d	40 %
28 d	42 %

Photodegradation
Test Type: Half-life (indirect photolysis)
Sensitization: OH radicals
Atmospheric half-life: 1.324 Hour
Method: Estimated.

Piperazine
Biodegradability: Material is readily biodegradable. Passes OECD test(s) for ready biodegradability.
10-day Window: Pass
Biodegradation: 65.3 %
Exposure time: 28 d
Method: OECD Test Guideline 301F or Equivalent

Photodegradation
Test Type: Half-life (indirect photolysis)
Sensitization: OH radicals

Atmospheric half-life: 2.8 Hour
Method: Estimated.

Bioaccumulative potential

Bioaccumulation: No data available for this product. See Section 12 for individual component data.

Mobility in soil

Substituted amine (1)

Potential for mobility in soil is high (Koc between 50 and 150).
Partition coefficient (Koc): 53 Estimated.

Piperazine

Potential for mobility in soil is low (Koc between 500 and 2000).
Partition coefficient (Koc): 507 Measured

13. DISPOSAL CONSIDERATIONS

Disposal methods: DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. AS YOUR SUPPLIER, WE HAVE NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Incinerator or other thermal destruction device.

14. TRANSPORT INFORMATION

DOT

Proper shipping name	Amines, liquid, corrosive, n.o.s.(Piperazine)
UN number	UN 2735
Class	8
Packing group	III

Classification for SEA transport (IMO-IMDG):

Proper shipping name	AMINES, LIQUID, CORROSIVE, N.O.S.(Piperazine)
UN number	UN 2735
Class	8
Packing group	III
Marine pollutant	No
Transport in bulk according to Annex I or II of MARPOL 73/78 and the	Consult IMO regulations before transporting ocean bulk

IBC or IGC Code

Classification for AIR transport (IATA/ICAO):

Proper shipping name	Amines, liquid, corrosive, n.o.s.(Piperazine)
UN number	UN 2735
Class	8
Packing group	III

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Transportation classifications may vary by container volume and may be influenced by regional or country variations in regulations. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. REGULATORY INFORMATION

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312
Acute toxicity (any route of exposure)
Skin corrosion or irritation
Serious eye damage or eye irritation
Respiratory or skin sensitisation
Reproductive toxicity

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

Pennsylvania Worker and Community Right-To-Know Act:
The following chemicals are listed because of the additional requirements of Pennsylvania law:

Components	**CASRN**
Piperazine	110-85-0

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

United States TSCA Inventory (TSCA)
All components of this product are in compliance with the inventory listing requirements of the U.S. Toxic Substances Control Act (TSCA) Chemical Substance Inventory.

16. OTHER INFORMATION

Product Literature
Additional information on this product may be obtained by calling your sales or customer service contact. Ask for a product brochure. Additional information on this and other products may be obtained by visiting our web page.

Hazard Rating System
NFPA

Health	Fire	Reactivity
3	1	0

Revision
Identification Number: 171345 / A001 / Issue Date: 12/28/2017 / Version: 11.0
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

ACGIH	USA. ACGIH Threshold Limit Values (TLV)
TWA	8-hour, time-weighted average

Full text of other abbreviations
AICS - Australian Inventory of Chemical Substances; ASTM - American Society for the Testing of Materials; bw - Body weight; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DOT - Department of Transportation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; EHS - Extremely Hazardous Substance; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; HMIS - Hazardous Materials Identification System; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; MSHA - Mine Safety and Health Administration; n.o.s. - Not Otherwise Specified; NFPA - National Fire Protection Association; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; RCRA - Resource Conservation and Recovery Act; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RQ - Reportable Quantity; SADT - Self-Accelerating Decomposition Temperature; SARA - Superfund Amendments and Reauthorization Act; SDS - Safety Data Sheet; TCSI - Taiwan Chemical

Substance Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative

Information Source and References
This SDS is prepared by Product Regulatory Services and Hazard Communications Groups from information supplied by internal references within our company.

THE DOW CHEMICAL COMPANY urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.

US

Equipment ID: HC1-A-1376 **Equipment Description: RESIDUE DISCHARGE COOLER**

HC1-FN-1376A FAN INSPECTION Alarm:

		Selected	Not Selected
FAN AVO	3. BELT ISSUE	Critical	None
FAN AVO	4. LEAK	Critical	None
FAN AVO	5. EXCESS NOISE	Critical	None
FAN AVO	6. EXCESS VIBRATION	Critical	None
FAN AVO	7. SCENT/OLFACTORY	Critical	None
FAN AVO	8. SEE NOTES	Critical	None
FAN AVO	1. EVERYTHING OK	Normal	None
FAN AVO	2. ON STANDBY	Normal	None
Note			

HC1-FN-1376B FAN INSPECTION Alarm:

		Selected	Not Selected
FAN AVO	3. BELT ISSUE	Critical	None
FAN AVO	4. LEAK	Critical	None
FAN AVO	5. EXCESS NOISE	Critical	None
FAN AVO	6. EXCESS VIBRATION	Critical	None
FAN AVO	7. SCENT/OLFACTORY	Critical	None
FAN AVO	8. SEE NOTES	Critical	None
FAN AVO	1. EVERYTHING OK	Normal	None
FAN AVO	2. ON STANDBY	Normal	None
Note			

HC1-FN-1376C FAN INSPECTION Alarm:

		Selected	Not Selected
FAN AVO	3. BELT ISSUE	Critical	None
FAN AVO	4. LEAK	Critical	None
FAN AVO	5. EXCESS NOISE	Critical	None
FAN AVO	6. EXCESS VIBRATION	Critical	None
FAN AVO	7. SCENT/OLFACTORY	Critical	None
FAN AVO	8. SEE NOTES	Critical	None
FAN AVO	1. EVERYTHING OK	Normal	None
FAN AVO	2. ON STANDBY	Normal	None
Note			

Equipment ID: HC1-FN-1375A **Equipment Description: RESIDUE INTERSTAGE**

HC1-FN-1375AA FAN INSPECTION Alarm:

		Selected	Not Selected
FAN AVO	3. BELT ISSUE	Critical	None
FAN AVO	4. LEAK	Critical	None
FAN AVO	5. EXCESS NOISE	Critical	None
FAN AVO	6. EXCESS VIBRATION	Critical	None

Response to First Technical Deficiency Letter Submitted on July 26, 2024

The BAT analysis required the receipt of vendor quotes before a thorough evaluation could be conducted and resulted in a delayed response.

Best Available Technology Review

Compressor and Measurement Device Venting

Reciprocating Compressor Rod Packing Vents

Emissions associated with the one (1) reciprocating compressor rod packing needed to compress CO_2 overheads for Harmon Creek 3 results in a facility-wide increase of 0.02 tpy of VOC. The measurement device venting for HC3 results in a facility-wide increase of 0.77 tpy of VOC. Per #31 of 25 Pa Code §127.14(a)(8), rod packing and measurement device venting from this project are exempt from the Plan Approval requirements of §127.11 and §127.12 because the uncontrolled VOC emissions from the project are less than 2.7 tons on a 12-month rolling basis. In addition to exemption #8, the measurement devices are exempt from permitting under 25 Pa Code §127.14(a)(7) because the gas chromatographs (GCs) and moisture analyzers are considered laboratory equipment used exclusively for chemical or physical analyses.

MPLX is providing a BAT analysis on rod packing emissions associated with the reciprocating compressor. In 2022, a search for "rod packing" was conducted in the RBLC Database from 8/2017 through 9/2022 for all pollutants and no results were returned. Another search for "rod packing", "reciprocating", and "compressor" was conducted in the RBLC Database with updated dates from 8/2022 to 6/2024. No relevant results were returned. Therefore, MPLX relied on technical expertise from the compressor manufacturer and facility personnel.

MPLX contacted Ariel Corporation in May 2022 to explore options to reduce rod packing emissions associated with the compressors. Based on reference material provided and discussions with Ariel representatives, the standard Ariel packings meet or exceed today's industry-standard requirements, and ongoing research and development efforts ensure the best possible seal. The new reciprocating compressor will be equipped with what Ariel identifies as low-emission packing. Please see the appended information provided by Ariel.

However, as requested by the Department, MPLX evaluated recovery options with five (5) vendors including ZEVAC and Eagle Pump & Compressor. ZEVAC provided a quote for a vapor recovery unit priced at $94,550. With the cost of freight and the estimated cost for installation, not including the annual cost for operating the unit, the ten-year cost per ton reduction is greater than $1.6M per ton of VOC. MPLX contacted Eagle Pump & Compressor for additional information on their distance piece recovery compressors. Based on the specification sheet provided, the discharge pressure is up to 25 psig. The rod packing vent pressures are typically less than 1 psig and would discharge to a line with a pressure greater than 100 psig. To route vapors back into the compressor suction, a 4-stage unit would be required. The Eagle Pump & Compressor options do not have enough stages of compression or horsepower to properly discharge the packing vents back into the process. Thus, the Eagle Pump & Compressor units are not an option for recovery. The other vendors did not provide budgetary quotes as the solutions were not cost-effective due to the high discharge pressure which would require another reciprocating compressor with rod packing vents.

The potential emissions associated with the CO_2 reciprocating compressor rod packing vent rates are based on the NSPS OOOOb compliance rate of 2 scfm and results in 0.02 tpy VOC and 0.01 tpy methane. The Ariel provided vent rate of 0.75 scfm results in even lower emissions. Due to the insignificant level of VOC and methane emissions associated with the CO_2 compressor and the high cost of recovery options, MPLX will not implement any of the recovery methods explored through this BAT analysis on the proposed reciprocating compressor rod packing vents. MPLX will comply with the NSPS OOOOb requirements for reciprocating compressors.

Centrifugal Compressor Dry Deal Vents

Based on the manufacturer-provided vent rate of 1.78 scfm, emissions associated with the two (2) proposed residue compressors result in 0.12 tpy of VOC. Given that the potential emissions for the residue compressor centrifugal dry seal vents are less than 1.0 tpy using the more conservative 10 scfm per seal NSPS OOOOb emission rate, MPLX will comply with the NSPS OOOOb requirements of monitoring dry seal vents to ensure the leak rate remains below the 10 scfm per seal standard.

The regenerative centrifugal compressors potential emissions were based on the NSPS OOOOb compliance limit of 10 scfm resulting in potential uncontrolled emissions of 35 tpy VOC. However, leak rate data provided by the manufacturer is significantly lower and results in uncontrolled emissions of approximately 0.88 tpy VOC. Based on the more conservative potential emission rate, MPLX will route the regenerative compressor dry seal vents to the flare to reduce potential emissions by 98% resulting in potential controlled emissions of 0.70 tpy. The regenerative centrifugal compressor dry seal vents are routed to the flare through a closed vent system which has a check valve in place to prevent back pressure.

Measurement Devices

One option considered is routing low-pressure measurement device vents to the closed drain where vapors are controlled by the process flare. One known risk is the possible contamination of the sensitive GC equipment due to potential flowback. However, this method is not practiced at MPLX facilities, and other potential challenges and risks are unknown because this type of system to control vents, at extremely low pressures, is not a widely available method or known to be in practice at other gas processing plants and therefore not considered BAT.

Low-pressure vents such as gas chromatographs, regulators, etc. cannot be combined into a common vent header with an installed check valve. A check valve is a requirement to prevent backflowing from the header to the venting device. However, measurement devices vent at such a low pressure that they cannot overcome the check valve opening pressure which can cause them not to vent. This non-venting or the previously mentioned backflowing can cause damage to the device or cause it to vent locally. Venting locally affects the hazardous classification of the area resulting in a potentially dangerous environment for operations personnel.

However, even if routing measurement device vents were technically feasible, the estimated cost is approximately $200,000 per vent to route vent streams to the closed drain. Twenty-one (21) measurement device vents are proposed for HC3, and the total installation cost would be approximately $4.2M to control 0.77 tpy VOC. This is equivalent to a $590,000 ten-year cost/ton reduction and would not be economically reasonable.

Another option to reduce emissions from low-pressure vents is by routing vents to a VRU. The estimated range to acquire and install a VRU is approximately $1-2M. Because these vents are located throughout the facility, multiple VRUs and significant amounts of piping would be required to recover these vapors. For the HC3 project, a minimum of four (4) VRUs would be required to capture emissions from the measurement device vents. The cost per ton reduction, without considering the operation and maintenance, over a ten-year period would be a minimum of $566,000/ton of VOC.

The high cost to install an emissions control for an insignificant emission reduction of 0.77 tpy is not economically reasonable. As referenced in 25 Pa Code §127.14(a), a plan approval is not required for the compressor or measurement device vents due to the minimal emissions associated with the sources.

Best Available Technology Supporting Information

ZEVAC Vapor Recovery Systems for CO2 Compressor

Year	MPLX Cost of Capital	Capital	Annual Operating	Annual Total	Annual Total with Cost of Capital
2025	8.96%	$ 297,833		$ 297,833	$ 324,518
2026	8.96%	$ -		$ -	$ -
2027	8.96%	$ -		$ -	$ -
2028	8.96%	$ -		$ -	$ -
2029	8.96%	$ -		$ -	$ -
2030	8.96%	$ -		$ -	$ -
2031	8.96%	$ -		$ -	$ -
2032	8.96%	$ -		$ -	$ -
2033	8.96%	$ -		$ -	$ -
2034	8.96%	$ -		$ -	$ -
2035	8.96%	$ -		$ -	$ -
				Ten-Year Total	$ 324,518
				Tons Reduced Over Ten Years	0.20
				Ten-Year Cost/Ton Reduction	$ 1,622,591

Routing Measurement Device Vents to Closed Drain

Year	MPLX Cost of Capital	Capital	Annual Operating	Annual Total	Annual Total with Cost of Capital
2025	8.96%	$ 4,200,000		$ 4,200,000	$ 4,576,320
2026	8.96%	$ -		$ -	$ -
2027	8.96%	$ -		$ -	$ -
2028	8.96%	$ -		$ -	$ -
2029	8.96%	$ -		$ -	$ -
2030	8.96%	$ -		$ -	$ -
2031	8.96%	$ -		$ -	$ -
2032	8.96%	$ -		$ -	$ -
2033	8.96%	$ -		$ -	$ -
2034	8.96%	$ -		$ -	$ -
2035	8.96%	$ -		$ -	$ -
				Ten-Year Total	$ 4,576,320
				Tons Reduced Over Ten Years	7.70
				Ten-Year Cost/Ton Reduction	$ 594,327

Routing Measurement Device Vents to VRUs

Year	MPLX Cost of Capital	Capital	Annual Operating	Annual Total	Annual Total with Cost of Capital
2025	8.96%	$ 4,000,000		$ 4,000,000	$ 4,358,400
2026	8.96%	$ -		$ -	$ -
2027	8.96%	$ -		$ -	$ -
2028	8.96%	$ -		$ -	$ -
2029	8.96%	$ -		$ -	$ -
2030	8.96%	$ -		$ -	$ -
2031	8.96%	$ -		$ -	$ -
2032	8.96%	$ -		$ -	$ -
2033	8.96%	$ -		$ -	$ -
2034	8.96%	$ -		$ -	$ -
2035	8.96%	$ -		$ -	$ -
				Ten-Year Total	$ 4,358,400
				Tons Reduced Over Ten Years	7.70
				Ten-Year Cost/Ton Reduction	$ 566,026

ZEVAC Proposal – Harmon Station

Item	Description	Qty	Price	Total
ZEVAC Harmon Compressor Station HP Mini Recovery Package	ZEVAC HP Mini – Motive Force required 185 cfm air @ 125 – 150 psi air, discharging into 325 psi. One ZEVAC HP Mini can handle total requested flow. If separate units are preferred due to site access piping feasibility, price can be multiplied by total quantity needed. All ZEVAC connections are ½ NPT. One ZEVAC HP Mini to recycle emissions from: (2) Residue Compressors Siemens centrifugal compressors) (2)CO2 Compressors Ariel two throw recip compressors): 8 scfm = 2 comps x 2 throws x 2 scfm max leak rate per throw (1) C2 Regen Compressor Sundyne LMC-337 centrifugal compressor): 0.25 scfm (1) Regen Compressor Sundyne LMC-311F centrifugal compressor): 0.25 scfm - Installation Support - Commissioning Support - Basic 1 Year Warranty - (1) "MCO" - Maintenance and Compliance Plan Customer will have Access to Loaner Fleet to ensure OOOOb Compliance	1	$94,550	$94,550
			Total Price:	$94,550

Critical Notes:

Pricing: All pricing valid for 30 days.
Payment: 50% down with PO, 50% net 30 days. All pricing is in USD and exclusive of taxes, tariffs, and duties.
Delivery: stock to 6 weeks, depending on availability at time of order placement
Freight: Cost plus 15% or customer can collect in Tulsa.

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PUMP & COMPRESSOR LTD.

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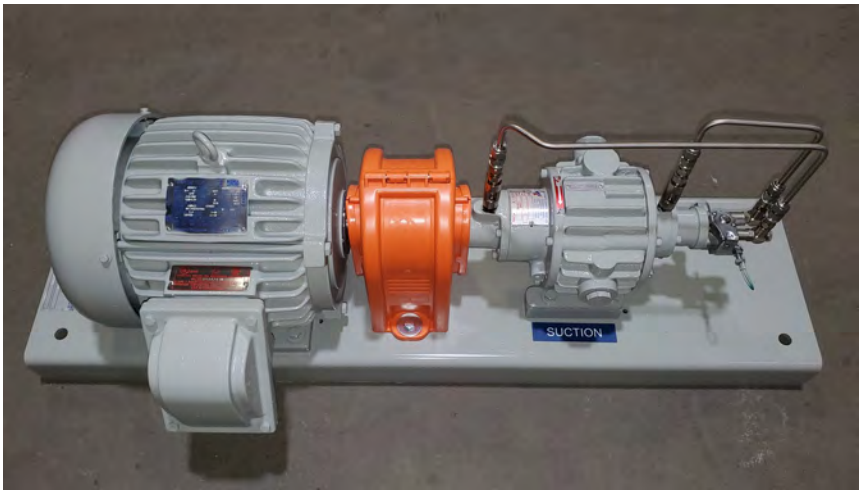

LGA/B ROTARY VANE GAS COMPRESSORS

- MECHANICAL SHAFT SEALS
- FLOWS TO 26 SCFM
- DIFFERENTIAL PRESSURES TO 25 PSIG
- TEFC OR EXPLOSION PROOF MOTORS
- SWEET / SOUR GASES
- AUTO LUBRICATOR PUMP INCLUDED

Available in 3 sizes which meet the majority of applications, these units are stocked in good quantities for rapid delivery.

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Eagle Pump & Compressor Ltd. 7025 5th St. SE, Calgary, AB T2H2G2 Web: **eagle-pc.com**

Response to First Technical Deficiency Letter Submitted on August 15, 2024

The BAT analysis required the receipt of vendor quotes before a thorough evaluation could be conducted and resulted in a delayed response.

Best Available Technology Review

Existing Process Flare and Enclosed Combustor Options

MarkWest Liberty Midstream and Resources, L.L.C., a fully owned subsidy of MPLX, hereinafter referred to as MPLX, is seeking authorization to construct and operate the Harmon Creek 3 Cryo (HC3) and a second de-ethanizer (De-Eth 2). During maintenance and emergency situations, MPLX will require the blowdown of equipment associated with HC3 and De-Eth 2. MPLX plans to route such vapors to the existing process flare. The most recent version of the GP5 excludes the use of open flares, and therefore MPLX submitted a plan approval application seeking authorization to control HC3 with the existing process flare.

The Department requested further justification related to the land use challenges associated with installing an enclosed combustor. One of the main challenges with installing a new enclosed combustor or additional ground flare is available land for use at the Harmon Creek facility. The only usable space for a new flare is highlighted in the Google Earth image in Attachment 1. There are multiple reasons why the usable space is limited to this area out of the parcels owned by MPLX, shown in Attachment 2. The topography of the surrounding properties is not conducive to building without significant site work. The neighboring property immediately to the west is more than 80 feet lower than the current site and is in a flood plain. The neighboring property to the northwest has multiple powerline right-of-ways and a power company substation on it, limiting usable space. The property to the southwest was previously strip mined and requires significant remediation and site work to be usable. Additionally, it is encroaching on adequate spacing from neighboring structures.

The cost associated with site work to make the space shown in the Google Earth image, in Attachment 1, usable for a new flare is approximately $1.7MM as detailed in Attachment 3. The estimate applies to both flare options because accessibility from the existing plant road would be required in addition to a flat spot to set the flare and tie-in piping.

New Enclosed Ground Combustor

MPLX obtained a quote from Zeeco for an ECD adequately sized for the Harmon Creek processes. The ECD was guaranteed the same destruction and removal efficiency (DRE) as the existing plant flare; thus, no emission reductions would be achieved from the control of waste gas. The required purge and pilot gas rates to safely operate the ECD results in emissions lower than the existing plant flare. The cost for the enclosed combustor is $11MM, construction is $2MM, and the site work is $1.7MM, totaling $14.7MM. The breakdown for the cost estimate associated with the new enclosed ground flare is included in Attachment 4. The VOC emission reduction from pilot and purge gas is expected to be approximately 0.009 tpy. The Harmon Creek facility will be major source only for VOC following this proposed HC3 project. Over a ten-year period, the cost to reduce the VOC emissions by 0.09 tons would be $171.9M without considering the annual operating and maintenance costs. Over a ten-year period, the cost to reduce VOC by 0.009 tpy, CO by 2.31 tpy, and NOx by 0.51 tpy, would be approximately $566,727. That cost is solely for the equipment and installation and does not account for the cost to operate and maintain the equipment. Installing an ECD to control the Harmon Creek processes is not economically reasonable for the low level of emission reductions.

Enclosed Ground Combustor for Maintenance

Additionally, as requested by the Department, MPLX evaluated options to control the Harmon Creek 3 project with an enclosed combustor meeting a DRE of 99%. As a part of the request the Department asked

MPLX to evaluate an enclosed ground flare from Baker Furnace. MPLX contacted Baker Furnace via phone and followed up by email and did not receive a response.

However, MPLX obtained a quote from Zeeco for an enclosed ground flare with a DRE of 99%. As shown in Table 1, the estimated emissions from the existing process flare with a DRE of 98% is 10.31 tons VOC. The total emissions from the HC3 sources routed to an enclosed ground flare with a DRE of 99%, excluding plant shutdowns due to the safety considerations, would be reduced by approximately 0.93 tpy VOC. The cost for the enclosed ground flare system is $1.2MM, construction is $2MM, and site work is $1.7MM, totaling $4.9MM. The quote and estimate for equipment and construction are detailed in Attachment 5. Based on the information in Attachment 5 and Table 1, the ten-year cost per ton reduction of VOC would be approximately $561,236. The installation of a ground flare to control the maintenance blowdowns associated with HC3 is not economically reasonable.

Table 1. Potential uncontrolled and controlled tpy of VOC emissions from waste gas.

	Tons VOC Emissions			
Source Routed to Flare	Total Uncontrolled	Total Controlled with 98% DRE	HC3 Project Uncontrolled	Total Controlled with 98% DRE on Existing and Plant Shutdowns 99% DRE on HC3 Sources
Pigging	10.05	0.20	4.94	0.15
Maintenance Blowdowns	6.00	0.12	1.55	0.10
Plant Shutdowns	153.50	3.07	76.76	3.07
PSVs	8.12	0.16	2.68	0.14
Dry Seal Vents	284.65	5.69	70.04	4.99
Loadout Operations	52.99	1.06	14.31	0.92
Total	**515.32**	**10.31**	**170.29**	**9.37**

Due to the significant cost associated with an enclosed combustor sized for this project, MPLX has determined that installing an ECD at the facility is not economically feasible. Thus, the existing flare at the facility is determined to meet BAT for this project.

Attachment 1 -

Google Earth Image
Usable Land Space

State Game Lands Number 117
Bavington Rd
T500
Point Pleasant Rd
123 Point Pleasant Rd
Harmon Creek Cryogenic Gas Plant
Maple Grove Rd
Valleyview Rd
Harmon Creek Rd
Gamelands Parking
Burgettstown Area Youth Baseball
Burgettstown Jr SR High School
Burgettstown Area Elementary
Raccoon Creek
Station St
Crossover Rd
Smiths Township State Rd
Wally's Auto Services
Image © 2024 Airbus
Google Earth
40°24'03.66" N 80°21'28.25" W elev 1212 ft eye alt 18168 ft

Attachment 2 -

Map of Parcels

ton County, PA Parcel & GIS Viewer

570-013-00-00-0014-00

570-003-00-00-0007-11
570-003-00-00-0014-02
570-003-00-00-0014-00A
570-003-00-00-0015-01
570-004-00-00-0003-01
570-002-00-00-0002-00
570-004-00-00-0003-04
570-004-00-00-0003-03
570-004-00-00-0003-00
570-004-00-00-0001-00
570-004-00-00-0005-00
570-004-00-00-0006-02
570-013-00-00-0014-00
570-013-00-00-0014-01
570-004-00-00-0006-00
570-013-00-00-0013-00
570-012-00-00-0001-00
570-012-00-00-0002-00
570-012-00-00-0003-00
570-012-00-00-0004-00
570-012-00-00-0006-01
570-012-00-00-0006-00
570-011-00-00-0028-00
570-013-01-02-0012-00
570-013-01-05-0006-00
570-021-00-00-0001-00
570-021-00-00-0002-00
570-021-00-00-0003-02
570-004-00-00-0008-00
570-004-00-00-0007-00
570-004-00-00-0007-01
570-005-00-00-0002-01
570-005-00-00-0002-00
570-005-00-00-0004-00
570-005-00-00-0004-01
570-005-00-00-0004-03
570-005-00-00-0004-04
570-005-00-00-0008-00
570-005-00-00-0008-02
570-005-00-00-0008-01
570-005-00-00-0009-00
570-005-00-00-0012-02
570-005-00-00-0010-02
570-005-00-00-0006-00
570-005-00-00-0005-00
570-005-00-00-0010-01
570-005-00-00-0006-01
570-005-00-00-0006-04
570-005-00-00-0012-00
570-013-00-00-0003-02
550-013-00-00-0003-00
550-006-00-00-0011-00
550-007-00-00-0020-01
550-010-00-00-0001-00
550-010-00-00-0002-00
550-010-00-00-0007-00
550-010-00-00-0005-01
550-010-00-00-0003-00
550-010-00-00-0006-00
550-010-00-00-0012-00
550-010-00-00-0005-00
550-010-00-00-0004-00
550-010-00-00-0005-02
550-010-00-00-0008-00
550-010-00-00-0010-01
550-010-00-00-0010-00
550-010-00-00-0009-01
550-010-00-00-0009-00
550-010-00-00-0009-03
550-010-00-00-0007-01
550-010-00-00-0008-01
550-011-00-00-0002-01
550-011-00-00-0001-00
550-013-00-00-0002-00

Attachment 3 -

Cost Estimate for
Site Work for Additional Flare

Item	Units	Estimated Quantity	Estimated Unit Price	Estimated Cost	Subtotal
Earthwork and Retaining Walls					**$ 768,750.00**
Earthwork	CY	35000	$ 6.25	$ 218,750.00	
Fill Foundation Keys	Lump Sum	1	$ 50,000.00	$ 50,000.00	
Retaining Walls	Lump Sum	1	$ 500,000.00	$ 500,000.00	
E&S and Demolition					**$ 150,000.00**
Erosion & Sedimetnation Control Measures	Lump Sum	1	$ 100,000.00	$ 100,000.00	
Misc. Demolition/Clearing/Abatement	Lump Sum	1	$ 50,000.00	$ 50,000.00	
Stormwater Management and Conveyance					**$ 318,075.00**
15" HDPE	LF	720	$ 75.00	$ 54,000.00	
18" HDPE	LF	350	$ 87.50	$ 30,625.00	
24" HDPE	LF	350	$ 100.00	$ 35,000.00	
36" HDPE	LF	70	$ 110.00	$ 7,700.00	
24" RCP	LF	50	$ 125.00	$ 6,250.00	
RipRap Apron	EA	2	$ 1,000.00	$ 2,000.00	
Cleanout	EA	2	$ 625.00	$ 1,250.00	
Stormwater Detention Control Structure	EA	2	$ 10,000.00	$ 20,000.00	
Stormwater Typ M Inlet	EA	6	$ 4,375.00	$ 26,250.00	
Storm Sewer Manhole	EA	2	$ 5,000.00	$ 10,000.00	
Nyoplast Drain Basin	EA	2	$ 1,875.00	$ 3,750.00	
Beehive Frame and Grate	EA	2	$ 1,250.00	$ 2,500.00	
Concrete Anti-Seep Collar	EA	2	$ 1,875.00	$ 3,750.00	
FABCO StormBasin	EA	8	$ 1,875.00	$ 15,000.00	
FABCO StormSack	EA	1	$ 1,250.00	$ 1,250.00	
Concrete Endwall	EA	2	$ 2,500.00	$ 5,000.00	
Stormwater Management Pond	Lump Sum	1	$ 93,750.00	$ 93,750.00	
Gravel Pad					**$ 67,000.00**
Gravel Pad	SY	5000	$ 12.50	$ 62,500.00	
Geoweb	SF	1000	$ 4.50	$ 4,500.00	
Miscellaneous Site Work					**$ 185,000.00**
Seed, Mulch, Topsoil, etc	Lump Sum	1	$ 60,000.00	$ 60,000.00	
Fence	Lump Sum	1	$ 125,000.00	$ 125,000.00	
SUB-TOTAL					**$ 1,488,825.00**
Insurance, Mobilization, Layout, Etc	% of Subtotal	3%			**$ 44,664.75**
Contingency	% of Subtotal	10%			**$ 148,882.50**
SITE WORK TOTAL					**$ 1,682,372.25**

Attachment 4 -

Quote and Cost Estimate for
New Enclosed Ground Flare

Engineering Metrics
Harmon Creek New Enclosed Ground Flare

PIPE COST

SIZE	LENGTH FT	$/FT	TOTAL COST $
0.5	0	95	$0
0.75	0	95	$0
1	200	95	$19,000
1.25	0	95	$0
1.5	0	95	$0
2	200	200	$40,000
3	0	250	$0
4	0	300	$0
6	0	400	$0
8	0	330	$0
10	0	450	$0
12	0	762	$0
16	0	1175	$0
20	200	1365	$273,000
TOTAL PIPE INSTALL COST $			$332,000

ELECTRICAL BOM

ITEM	SIZE	LENGTH F	$/FT	TOTAL COST $	LENGTHS
TRAY	24	200	250	$50,000	
CABLE	ALL	SEE RIGH	39	$39,000	1000
TOTAL ELECTRICAL INSTALL COST $				$89,000	

Tray length is equal to approximate total length of piperack in rail area.

Median unit cost assigned to all cable sizes due to McCarls limited pricing values.

CIVIL WORK

ITEM	QUANTITY (CY	$/CY	ITEM COST
Foundation	60	$2,566	$153,972
TOTAL CIVIL INSTALL COST			$153,972

STRUCTRUAL WORK

QUANTITY (LB)	$/LB	ITEM COST
5000	5.68	$28,405
STRUCTURAL INSTALL COST		$28,405

TOTAL CONSTRUCTION COST

AREA	COST
PIPING	$332,000.00
ELECTRICAL/INSTRUMENTATION	$89,000.00
CIVIL	$153,972.00
STRUCTURAL	$28,405.00
INDIRECTS AND OVERHEAD	$48,270.16
TOTAL COST	**$651,647.16**
Mob/Demob	$20,000.00
Equipment	$11,400,000.00
Enclosed Ground Flare	$11,000,000.00
Measurement	$90,000.00
Instrumentation	$50,000.00
Valves	$260,000.00
Engineering	$100,000.00
Commissioning and Startup	$70,000.00
Contingency	$734,498.83
TOTAL	**$12,976,145.99**

PROCESS CONDITIONS

	Deethanizer Plant				Cryo Plant					Global	Plant Inlet
	PSV-251	PSV-155/156/157	PSV-456	PSV-458	PSV-422B	PSV-321	PSV-140/1/2	PSV-521 New	PSV-151/2/3/4D	Multiple	
Description	DeC2 Reboiler	Refrig Comp	C3+ Tank	Ethane Tank	DeC1 Surge Tank	A-321	Refrig Comp	Demethanizer LCV	Residue Comp	Power Failure	Slug Catcher
Case	Reflux Failure	Blocked Outlet	Fire	Fire	Fire	Control Failure	Blocked Outlet	Bypass Failure	Blocked Outlet		Fire
PSV Set Pressure	550	350	550	550	550	540	350	550	1310	--	1440
Flow Rate (lb/hr)	528,094	754,400	843,008	415,642	296,598	711,364	754,400	663,115	1,117,000	1,244,327	732,000
Molecular Weight	48.1	44.1	50.3	29.9	50.87	21.76	44.1	20.88	18.8	21.97	39.46
Lower Heating Value (Btu/SCF)	2515	2317	2624	1610	2651	1187	2317	1149	1039	1205	2068
Temperature @ Inlet (°F)	265	142	60	-127	275	108	142	-38.6	186	58.4	400
Smokeless Requirements (%)	100	100	0	0	100	100	100	0	0	0	0
Allowable pressure @ Inlet (psig)	Vendor	Vendor	Vendor	Vendor	Vendor	Vendor	Vendor	Vendor	Vendor	Vendor	Vendor
Composition (mol%)											
C1	0.00	0.00	0.00	1.97	0.00	74.31	0.00	76.43	81.49	73.06	38.35
C2	2.18	1.00	1.38	97.63	1.32	15.54	1.00	15.32	16.95	16.45	18.10
C3	73.41	98.00	65.54	0.40	62.98	5.87	98.00	5.27	0.89	6.23	13.79
i-C4	5.56	1.00	6.39	0.00	6.75	0.64	1.00	0.50	0.03	0.69	2.68
n-C4	13.51	0.00	16.96	0.00	18.23	1.79	0.00	1.31	0.05	1.91	9.03
C5+	5.34	0.00	9.73	0.00	10.22	1.31	0.00	0.61	0.00	1.14	17.79
H2S	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
H2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N2	0.00	0.00	0.00	0.00	0.50	0.39	0.00	0.40	0.43	0.38	0.14
O2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C6H6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NH3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Others-CO2	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.15	0.16	0.15	0.12
ZEECO NOTES BELOW											
No Units	1	1	1	1	1	1	1	1	2	2	1
Chamber Diameter (FT)		74	78			74	74		68	72	74
Chamber Height (FT)		124	124			122	124		115	113	120
Overall Height (FT)		152	154			150	152		140	140	148
WF Diameter (FT)		105	110			105	105		96	102	105
Budgetary Price		$ 6,625,000.00	$ 7,500,000.00			$ 6,625,000.00	$ 6,625,000.00		$ 11,000,000.00	$ 12,500,000.00	$ 6,625,000.00
Delivery (Weeks)		58	62			58	58		66	66	58

Attachment 5 -

Quote and Cost Estimate for
Maintenance Enclosed Ground Flare

Engineering Metrics
Harmon Creek Maintenance Blowdown Ground Flare

PIPE COST

SIZE	LENGTH FT	$/FT	TOTAL COST $
0.5	0	95	$0
0.75	0	95	$0
1	100	95	$9,500
1.25	0	95	$0
1.5	0	95	$0
2	150	200	$30,000
3	150	250	$37,500
4	918	300	$275,400
6	1442	400	$576,800
8	0	330	$0
10	0	450	$0
12	0	762	$0
16	0	1175	$0
20	0	1365	$0
	TOTAL PIPE INSTALL COST $		$929,200

ELECTRICAL BOM

ITEM	SIZE	LENGTH FT	$/FT	TOTAL COST $	LENGTHS
TRAY	24	1000	250	$250,000	
CABLE	ALL	SEE RIGHT	39	$39,000	1000
		TOTAL ELECTRICAL INSTALL COST $		$289,000	

Tray length is equal to approximate total length of piperack in rail area.

Median unit cost assigned to all cable sizes due to McCarls limited pricing values.

CIVIL WORK

ITEM	QUANTITY (CY)	$/CY	ITEM COST
Foundatior	24	$2,566	$61,589
	TOTAL CIVIL INSTALL COST		$61,589

STRUCTRUAL WORK

QUANTITY (LB)	$/LB	ITEM COST
5000	5.681	$28,405
STRUCTURAL INSTALL COST		$28,405

TOTAL CONSTRUCTION COST

AREA	COST
PIPING	$929,200.00
ELECTRICAL/INSTRUMENTATION	$289,000.00
CIVIL	$61,588.80
STRUCTURAL	$28,405.00
INDIRECTS AND OVERHEAD	$104,655.50
TOTAL COST	$1,412,849.30
Mob/Demob	**$20,000.00**
Equipment	$1,420,000.00
Enclosed Ground Flare	$1,200,000.00
Measurement	$90,000.00
Instrumentation	$50,000.00
Valves	$80,000.00
Engineering	$100,000.00
Commissioning and Startup	$70,000.00
Contingency	$181,370.96
TOTAL	**$3,204,220.26**

ZEECO QUOTATION

CLIENT:	Marathon Petroleum
END USER:	Marathon Petroleum
ZEECO QUOTE #:	2024-07081FL-01
QUOTE REV #:	0
DATE OF ISSUE:	July 15, 2024
APPLICATION ENGINEER:	Nikki Ebert

ZEECO®

BURNERS | FLARES | THERMAL OXIDIZERS
VAPOR CONTROL | RENTALS | AFTERMARKET

ZEECO, INC.
22151 East 91st Street
Broken Arrow, OK 74014 USA

+1 (918) 258 8551 | sales@zeeco.com | zeeco.com

Budgetary Enclosed Ground Flare System Price: $1,200,000

Enclosed Ground Flare System General Scope of Supply

- Necessary CK-20 (310 SS) investment cast burner assemblies with 304 SS risers.
- Minimum One (1) pre-mix pilot assembly per stage/row, 310 SS construction, retractable to outside windfence.
- Flare gas burner piping runners for mounting inside the fenced area, including burner runners with plate supports and utility piping/conduit support brackets, 304 SS
- Flare system piping manifolds for flare gas, fuel gas, instrument air, etc, 304 SS
- Distribution tubing and fittings for instrument air to each staging valve and other solenoid operated equipment.
- Staging valves with air to close / spring open actuators, solenoids, position transmitters.
- Non-reclosing pressure bypass devices around staging valve with limit switch showing valve open.
- Carbon steel combustion chamber, field welded, with steel support legs to mount on foundations by others.
    - Ceramic fiber lining with anchors included for field installation by others.
    - Galvanized carbon steel wind fence for control of combustion air and minimization of combustion noise.
- Automatic/manual High Energy Spark ignition system for pilot monitoring and ignition
- One (1) simplex fixed type k 310 SS sheathed thermocouple per pilot.
- Necessary thermocouple and HEI wiring within Zeeco's battery limit.
- Staging control in customer DCS, with logic provided by Zeeco.
    - Pressure transmitters for 2oo3 voting / staging control provided as ship loose

Ex Works: Zeeco Shop (Burners, Pilots, LCP)

Point of Manufacture International (Runners, Manifold, Chamber, Shields, etc.)

Delivery: Foundation Loads - 8 weeks after receipt of order

GA Drawing and P&ID – 10 weeks after receipt of order

Equipment Ready to Ship – 50 weeks after receipt of order

Warranty: 12 months from start-up, or 18 months after shipment, whichever occurs first

Preliminary Sizing Information: Chamber OD = 24'
Chamber OAH = 57'
Windfence OD = 45'

Attachments: Gas Compositions
EGF Brochure

ENCLOSED GROUND FLARE

BURNERS | FLARES | INCINERATORS | PARTS & SERVICE

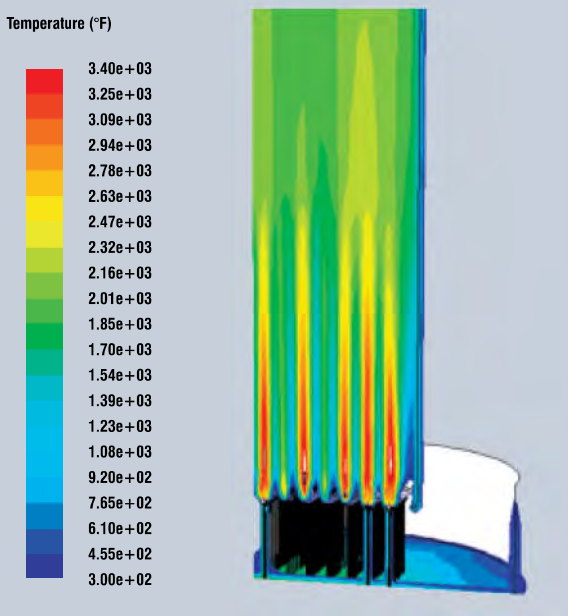
ENCLOSED GROUND FLARE

Enclosed flame, open record.

Enclosed smokeless flaring of waste gases in populated, tightly controlled, or small footprint plants calls for our proven ZEECO® Enclosed Ground Flare. Designed and staged to fully utilize the available pressure in the waste stream, our enclosed ground flare provides smokeless operation without steam, even when flaring hydrocarbon gases as heavy as butadiene. If your plant space is limited or located near a population center or environmentally sensitive area, the experienced team at Zeeco will custom design an enclosed ground flare system to minimize visible flaring impacts at the plant boundary. From the ground up, our enclosed ground flares protect facilities, employees, reputations, and the environment worldwide.

Proprietary, proven Zeeco investment cast burner heads using free-jet theory promote smokeless flaring with easy maintenance. Our innovative labyrinth shield design eliminates any line of sight into the combustion chamber. Our shield design creates more efficient air induction. This allows our flare to achieve higher destruction efficiencies compared to competing technologies. In fact, our enclosed ground flare is engineered for better air intake and is the quietest flare choice without *any* radiation at grade.

As a worldwide leader in combustion technology, Zeeco has both the extensive engineering experience and intensive testing capabilities you need to ensure a superior enclosed ground flare solution. These systems are complex; choose a provider with proven expertise in the design, installation, and commissioning of the equipment. At Zeeco, we ensure smokeless operation under varying amounts of pressure, flow, and gas compositions. Reduce noise and eliminate radiation at grade without sacrificing land or compromising efficiency.



CFD No Wind Results – Centerline Temperature (˚F)

Our testing smokes the competition.

Zeeco's expert engineering group goes the extra mile with every smokeless enclosed ground flare solution we design and our standard approach is anything but "standard." We use advanced Computational Fluid Dynamics (CFD) to model your specific process conditions against actual equipment design, allowing us to accurately simulate flame behavior and interaction under varying wind and weather conditions, fuel types, and flows. We use wind tunnel testing to accurately predict how wind will affect live performance. The result? A system with reliable, superior results and flares that last significantly longer.

The same commitment to excellence applies to our complete combustion testing process. Our Combustion Research and Test Facility was the first in the world to become ISO 9001-2000 certified, and our staff stays ahead of rapidly changing regulations and emission requirements. With our flare testing facilities and multi-fuel capabilities, from natural gas to butadiene and more, Zeeco can simulate flare system performance in a variety of conditions.

The Zeeco difference.

Our only business is the combustion business. By concentrating on what we do best, Zeeco has grown into a worldwide leader in combustion solutions. We are a privately held company whose ownership stays highly involved in daily operations, with upper management comprised of the world's leading combustion experts.

When you call Zeeco, we answer. When you make a request, you get a a quick response. Our sales, engineering, and purchasing groups work hand-in-hand to deliver highly competitive quotes and heroic turnaround times. We stand ready and willing to travel anywhere in the world to discuss upcoming projects firsthand and to ensure every existing project runs seamlessly.

Design Features

- Engineered for longer life and reliable service
- Lower maintenance cost from investment cast burner heads

Typical Applications

- Small plant footprints
- Populated areas
- Locations requiring reduced environmental impact (noise, radiation, or visibility)

100% Xylene Testing in Zeeco's Test Facility

Enclosed Ground Flare with Interior Chamber Cast Burner Heads

The Zeeco Difference.

Our only business is the combustion business. By concentrating on what we do best, Zeeco has grown into a worldwide leader in combustion solutions. We are a privately held company whose ownership stays highly involved in daily operations, with upper management comprised of the world's leading combustion experts.

When you call Zeeco, we answer. When you make a request, you get a quick, efficient response. We are lean and efficient, able to make decisions quickly, without bureaucracy and red tape. Our sales, engineering, and purchasing groups work hand-in-hand to deliver highly competitive quotes and heroic turnaround times. We stand ready and willing to travel anywhere in the world to discuss upcoming projects firsthand, and to ensure that every existing project runs seamlessly.

*Visit **zeeco.com/contact** for additional Global Location contact information*

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Choose to work with our dedicated, flexible, and innovative team, and you won't be disappointed. Call or email us today to request a quote or to learn more about our proprietary combustion systems.

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Certifications apply to Zeeco Headquarters.

NSF REGISTERED ISO 9001: 2015

UB20 Rev 1

Letter on BAT Determination and Meeting Request
Submitted on October 2, 2024

MarkWest Liberty Midstream & Resources, L.L.C.
1515 Arapahoe Street
Tower 1, Suite 1600
Denver, CO 80202-2126
(800) 730-8388
(303) 290-8700
(303) 825-0920 Fax

October 2, 2024

Mark Gorog
Environmental Program Manager
PA DEP SW Regional Office
400 Waterfront Drive
Pittsburgh, PA 15222

Re: MarkWest Liberty Midstream & Resources, L.L.C.
Harmon Creek Gas Plant
Flare Best Available Technology

Dear Mark,

On January 19, 2024, MPLX submitted a plan approval application seeking to authorize the construction and initial operation of a third natural gas processing plant at our Harmon Creek facility (HC3). MPLX personnel, including Allie Juarez and myself, have held bi-weekly phone calls with Southwest Regional Office (SWRO) PADEP personnel, including you, Sheri Guerrieri, and Devin Tomko. MPLX has also responded to a Technical Deficiency, which requested more information regarding the facility, particularly focusing on the Best Available Technology (BAT) analysis for controlling plant-wide emissions through an open flare. MPLX submitted a final response to the Technical Deficiency on August 15, 2024.

After allowing the SWRO to review the deficiency response, a bi-weekly meeting was held on September 19, 2024. During this meeting, MPLX was verbally informed that the BAT analysis was inadequate and would not be accepted for the following two reasons. First, SWRO's position is that the General Plan Approval and/or General Operating Permit for Unconventional Natural Gas Well Site Operations and Remote Pigging Stations (GP5) is the floor for BAT and thus, an Enclosed Combustor (ECD) must be installed to control emissions from maintenance events at the HC3 facility. Second, SWRO asserts that BAT analysis does not consider a cost-effectiveness component and that the applicant should search for any instances of enclosed combustors controlling maintenance activities, even in different industrial sectors, asserting the application of technology transfer should be considered. MPLX disagrees with SWRO's positions for the reasons discussed below.

The statement from the SWRO that the GP5 includes a BAT component that should be considered the floor of BAT analysis in a plan approval is contradictory to published materials by the PADEP in the GP5 Comment Response Document Part 1 of 2 finalized in June 2018. Page 12 of this document states that the purpose of issuing the GP5 was "to reduce the administrative burden on both industry and the Department by offering an alternative to the case-by-case determinations of the standard plan approval and operating permit program." In the same paragraph, the PADEP further states that "Owners and operators may, at their discretion, opt to undergo a case-by-case

determination if these specifications and conditions may not be met for their individual facility." Furthermore, to avoid confusion, the PADEP clarifies that the GP5 is not the floor for BAT determinations by stating on Page 15 that "The Department disputes the implication that the standardized terms and conditions of a general permit constitute a 'binding norm' as suggested by the commentators. The use of a general plan approval or a general operating permit is not mandatory. An applicant seeking to authorize their facility may opt instead for a case-by-case plan approval, in which they must demonstrate the case-by-case BAT for methane and all other pollutants emitted by sources at the facility."

Following the direction in the Comment Response Document, MPLX submitted a plan approval application and provided a case-by-case BAT analysis. This analysis demonstrates that the existing process flare, with a 98% destruction and removal efficiency (DRE) meets and exceeds BAT, as the GP5 only requires 95% for many sources, such as tank loadout operations and pigging emissions, which are routed to the existing process flare at the Harmon Creek facility. The analysis also demonstrates that an ECD with a DRE of 99% for the HC3 maintenance activities is not economically feasible. Based on a preliminary analysis for the site work, equipment, and construction for the ECD, the cost is approximately $4.9MM as detailed in the BAT analysis provided to PADEP on August 15, 2024. Even with the additional 1% of DRE, the cost per ton reduction over a 10-year period is at least $561,000 and likely more since the costs to maintain and operate the equipment were not yet evaluated.

Based on the September 19th call, MPLX understands that the position of the SWRO is that there is no cost-effectiveness component associated with a BAT analysis once a control technology is demonstrated to be in use. This position is not in harmony with the GP5 Technical Support Document and Comment Resolution Documents. Cost-effective ECDs are used at many MPLX compressor stations due to the limited number of sources, the limited length of piping runs and the relatively low volumes to the ECD. Open flares have been used at MPLX gas processing plants for safety reasons as an ECD cannot handle a sufficient volume of gas in a short period of time to evacuate a plant safely. The ECDs have not been operated at MPLX gas processing plants for maintenance activities due to the ability to route such activities to the existing process flares that are required for safety purposes to control high volumes during site shutdowns and emergency blowdowns. In short, the existing process flare on site meets BAT and the substantial cost to install an ECD for marginal increased efficiency does not meet established cost-effectiveness criteria.

The argument that there is no cost component associated with a control technology once it has been demonstrated to be in use at another facility is flawed due to the complexities and variations in design and processes. A technology may be economically reasonable at one facility and not at another due to the existing design and processes. Additionally, another facility may choose to install a control device that does not meet cost-effective criteria for several reasons including being subject to Lowest Achievable Emission Rate (LAER) criteria, or compliance and/or operational issues that require a more substantive control.

The PADEP has issued several Technical Support Documents (TSD) and Comment Resolution Documents for the GP5 and GP1 that have multiple references to cost-effective criteria. Page 23 of the TSD for the GP5 describes the philosophy of the PADEP regarding BAT when it states: "The emission limitation included in the General Permits must be technically and economically feasible and must be sustainable during the life of the air pollution source." To support the notion of cost-effectiveness required in a BAT determination the TSD cites calculations and references to cost-

effectiveness on at least 41 of 97 pages and is referenced on at least another 12 pages in Part 2 of 2 of the GP5 Comment Response Document. More recently, in January of 2023, the PADEP continued to cite cost-effectiveness in the TSD supporting the GP1 for heaters. Citing cost-effectiveness in such a detailed and frequent indicates that PADEP does consider cost-effectiveness as a criteria to be considered in BAT evaluations. Specifically, on page 78 of the GP5 TSD the cost-effectiveness of an ECD was enumerated when it states "If the cost-effectiveness threshold excluding methane is considered, combustion control devices are cost-effective up to a total capital investment of $75,000 because it is close to the $5,000 per ton of pollutant reduced."

As demonstrated in the attached BAT analysis provided by MPLX, the capital cost of an ECD would be $4.9 million and a cost-per-ton reduction of $561,000/ton, which far exceeds the $75,000 capital threshold and $5,000/ton limitations cited in the TSD. A cost-per-ton reduction greater than 100 times the threshold listed in the TSD is not considered cost-effective and therefore, the existing process flare is BAT for the HC3 maintenance activities.

MPLX maintains that the Plan Approval Application as submitted and amended with detailed cost information meets all the requirements, including the BAT requirements, for the SWRO to proceed with processing and issuing a Plan Approval with the equipment and controls as described in the application for the HC3 facility. If the SWRO is not in agreement with this determination, MPLX is formally requesting a meeting with the PADEP Harrisburg Central Office to discuss these issues. We respectively request a response from SWRO by Wednesday, October 16th.

Sincerely,

Nathan M. Wheldon

Nathan M. Wheldon, P.E.
Environmental Manager

Response to Second Technical Deficiency/Pre-Denial Letter
Submitted on November 26, 2024

MarkWest Liberty Midstream & Resources, L.L.C.
1515 Arapahoe Street
Tower 1, Suite 1600
Denver, CO 80202-2126
(800) 730-8388
(303) 290-8700
(303) 825-0920 Fax

November 26, 2024

Devin P. Tomko, P.E./DPT
Air Quality Engineer
PA DEP SW Regional Office
400 Waterfront Drive
Pittsburgh, PA 15222

Re: Response to Technical Deficiencies
MarkWest Liberty Midstream & Resources, L.L.C. – Harmon Creek Gas Plant
Application for Plan Approval PA-63-01011B
APS No. 1066962, AUTH No. 1471222
Smith Township, Washington County

Dear Devin P. Tomko, P.E./DPT:

MarkWest Liberty Midstream & Resources, L.L.C. ("**MPLX**") is providing this response to the pre-denial and second technical deficiency letter received on November 12, 2024, to which the Department gave MPLX only 10 business days to respond. The majority of the Department's requests were either previously addressed by MPLX and/or were items that were provided in the plan approval application and could have been requested in the initial technical deficiency letter. Nevertheless, MPLX has attempted to address all points raised in the Department's letter. To that end, please find MPLX's responses, including references to the application and previous correspondence for items that have already been supplied.

1. The Department asserts that the documentation submitted by MPLX does not demonstrate that the proposed control technology for the Harmon Creek 3 Plant ("**HC3**") meets the applicable Best Available Technology standard. However, the Department fails to explain why MPLX has not met the applicable BAT standard or identify a single deficiency in MPLX's submittal. As the Department is aware, MPLX conducted detailed BAT analyses evaluating the technical and economic feasibility of controlling the HC3 sources with an enclosed combustor. These analyses were conducted by first evaluating the technical feasibility of alternative controls and obtaining quotes from vendors based on equipment that could be utilized at the facility in a safe manner and of the appropriate size. The potential reduction in emissions from an enclosed combustor was calculated and evaluated on a ten-year period to determine the cost per ton of emission reduction. As detailed in the BAT analysis provided to the Department on August 15, 2024, and in the follow-up letter to the Department on October 2, 2024, MPLX determined that an enclosed combustor has a minimal impact on emissions reduction and significant costs, over $400,000 per ton of VOC emissions. Based on the Department's own Comment and Response and Technical Support Documents relating to BAT, the installation of an enclosed combustor is not economically reasonable and accordingly does not meet the Department's BAT standard.

2. MPLX understands that the GP-5 only allows open flares for control of new or modified sources at remote locations and for infrequent operations. However, MPLX submitted a plan approval application for a case-by-case determination as the general permit is not intended to be a "binding-norm" and the BAT analysis provided to the Department on August 15, 2024 demonstrates that the installation of an enclosed combustor for these sources is not economically reasonable. Please see the BAT analysis and follow-up letter provided on October 2, 2024.

   As stated in the Department's Best Available Technology and Other Permitting Criteria (275-2101-007; February 23, 1996) ("BAT-TGD") Section 7.10 (Best Available Technology Criteria for Municipal Residue Landfills), "the requirements set forth in this document are for guidance purposes and are not meant to be a regulation" and "if an applicant proposes technology that is less effective than that specified in this document, then the application for the less effective technology must be accompanied by a feasibility analysis for all of the technologies considered and an economic evaluation of all the feasible technologies." Similar language is included in the GP-5 Technical Support Document (TSD) and while an open flare is not less effective than an enclosed combustor, MPLX has provided documentation that the economic impact of an enclosed combustor is beyond the thresholds listed in the GP-5 TSD.

   The *Best Available Technology Criteria for Municipal Residue Landfills* is not applicable to gas processing plants. The statement that emission streams are similar is vague and is not supported in the referenced document. Moreover, the use of enclosed combustion devices at landfills is not indicative of BAT for a project within the natural gas industry.

   a. MPLX has provided a BAT analysis for recompression with this response. Please find that evaluation in Attachment 1 of this response. The Texas Eastern Transmission, LP Holbrook Station project has gas recompression on their Solar turbines using Solar Turbine's proprietary gas release control technology. The HC3 project is not proposing the use of solar turbines and thus, this specific technology does not apply and has not been demonstrated in use at gas processing plants. Additionally, the 95% emission reduction from blowdowns is less effective than the proposed 98% DRE using the existing open flare.

   b. Energy Transfer Corporation Revolution Cryogenic Gas Processing Facility obtained a GP-5 for their process. MPLX is not familiar with ETC design or site-specific processes and thus, cannot speak to the feasibility or cost-effectiveness of that specific scenario. However, as stated in the Department's GP-5 Comment and Response Document Part 1 finalized in June 2018, "Owners and operators may, at their discretion, opt to undergo a case-by-case determination if these specifications and conditions may not be met for their individual facility." Furthermore, to avoid confusion, the Department clarifies that the GP-5 is not the floor for BAT determinations by stating "The Department disputes the implication that the standardized terms and conditions of a general permit constitute a 'binding norm' as suggested by the commentators. The use of a general plan approval or a general operating permit is not mandatory. An applicant seeking to authorize their facility may opt instead for a case-by-case plan approval, in which they must demonstrate the case-by-case BAT for methane and all other pollutants emitted by sources at the facility." As such, MPLX submitted a plan approval and has submitted the case-by-case analysis for BAT of the new sources.

3. The Department stated that MPLX "failed to include a complete evaluation of project and project emissions aggregation and/or circumvention (25 Pa. Code §127.216) for the process equipment and controls proposed in the subject application with those proposed and/or authorized in GP5-63-01011A, GP1-63-01011A, GP5-63-01011B, and Plan Approval PA-63-01011" and referenced 25 Pa. Code §127.12(a)(2, 4, and 5) as the justification for considering this a technical deficiency. The referenced sections under §127.12 are listed below:

> (2) Contain information that is requested by the Department and is necessary to perform a thorough evaluation of the air contamination aspects of the source.
> (4) Show that the source will comply with applicable requirements of this article and requirements promulgated by the Administrator of the EPA under the Clean Air Act (42 U.S.C.A. § § 7401—7706).
> (5) Show that the emissions from a new source will be the minimum attainable through the use of the best available technology.

Section (5) does not appear to be applicable to the aggregation and/or circumvention request. The plan approval application submitted on January 17, 2024, included all forms required, which do not include aggregation and/or circumvention evaluations, and MPLX has been engaged in bi-weekly meetings with the Department during the permitting process for HC3. At no time, prior to receiving the pre-denial/second technical deficiency letter on November 12, 2024, has the Department indicated a need for or requested additional evaluation on aggregation and/or circumvention.

The *Clean Air Council v. DEP* case, which the Department requested MPLX to evaluate, is a case in which phasing or staging of a project was potentially used to avoid aggregating emissions sources for purposes of determining PSD and NSR applicability. As the Department noted MPLX has applied for and obtained air permits, as required, for the Harmon Creek Gas Plant as the facility has expanded. There is no basis for the Department to assert that MPLX has attempted to circumvent any of the Department's permitting requirements. To the extent the Department is asserting that MPLX should have permitted the facility as a major source from the outset of the development of the site, there is similarly no basis in fact or law for such a position. The timeline of MPLX's permitting activities demonstrates that each plant at the Harmon Creek site is a separate project.

MPLX gathering and processing facilities are designed and constructed in response to producer demand and, thus, are not planned until the need exists. MPLX initially permitted Harmon Creek 1 and 2 under a GP-5 on June 12, 2017 and commenced constructed thereafter. However, due to lack of producer demand, Harmon Creek 2 was not constructed within the time periods required under that permit. Accordingly, once producer demand justified construction of a second plant at the Harmon Creek site, MPLX obtained a separate plan approval for that facility on June 30, 2022. At that point in time, MPLX had no contractual obligation to construct a third plant at the Harmon Creek site nor had one been elected by the producer. It was not until the producer later elected the third plant at the Harmon Creek site, which required execution of significant contract documents to effectuate, that MPLX submitted its permit application for the facility. Under the *Clean Air Council* case, the only factor present here is physical proximity.

MPLX considered all facility emissions when permitting HC3 as a Title V source. However, that does not mean that the development of construction of three separate plants at the site constitutes one "project." As established above, there is no "temporary proximity" as there was in the *Clean Air*

Council case. Nor is there interdependence between the separate plants as there was with the facilities in *Clean Air Council*. Nor was there a common plan regarding construction of the three separate plants. Indeed, as described above, there are no plans to build additional plants unless and until a producer elects to have one constructed, which is outside of MPLX's control. Simply put, there is no basis to assert that MPLX has circumvented any of the Department's permitting requirements under applicable law.

4. The applicability of the Nonattainment New Source Review as given in 25 Pa. Code Chapter §127 Subchapter E pursuant to §127.203(e)(2) states:

> "If a particular source or modification becomes a major facility or major modification **solely** by virtue of a relaxation in an enforcement limitation which was established after August 7, 1980, on the capacity of the source or modification to emit a pollutant including a restriction on hours of operation, the requirements of this subchapter also apply to the source or modification as though construction had not yet commenced on the source or modification."

   With the application for the addition of HC3 and DeEthanizer II, MPLX has not requested the relaxation of enforcement limitations associated with any existing equipment as the Harmon Creek facility. The limitations for all unchanged sources remain the same, or in some instances have decreased as better information has become available. The only increase in emissions comes from new sources which includes additional heaters, additional fugitive emission components, additional compressors with rod-packing emissions and dry-seal vents, additional methanol tanks and additional measurement devices, all of which are required solely for the operation of Harmon Creek III and De-Ethanizer II. Furthermore, the additional emissions from the new processing equipment are below the significant emission increases as defined in 25 Pa. Code Chapter §121.1. Therefore, the requirements of the subchapter do not apply.

5. MPLX contacted the regenerative heater manufacturer to evaluate options to achieve <5 ppmv NOx with flue gas recirculation (FGR). The heater manufacturer has not proven the ability to reach <5 ppmv NOx on process heaters with FGR and would require factory testing before such technology could be offered. However, MPLX evaluated a burner option to reach lower NOx levels in the BAT analysis provided in Attachment 2 of this response. Based on the significant cost associated with minimal emission reductions equating to $199,523/ton NOx, MPLX is proposing the use of FGR to achieve 9 ppmv NOx.

6. Please find the manufacturer specifications for the existing process flare in Attachment 3 of this response. As calculated based on flare design information, the minimum flow is 39.27 scfm and the maximum flow is 364,511 scfm. The minimum heat input is 2.167 MMBtu/hr and the maximum heat input is 25,200 MMBtu/hr.

7. The "Estimated Potential Blowdowns (Controlled by Flare)" list has been updated, in Attachment 4, to include an approximate total elapsed time for blowdowns, the mass emission rate, and the volumetric emission rate. Please note that the elapsed time and emission rates vary based on the equipment size and operating parameters. The equipment blowdown times provided are based on typical durations observed by facility personnel.

Please find the operating guideline for equipment blowdowns in Attachment 5. Consistent with good air pollution practices, emissions from blowdowns are controlled by the process flare rather than routed to the atmosphere.

8. The PFD has been updated to include the compressors requested by the Department and can be found in Attachment 6 of this response. To simplify the PFD, information regarding the location in which blowdowns and venting are routed has been included separately. Please refer to the "Estimated Potential Blowdowns (Controlled by Flare)" list, in Attachment 4, which has been updated to indicate the plant location of each compressor and if maintenance blowdowns and compressor rod packing/dry seal venting are routed to the flare or atmosphere.

9. Regarding the request for a copy of the API Standard 537, as MPLX previously stated, the standard could not be distributed to the Department due to licensing restrictions. MPLX offered to review the API 537 Standard with the Department and can bring a copy to the face-to-face meeting in December to allow the opportunity to review siting requirements in the standard. The Department's need for access to specific standards, which it can obtain itself, should not be considered a technical deficiency of an application. Nevertheless, MPLX is providing the summary below relating to flare siting standards for the proposed project.

   MPLX is proposing to utilize the existing process flare as part of the HC3 plan approval application. As a result, there are no specific applications of the API 537 Standard related to the HC3 plan approval application. Generally, the only applications of the API 537 Standard for siting a flare are related to Thermal Radiation Shielding Considerations per Section D.1.4 and System design per Section 4.2. MPLX typically does not use shielding, and MPLX follows the spacing and design guidelines in API 521 which are referenced by these sections. Referencing API 521, Section 5.7.2.1 discusses the effect of thermal radiation on human skin which is considered into the design and siting of our flares. In accordance with API 521, MPLX sites its flares to minimize the effects of thermal radiation on both our personnel and the general public via spacing and restricted access. This requires the flare to be certain specified distances from other plant equipment and from adjacent property owners/structures. Access to the area around the flare is controlled/restricted via signage warning of the potential thermal radiation hazard along with physical controls, such as fencing, and administrative controls.

10. The assertion that additional property would be needed was based on the previous Harmon Creek 2 plan approval application BAT analysis, evaluating the installation of multiple enclosed combustion devices per the Department's request. The Flare BAT analysis for HC3 included a detailed write-up of the land use challenges associated with the installation of an enclosed combustor. Please review the written statements regarding land use in the second paragraph on page 1 of the Harmon Creek 3 Flare BAT analysis provided to the Department on August 15th, 2024. The analysis has been provided again in the compiled application/responses on page 223/279.

11. Please find the emission estimates for the closed drain and amine closed drain tanks in Attachment 7 of this response. The supporting data, assumptions including throughputs and basis for composition estimates, and calculation methodologies to establish the estimates are included in the notes of the calculation tables.

12. There is one reciprocating compressor which is in CO2 service proposed for this project. As detailed in the application, VOC and methane emissions are negligible. However, the potential emissions were included in the application. The SCFH emission rate provided in the application was calculated based on the number of throws per compressor. The application conservatively assumed four throws, which equates to 480 SCFH. However, there are only two throws on this unit and each throw will be subject to the NSPS OOOOb compliance rate of 2 SCFM, which equates to 240 SCFH, whether manifolded or individually vented. The two rod packing vents are anticipated to be manifolded.

13. The previous BAT analysis was specific to the HC2 application as the technologies between the two projects had not changed at the time. As stated in the technical deficiency response sent to the Department on June 27, 2024, the BAT analysis for compressors and measurement device venting was corrected to be specific to the HC3 project. Please refer to the Compressor and Measurement Venting BAT Analysis provided to the Department on July 26, 2024 and included on page 217/279 of the compiled application/responses, which lists one reciprocating compressor, in the first sentence of the section titled *Reciprocating Compressor Rod Packing Vents,* and two residue centrifugal compressors and one regenerative centrifugal compressor, in the section titled *Centrifugal Compressor Dry Seal Vents*.

14. The screw compressors were accounted for in the plan approval application submitted on January 19, 2024. Each screw compressor is accounted for in the Estimated Potential Blowdowns (Controlled by Flare) table on page 99/132 and under the Fugitive Emissions table on page 101/132 of the initial plan approval application, and provided again on pages 101/279 and 103/279, respectively in the compiled response document. Additionally, in the regulatory review provided on page 112/132 of the initial plan approval application and again on page 114/279 of the compiled response document, MPLX states that the process unit equipment for HC3 will be subject to the NSPS OOOOb requirements. Finally, MPLX provided supporting documentation in the plan approval application for fugitive components and the Harmon Creek LDAR practices. Please find those details starting on page 126/132 of the initial application and provided again on page 128/279 in the compiled response document. Additional Fugitive Component BAT analysis has been provided in Attachment 2 of this response.

15. Please see the estimated volumes calculated from sources routed to flare listed below:

Source	Estimated Annual Volume (SCF)
Pigging	1,499,696
Blowdowns	415,522
Plant Shutdown	23,040,960
PSVs	2,438,456
Dry Seal Vents	529,627
Loadout	37,993
Closed Drain	11,428,105
Amine Closed Drain	583,890
Pilot and Sweep Gas	26,518,272
Total	**66,492,521**

Based on records and confirmation from facility operations personnel, MPLX expects flare volumes to remain consistent with current operations for the existing equipment ranging between 30.87 and 35.72 mmscf/yr. To account for the proposed equipment, the volume routed to the flare is conservatively doubled which results in an estimated 61.75 to 71.44 mmscf/yr. As such, MPLX is proposing to maintain the annual flare volume limit of 126.52 mmscf.

16. Harmon Creek has been complying with NSPS OOOOa requirements for process unit equipment since 2020 and has been submitting OOOOa reports to the US EPA as required. The construction of Harmon Creek 2 triggered a modification under NSPS OOOOb applicability for process unit equipment. As required, MPLX submitted an NSPS OOOOb report for the Harmon Creek process unit equipment in July 2024 to the US EPA. Additionally, there are no OOOOa sources being modified as part of this project that have not already been identified as OOOOb-applicable sources.

17. The plan approval application for the closed drains tanks included a throughput increase of 80,000 gallons per year, taking the previously permitted flow rate from 220,000 gallons per year to 300,000 gallons per year. The estimated potential emissions associated with the closed drain tanks are included, as requested, in response to #11 above. Finally, the closed drain tanks are a storage vessel affected facility subject to the NSPS OOOOb standards.

As requested, MPLX is also providing a PDF of all responses to the second technical deficiency letter, responses to the first technical deficiency letter, and the initial application in a compiled package.

MPLX appreciates the work of agency personnel thus far on the HC3 permit application. To that point, MPLX and the Department have met informally and frequently to work through the technical portions of the application. MPLX recently requested an additional face-to-face meeting with the Department (SWRO and Central) to further address details pertinent to this project. MPLX is appreciative of the Department's willingness to schedule the meeting on December 4th in Harrisburg and looks forward to this discussion.

Sincerely,

Alexandra M. Juarez
Environmental Engineer
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Enclosure(s)

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Attachment 1

Vapor Recovery BAT Analysis

Best Available Technology Review

Existing Process Flare and Vapor Recovery Options

MarkWest Liberty Midstream and Resources, L.L.C., a fully owned subsidy of MPLX, hereinafter referred to as MPLX, is seeking authorization to construct and operate the Harmon Creek 3 Cryo (HC3) and a second de-ethanizer (De-Eth 2). During maintenance and emergency situations, MPLX will require the blowdown of equipment associated with HC3 and De-Eth 2. MPLX plans to route such vapors to the existing process flare. The most recent version of the GP-5 excludes the use of open flares, and therefore MPLX submitted a plan approval application seeking authorization to control HC3 with the existing process flare.

Vapor Recovery

As requested, MPLX evaluated the technical and economic feasibility for vapor recovery of sources from HC3 that are proposed to be controlled by the existing process flare.

Vapors from plant shutdowns and PSV lifts cannot be captured by a vapor recovery unit (VRU) due to high flow rates. All other sources routed to the existing flare, as listed in Table 2, have been evaluated for vapor recovery as a control option. For this evaluation, the VRU would be designed to capture 100% of the vapors while operating. However, the VRU would require downtime for maintenance and would operate for 85% of the year. During the period in which the VRU would be down, this evaluation assumes the vapors would be routed to the existing flare for a 98% DRE.

As shown in Table 2, the emission reduction between using the existing flare for HC3 sources and installing a vapor recovery unit is 2.12 tpy VOC. Based on the quoted cost for a vapor recovery unit, installation, and annual operating and maintenance costs, the ten-year cost per ton reduction of VOC would be approximately $622,162. MPLX would like to note, that if the VRU did not require maintenance downtime and was capable of capturing all emissions. The ten-year cost per ton reduction of VOC, based on 2.49 tpy, would be approximately $529,463.

Table 2. Potential emissions from HC3 are shown as controlled by the existing flare versus a vapor recovery unit.

	HC3 VOC Emissions (tpy)	
Source	Existing Flare	VRU
Pigging	0.10	0.01
Maintenance Blowdowns	0.03	0.00
Dry Seal Vents	1.40	0.21
Loadout Operations	0.29	0.04
Closed Drain Tank	0.68	0.10
Amine Closed Drain	0.00	0.00
Total	**2.49**	**0.37**

Due to the significant cost associated with a vapor recovery unit sized for this project, MPLX has determined that installing a VRU at the facility is not economically reasonable. Thus, MPLX proposes the use of the existing flare at the facility as BAT for this project.

Cost Estimate for
Vapor Recovery Unit

TOTAL CONSTRUCTION COST

AREA	COST
PIPING	$1,055,700.00
ELECTRICAL/INSTRUMENTATION	$491,300.00
CIVIL	$384,930.00
STRUCTURAL	$142,025.00
INDIRECTS AND OVERHEAD	$248,874.60
TOTAL COST	**$2,322,829.60**
Mob/Demob	$20,000.00
Equipment	$2,575,498.00
Enclosed Ground Flare	$1,500,000.00
Measurement	$350,000.00
Instrumentation	$100,000.00
Valves	$80,000.00
MCC	$80,000.00
GC Building	$465,498.00
Engineering	$200,000.00
Commissioning and Startup	$70,000.00
Contingency	$778,249.14
TOTAL	**$5,966,576.74**

Vapor Recovery BAT Cost Information

Year	MPLX Cost of Capital	Capital	Annual Operating	Annual Total	Annual Total with Cost of Capital
2025	8.96%	$ 5,966,577	$ 350,000	$ 6,316,577	$ 6,882,542
2026	8.96%	$ -	$ 350,000	$ 350,000	$ 415,530
2027	8.96%	$ -	$ 350,000	$ 350,000	$ 452,761
2028	8.96%	$ -	$ 350,000	$ 350,000	$ 493,329
2029	8.96%	$ -	$ 350,000	$ 350,000	$ 537,531
2030	8.96%	$ -	$ 350,000	$ 350,000	$ 585,694
2031	8.96%	$ -	$ 350,000	$ 350,000	$ 638,172
2032	8.96%	$ -	$ 350,000	$ 350,000	$ 695,352
2033	8.96%	$ -	$ 350,000	$ 350,000	$ 757,656
2034	8.96%	$ -	$ 350,000	$ 350,000	$ 825,542
2035	8.96%	$ -	$ 350,000	$ 350,000	$ 899,510
				Ten-Year Total	$ 13,183,618
				Tons Reduced Over Ten Years	24.90
				Ten-Year Cost/Ton Reduction	$ 529,463

Attachment 2

BAT Analysis for
Fugitive Emissions and the Regenerative Heater

Best Available Technology Review

Fugitive Components

The following control technologies were considered as part of the case-by-case analysis for fugitive components associated with all component groups, including compressors:

- Thermal Oxidation (TO)
- Regenerative Thermal Oxidation (RTO)
- Thermal Catalytic Oxidation (TCO)
- Carbon Adsorption
- Condensation
- Work Practice requirements

Thermal Oxidation (TO) and Regenerative Thermal Oxidation (RTO)

Thermal oxidation refers to the complete gas-phase combustion of VOCs to carbon dioxide and water vapor. Oxidation is achieved by heating the VOC exhaust in the presence of oxygen. Supplemental fuel (natural gas) is required to maintain combustion conditions. The destruction efficiency of thermal oxidation is typically 95% or greater with a combustion temperature of 1500 deg F and a retention time of 1.0 second. This is also dependent upon the quantity of VOC in the gas stream. For low-concentration VOC streams, a lower destruction efficiency can be expected. Thermal oxidation can be accomplished with or without heat recovery. Because these sources are throughout the plant, ductwork would have to be installed over every fugitive component. The installation of ductwork over every component is not technically feasible, and we have dismissed this option. There are no similar sources that are controlled in this manner.

Thermal Catalytic Oxidation (TCO)

Catalytic oxidation refers to complete combustion of VOCs to carbon dioxide and water through the use of an oxidation catalyst. Catalytic oxidation occurs at lower temperatures typically between 650 deg and 800 deg F. As with thermal oxidation, supplemental fuels (natural gas) is needed with dilute gas streams. Destruction efficiencies of 95% are typical. The catalyst slowly degrades over time and must be replaced on a periodic basis. Because these sources are throughout the plant, ductwork would have to be installed over every fugitive component. The installation of ductwork over every component is not technically feasible, and we have dismissed this option. There are no similar sources that are controlled in this manner.

Condensation

VOCs can be removed in the condensation process. This technology has been used in some cases to control high VOC concentration gas streams. In fact, in certain areas of the plant, where there are very low temperatures the gas is in liquid form. In gas streams consisting of a single VOC and no non-condensable gas, condensation occurs isothermally, or at a constant temperature. In gas streams consisting of non-condensables or VOCs with varied volatilities, condensation occurs along a temperature change. However, to achieve condensation of the vapor, ductwork would be required to capture the vented vapor from every component and vessels for the condensation process would be required. As stated earlier, the installation of ductwork over every fugitive component is not technically feasible and condensation is not an option for these sources. There are no similar sources that are controlled in this manner.

Adsorption

VOCs can be removed using carbon or zeolites as adsorbents. However, these sources are throughout the plant and ductwork would be required over every fugitive component. Installing ductwork over every component within the facility is not technically feasible, and this option has been dismissed. There are no similar sources that are controlled in this manner.

Work Practice

The facility will be subject to the Equipment Leak Standard in 40 CFR Part 60 Subpart OOOOb (Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution in accordance with the provisions in 60.5400b. Additionally, as a best management practice, new PORVs installed at the facility are equipped with bottom dome piping, new and replacement valves are low-emission valves.

Conclusion

Best Available Technology shall be to operate using good air pollution practices and to conduct a Leak Detection and Repair (LDAR) program as recommended in 40 CFR Part 60 Subpart OOOOb and continue to follow MPLX's best management practices.

Regenerative Heater

Based on a search in the RACT/BACT/LAER Clearinghouse (RBLC), the lowest value for NOx emissions for process heaters is 9 ppmv NOx. Additionally, in November 2022, the Department determined that the 9 ppmv NOx was BAT for the Harmon Creek 2 regenerative heater based on the GP-1 for the operation of combustion units. Thus, MPLX is proposing the same level of control through flue gas recirculation on the HC3 regenerative heater.

However, in response to the Department's request, MPLX contacted two vendors to evaluate options. One vendor does not have the technology available to reach <5ppmv NOx using flue gas recirculation without requiring factory testing. The second vendor has proven technology to reach <5 ppmv NOx and provided a quote to MPLX for BAT cost analysis purposes.

As detailed in Table 1, the capital cost for the equipment and installation is approximately $755,000 and the annual operating and maintenance costs are approximately $5,000 per blower, with two blowers required. The emission reduction for this heater is 0.508 tpy NOx. Thus, the cost-per-ton reduction over a 10-year period is approximately $199,523.

In February 2022, the Department's SWRO reviewed a BAT analysis for the combustion of natural gas in a turbine which included the evaluation of an emission reduction from 15 ppmv NOx to 9 ppmv NOx. The Department made the determination that the cost to reduce emissions from 15 ppmv NOx to 9 ppmv NOx was not economically feasible due to the high removal cost of $12,858 to $16,351/ton NOx removed. The cost to reduce combustion emissions from 9 ppmv to <5 ppmv is more than ten times the cost that was determined infeasible to reach 9 ppmv.

Thus, considering the high cost and the low reduction in emissions, MPLX is proposing flue gas recirculation on the regenerative heater to achieve 9 ppmv NOx as BAT.

Table 1. Cost information supporting regenerative heater BAT analysis.

Year	MPLX Cost of Capital	Capital	Annual Operating	Annual Total	Annual Total with Cost of Capital
2025	8.96%	$755,000	$10,000	$765,000	$833,544
2026	8.96%	-	$10,000	$10,000	$11,872
2027	8.96%	-	$10,000	$10,000	$12,936
2028	8.96%	-	$10,000	$10,000	$14,095
2029	8.96%	-	$10,000	$10,000	$15,358
2030	8.96%	-	$10,000	$10,000	$16,734
2031	8.96%	-	$10,000	$10,000	$18,233
2032	8.96%	-	$10,000	$10,000	$19,867
2033	8.96%	-	$10,000	$10,000	$21,647
2034	8.96%	-	$10,000	$10,000	$23,587
2035	8.96%	-	$10,000	$10,000	$25,700
				Ten-Year Total	$1,013,575
				Tons Reduced in Ten Years	5.08
				Cost/Ton Reduction	$199,523

Attachment 3
Flare Specifications

Provided in a separate document with a confidentiality request

Attachment 4

Updated Estimated Potential Blowdowns Table

MarkWest Liberty Midstream & Resources, L.L.C.
Harmon Creek Gas Plant

Estimated Potential Blowdowns (Controlled by Flare)

Compressor	Location	Description	Rated HP[a]	Blowdown frequency per year	Est. Elapsed Time (mins)[f]	Mass Emission Rate (lb/hr)	Volumetric Flowrate (scfm)	Operating pressure (PSIG)	Volume Gas or Liquid (ft^3)	Product	Z-factor	MW	Volume Routed to Flare (scf)	Mass Routed to Flare (lb)	VOC Wt%	VOC Emissions (lbs)	HAP wt%	HAP Emissions (lbs)	Methane wt%	Methane Emissions (lbs)	CO2 wt%	CO2 Emissions (lbs)	Blowdowns to Flare or Atmosphere	Compressor Packing or Dry Seal Vents
C-1111	Cryo-1	Regen Centrifugal	150	6	15	162.8	48.6	1,100.00	20	Inlet	0.71	21.17	730	41	23.886%	9.724	0.409%	0.166	77.010%	31.352	0.212%	8.626%	Flare	Flare
C-2111	Cryo-2	Regen Centrifugal	150	6	15	162.8	48.6	1,100.00	20	Inlet	0.71	21.17	730	41	23.886%	9.724	0.409%	0.166	77.010%	31.352	0.212%	8.626%	Flare	Flare
C-1121	Cryo-1	Centrifugal w/ no drive	19700	6	30	1856.9	714.9	400.00	2681	Residue	0.95	17.04	21446	928	0.109%	1.013	0.000%	0.000	95.123%	883.156	0.528%	489.990%	Flare	No Vents
C-2121	Cryo-2	Centrifugal w/ no drive	19700	6	30	1856.9	714.9	400.00	2681	Residue	0.95	17.04	21446	928	0.109%	1.013	0.000%	0.000	95.123%	0.000	0.528%	0.000%	Flare	No Vents
C-1151	Cryo-1	Recip	5000	6	20	125.7	48.4	385.00	125.5	Residue	0.95	17.04	968	42	0.109%	0.046	0.000%	0.000	95.123%	39.848	0.528%	22.108%	Flare	Atmosphere
				6	20	305.5	117.6	705.00	162.3	Residue	0.91	17.04	2352	102	0.109%	0.111	0.000%	0.000	95.123%	96.868	0.528%	53.744%	Flare	Atmosphere
				6	20	206.1	79.3	1,210.00	60.8	Residue	0.86	17.04	1587	69	0.109%	0.075	0.000%	0.000	95.123%	96.868	0.528%	53.744%	Flare	Atmosphere
C-1152	Cryo-1	Recip	5000	6	20	125.7	48.4	385.00	125.5	Residue	0.95	17.04	968	42	0.109%	0.046	0.000%	0.000	95.123%	96.868	0.528%	53.744%	Flare	Atmosphere
				6	20	305.5	117.6	705.00	162.3	Residue	0.91	17.04	2352	102	0.109%	0.111	0.000%	0.000	95.123%	96.868	0.528%	53.744%	Flare	Atmosphere
				6	20	206.1	79.3	1,210.00	60.8	Residue	0.86	17.04	1587	69	0.109%	0.075	0.000%	0.000	95.123%	96.868	0.528%	53.744%	Flare	Atmosphere
C-1153	Cryo-1	Recip	5000	6	20	125.7	48.4	385.00	125.5	Residue	0.95	17.04	968	42	0.109%	0.046	0.000%	0.000	95.123%	96.868	0.528%	53.744%	Flare	Atmosphere
				6	20	305.5	117.6	705.00	162.3	Residue	0.91	17.04	2352	102	0.109%	0.111	0.000%	0.000	95.123%	96.868	0.528%	53.744%	Flare	Atmosphere
				6	20	206.1	79.3	1,210.00	60.8	Residue	0.86	17.04	1587	69	0.109%	0.075	0.000%	0.000	95.123%	96.868	0.528%	53.744%	Flare	Atmosphere
C-1154	Cryo-1	Recip	5000	6	20	125.7	48.4	385.00	125.5	Residue	0.95	17.04	968	42	0.109%	0.046	0.000%	0.000	95.123%	96.868	0.528%	53.744%	Flare	Atmosphere
				6	20	305.5	117.6	705.00	162.3	Residue	0.91	17.04	2352	102	0.109%	0.111	0.000%	0.000	95.123%	96.868	0.528%	53.744%	Flare	Atmosphere
				6	20	206.1	79.3	1,210.00	60.8	Residue	0.86	17.04	1587	69	0.109%	0.075	0.000%	0.000	95.123%	96.868	0.528%	53.744%	Flare	Atmosphere
C-2151	Cryo-2	Recip	5000	6	20	125.7	48.4	385.00	125.5	Residue	0.95	17.04	968	42	0.109%	0.046	0.000%	0.000	95.123%	39.848	0.528%	22.108%	Flare	Atmosphere
				6	20	305.5	117.6	705.00	162.3	Residue	0.91	17.04	2352	102	0.109%	0.111	0.000%	0.000	95.123%	96.868	0.528%	53.744%	Flare	Atmosphere
				6	20	206.1	79.3	1,210.00	60.8	Residue	0.86	17.04	1587	69	0.109%	0.075	0.000%	0.000	95.123%	96.868	0.528%	53.744%	Flare	Atmosphere
C-2152	Cryo-2	Recip	5000	6	20	125.7	48.4	385.00	125.5	Residue	0.95	17.04	968	42	0.109%	0.046	0.000%	0.000	95.123%	39.848	0.528%	22.108%	Flare	Atmosphere
				6	20	305.5	117.6	705.00	162.3	Residue	0.91	17.04	2352	102	0.109%	0.111	0.000%	0.000	95.123%	96.868	0.528%	53.744%	Flare	Atmosphere
				6	20	206.1	79.3	1,210.00	60.8	Residue	0.86	17.04	1587	69	0.109%	0.075	0.000%	0.000	95.123%	96.868	0.528%	53.744%	Flare	Atmosphere
C-2153	Cryo-2	Recip	5000	6	20	125.7	48.4	385.00	125.5	Residue	0.95	17.04	968	42	0.109%	0.046	0.000%	0.000	95.123%	39.848	0.528%	22.108%	Flare	Atmosphere
				6	20	305.5	117.6	705.00	162.3	Residue	0.91	17.04	2352	102	0.109%	0.111	0.000%	0.000	95.123%	96.868	0.528%	53.744%	Flare	Atmosphere
				6	20	206.1	79.3	1,210.00	60.8	Residue	0.86	17.04	1587	69	0.109%	0.075	0.000%	0.000	95.123%	96.868	0.528%	53.744%	Flare	Atmosphere
C-1179	Deeth-1	Centirfugal	100	6	15	121.2	26.2	495.00	14	Ethane	0.57	30.07	394	30	0.001%	0.000	0.001%	0.000	0.000%	0.000	0.001%	0.030%	Flare	Flare
C-1140	Cro-1	Screw	1500	6	20	446.9	65.3	297.00	204	Propane	0.84	16.04	1307	149	100.000%	148.971	0.001%	0.001	0.000%	0.000	0.000%	0.000%	Flare	No Vents
C-1141	Cro-1	Screw	1500	6	20	446.9	65.3	297.00	204	Propane	0.84	16.04	1307	149	100.000%	148.971	0.001%	0.001	0.000%	0.000	0.000%	0.000%	Flare	No Vents
C-1142	Cro-1	Screw	1500	6	20	446.9	65.3	297.00	204	Propane	0.84	16.04	1307	149	100.000%	148.971	0.001%	0.001	0.000%	0.000	0.000%	0.000%	Flare	No Vents
C-1155	Deeth-1	Screw	1500	6	20	446.9	65.3	297.00	204	Propane	0.84	16.04	1307	149	100.000%	148.971	0.001%	0.001	0.000%	0.000	0.000%	0.000%	Flare	No Vents
C-1156	Deeth-1	Screw	1500	6	20	446.9	65.3	297.00	204	Propane	0.84	16.04	1307	149	100.000%	148.971	0.001%	0.001	0.000%	0.000	0.000%	0.000%	Flare	No Vents
C-1157	Deeth-1	Screw	1500	6	20	446.9	65.3	297.00	204	Propane	0.84	16.04	1307	149	100.000%	148.971	0.001%	0.001	0.000%	0.000	0.000%	0.000%	Flare	No Vents
C-2141	Cro-2	Screw	1500	6	20	446.9	65.3	297.00	204	Propane	0.84	16.04	1307	149	100.000%	148.971	0.001%	0.001	0.000%	0.000	0.000%	0.000%	Flare	No Vents
C-2142	Cro-2	Screw	1500	6	20	446.9	65.3	297.00	204	Propane	0.84	16.04	1307	149	100.000%	148.971	0.001%	0.001	0.000%	0.000	0.000%	0.000%	Flare	No Vents
C-2140	Cro-2	Screw	1500	6	20	446.9	65.3	297.00	204	Propane	0.84	16.04	1307	149	100.000%	148.971	0.001%	0.001	0.000%	0.000	0.000%	0.000%	Flare	No Vents
C-1191	Stabilzer	Recip	900	6	20	197.0	58.9	285.00	122	Inlet	0.71	21.17	1177	66	23.886%	15.687	0.409%	0.268	77.010%	50.577	0.212%	13.915%	Flare	Atmosphere
				6	20	741.1	221.4	1,117.00	122	Inlet	0.71	21.17	4428	247	23.886%	59.006	0.409%	0.268	77.010%	50.577	0.212%	13.915%	Flare	Atmosphere
C-1192	Stabilzer	Recip	900	6	20	196.3	58.6	285.00	122	Inlet	0.71	21.17	1173	65	23.886%	15.626	0.409%	0.268	77.010%	50.577	0.212%	13.915%	Flare	Atmosphere
				6	20	741.1	221.4	1,117.00	122	Inlet	0.71	21.17	4428	247	23.886%	59.006	0.409%	0.268	77.010%	50.577	0.212%	13.915%	Flare	Atmosphere
C-0501	OSBL	Recip	75	6	15	9.3	1.3	25.00	10	CO2	0.94	43.57	20	2	0.001%	0.000	0.001%	0.000	0.000%	0.000	100.00%	231.876%	Flare	Atmosphere
				6	15	12.5	1.8	40.00	10	CO2	0.94	43.57	27	3	0.001%	0.000	0.001%	0.000	0.000%	0.000	100.00%	231.876%	Flare	Atmosphere
				6	15	51.4	7.5	210.00	10	CO2	0.94	43.57	112	13	0.001%	0.000	0.001%	0.000	0.000%	0.000	100.00%	231.876%	Flare	Atmosphere
				6	15	99.5	14.4	420.00	10	CO2	0.94	43.57	217	25	0.001%	0.000	0.001%	0.000	0.000%	0.000	100.00%	231.876%	Flare	Atmosphere
TBD	OSBL	Recip	75	6	15	9.3	1.3	25.00	10	CO2	0.94	43.57	20	2	0.001%	0.000	0.001%	0.000	0.000%	0.000	100.00%	231.876%	Flare	Atmosphere
				6	15	12.5	1.8	40.00	10	CO2	0.94	43.57	27	3	0.001%	0.000	0.001%	0.000	0.000%	0.000	100.00%	231.876%	Flare	Atmosphere
				6	15	51.4	7.5	210.00	10	CO2	0.94	43.57	112	13	0.001%	0.000	0.001%	0.000	0.000%	0.000	100.00%	231.876%	Flare	Atmosphere
				6	15	99.5	14.4	420.00	10	CO2	0.94	43.57	217	25	0.001%	0.000	0.001%	0.000	0.000%	0.000	100.00%	231.876%	Flare	Atmosphere
TBD	Cryo-3	Centrifugal	150	6	15	162.8	48.6	1,100.00	20	Regen/Inlet	0.71	21.17	730	41	23.886%	9.724	0.409%	0.166	77.010%	31.352	0.212%	8.626%	Flare	Flare
TBD	Deeth-2	Centirfugal	100	6	15	121.2	26.2	495.00	14	Ethane	0.57	30.07	394	30	0.001%	0.000	0.001%	0.000	0.000%	0.000	0.001%	0.030%	Flare	Flare
TBD	Cryo-3	Screw	2250	6	20	670.4	98.0	297.00	306	Propane	0.84	16.04	1960	223	100.000%	223.457	0.001%	0.001	0.000%	0.000	0.000%	0.000%	Flare	No Vents
TBD	Cryo-3	Screw	2250	6	20	670.4	98.0	297.00	306	Propane	0.84	16.04	1960	223	100.000%	223.457	0.001%	0.001	0.000%	0.000	0.000%	0.000%	Flare	No Vents
TBD	Cryo-3	Screw	2250	6	20	670.4	98.0	297.00	306	Propane	0.84	16.04	1960	223	100.000%	223.457	0.001%	0.001	0.000%	0.000	0.000%	0.000%	Flare	No Vents
TBD	Deeth-2	Screw	3500	6	20	1042.8	152.5	297.00	476	Propane	0.84	16.04	3049	348	100.000%	347.600	0.001%	0.001	0.000%	0.000	0.000%	0.000%	Flare	No Vents
TBD	Deeth-2	Screw	3500	6	20	1042.8	152.5	297.00	476	Propane	0.84	16.04	3049	348	100.000%	347.600	0.001%	0.001	0.000%	0.000	0.000%	0.000%	Flare	No Vents
TBD	Deeth-2	Screw	3500	6	20	1042.8	152.5	297.00	476	Propane	0.84	16.04	3049	348	100.000%	347.600	0.001%	0.001	0.000%	0.000	0.000%	0.000%	Flare	No Vents
TBD	Cryo-3	Centrifugal	20000	6	30	83.8	32.3	385.00	125.5	Residue	0.95	17.04	968	42	0.109%	0.046	0.000%	0.000	95.123%	39.848	0.528%	22.108%	Flare	No Vents
				6	30	203.7	78.4	705.00	162.3	Residue	0.91	17.04	2352	102	0.109%	0.111	0.000%	0.000	95.123%	96.868	0.528%	53.744%	Flare	No Vents
				6	30	137.4	52.9	1,210.00	60.8	Residue	0.86	17.04	1587	69	0.109%	0.075	0.000%	0.000	95.123%	96.868	0.528%	53.744%	Flare	No Vents
TBD	Cryo-3	Centrifugal	20000	6	30	83.8	32.3	385.00	125.5	Residue	0.95	17.04	968	42	0.109%	0.046	0.000%	0.000	95.123%	39.848	0.528%	22.108%	Flare	No Vents
				6	30	203.7	78.4	705.00	162.3	Residue	0.91	17.04	2352	102	0.109%	0.111	0.000%	0.000	95.123%	96.868	0.528%	53.744%	Flare	No Vents
				6	30	137.4	52.9	1,210.00	60.8	Residue	0.86	17.04	1587	69	0.109%	0.075	0.000%	0.000	95.123%	96.868	0.528%	53.744%	Flare	No Vents
TBD	Cryo-3	Centrifugal w/ no drive	19700	6	30	63.5	24.5	1,210.00	60.8	Residue	1.86	17.04	734	32	0.109%	0.035	0.000%	0.000	95.123%	96.868	0.528%	53.744%	Flare	No Vents
--	Various	Misc. Maintenance Activities	--	64	Varies	--	--	1,200.00	500	Inlet	0.71	21.17	207761	11591	23.886%	2768.661	0.409%	47.387	77.010%	8926.448	0.212%	2455.953%	Flare	--
--	Plant	Plant Shutdown	--	1	120-480	80,343-321,372	24,001-96,004	--	--	Inlet	0.71	21.17	11520480	642744	23.886%	153523.978	0.409%	2627.624	77.010%	494977.093	0.212%	##########	Flare	--
											Total Volume to Flare		23,715,500		Total (lbs)	319058.39		2676.607		507453.244		1423.817		
														Potential	Controlled (lbs)	6381.17		53.53		10149.06		28.48		
															Controlled (tpy)	3.19		0.03		5.07		0.01		

[a] Maintenance blowdown frequencies and volumes listed are estimates and may vary. Maintenance blowdown emissions are controlled by the flare and accounted for in the flare emissions section.
[b] Volumes of compressors based on engineering estimates or calculated using CATG3612 at 483.1 acf and scaled to horsepower from 3550.
[c] Miscellaneous maintenance activities, such as filter change outs, are included for conservatism.
[d] The plant shutdown volume is based on estimates from actual flare meter data and a conservative factor of 3 is applied to the volume to account for HC2 and HC3.
[e] A factor of 2.0 is applied to the total blowdown volume to flare for conservatism.
[f] The elapsed time for each blowdown will vary based on equipment size and operating parameters.The elapsed times and mass and volumetric flowrates provided are estimates based on typical blowdown times for each unit.

Calculation Methodology

Emissions (lbs) = ((Operating P (PSIG) + Standard P (14.7 PSIG)) x Volume x MW) / (R (1545 ft lb/lb-mol R) x Standard Temp (60 F) x Z-Factor) x Pollutant wt% x # Events x Control Efficiency (1-98%)

Attachment 5

Operating Guideline for Blowdowns

Procedure Risk Category:	Procedure Risk Ranking:	Procedure Category:
Low	1.2.1	Normal Operations

PROCEDURE APPROVALS:

Note: Signature indicates that the Procedure Review process outlined in the Operating Procedure Standard (OPS-STD-003) has been completed and all action items resolved. Operations Supervisor/Manager has signed and issued approval for implementation and authorization for use.

Operations Supervisor/Manager	11-19-24 Date
Operations Specialist	11/19/2024 Date
Operator	11/19/2024 Date

1 PURPOSE

1.1 This Procedure provides guidance on depressurizing and de-inventorying stored hydrocarbon energy during Energy Isolation for all applicable MPLX G&P equipment in preparation for invasive work.

2 SCOPE

2.1 **Initial Condition:** Equipment has been shut down but remains pressurized or inventoried.

2.2 **Final Condition:** Equipment has been isolated per the Energy Isolation standard and depressurized / de-inventoried in preparation for invasive work.

3 PRE-CAUTIONS

3.1 Health and Safety Precautions

3.1.1 Minimum Personal Protective Equipment (PPE) is covered by the Personal Protective Equipment Standard, SAF-STD-0001. General Personal Protective Equipment (PPE) requirements are covered by training.

3.1.2 Natural Gas Liquids (NGL) / Liquefied Petroleum Gases (LPG) are extremely flammable. Keep away from heat, sparks, and open flame. Forms explosive mixtures with air. Based on type of hydrocarbon, some NGL may initially be heavier than air and spread along ground and will settle into low lying areas. Vapors may cause dizziness or asphyxiation without warning. Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite. Do not depend on odor as warning of dangerous air concentrations. Avoid exposure to liquid or cryogenic gas vapor. Refer to SDS for proper PPE and additional information.

4 REFERENCES

4.1 SAF-STD-0014, Energy Isolation Standard

4.2 ASME B31.3, B31.3 ASME Process Piping Code Design

4.3 SP-50-14, Rubber and Corrugated Metal Hoses

5 DEFINITIONS

5.1 Control Device:

A device used to control emissions to the atmosphere. This could include Flares, VRUs, Enclosed Flares, Thermal Oxidizers and Combustors if applicable.

5.2 Closed Vent System:

Any system that goes to a control device. This could start but is not limited to PSVs, Reciprocal Compressor Rod Packing or Centrifugal Compressor Dry Seal Vents. The system ends at the control device.

5.3 P&IDs

Piping and Instrumentation Diagrams

6 PRE-MAINTENANCE ACTIVITIES

6.1 N/A

7 PROCEDURE

7.1 Isolation

_____/_____ 7.1.1 Plant Operator: **Utilize** Plant P&IDs to identify isolation points for the equipment to be deenergized and de-inventoried.

_____/_____ 7.1.2 Plant Operator: **Ensure** equipment is shutdown and ready per console operator's guidance for energy isolation.

_____/_____ 7.1.3 Plant Operator: **Ensure** I&E has deenergized and locked breakers for power supply to equipment if applicable.

_____/_____ 7.1.4 Plant Operator: **Close and lock** all block valves necessary nearest to the equipment to minimize amount of hydrocarbon blowdown.

NOTE:	**If applicable, reduce pressure / volume by equalizing with lower system pressures.**

_____/_____ 7.1.5 Plant Operator: **Identify** piping to be used for de-inventory of vapor/liquid in equipment. If necessary, hook up hosing to flare header using appropriately rated hoses and manifolds with whip checks properly installed.

CAUTION:	**FACILITY PIPING TEMP RATINGS ARE AS FOLLOWS:** **CARBON STEEL: -20 F** **LOW TEMPERATURE CARBON STEEL: -50 F** **STAINLESS STEEL: -325 F**

7.2 De-Inventory

NOTE:	**If utilizing hoses, utilize a properly-rated temporary valve within the hose setup boundaries as a throttle valve to mitigate fatigue of permanently installed valves within the process.**

_____/_____ 7.2.1 Plant Operator: **Inform** Control Room that de-inventory process (blowdown) will begin.

_____/_____ 7.2.2 Console Operator: **Monitor** flare opacity during the de-inventory process to ensure alarm setpoints are not exceeded.

NOTE:	**Hi Alarm is set at 1500 mscfd per the alarm flow faceplate**

_____/_____ 7.2.3 Plant Operator: **Slowly open** blowdown valve until flow is established.

_____/_____ 7.2.4 Console Operator: **Monitor and communicate** flow to the flare along with temperature indicators near the blowdown point.

_____/_____ 7.2.5 Plant Operator: **Monitor** local temperature and pressure indicators to adjust blowdown rate if needed based on temperature of piping, flare opacity and/or pressure drop rate.

_____/_____ 7.2.6 Plant Operator: **Utilize** Nitrogen, if necessary, to sweep remaining hydrocarbon from the equipment after initial depressurization / de-inventory. Sweep nitrogen through equipment to flare until hydrocarbon free or at an acceptable level for procession of work.

CAUTION:	**AVOID NITROGEN INHALATION ALWAYS REMAIN UPWIND WHILE VENTING. SERIOUS INJURY OR DEATH DUE TO ASPHYXIATION CAN RESULT.**

_____/_____ 7.2.7 Plant Operator: **Disconnect** temporary hosing and manifolds once equipment has been proven to be depressurized and swept with nitrogen.

8 PROCEDURE CLOSEOUT:

8.1 Select the appropriate statement and sign below:

	This Procedure was executed **as written**. Return to the Operations Specialist or Designee to complete Section 8.3.
	This Procedure was executed **with changes**. Return to the Operations Specialists to complete Sections 8.2.

Operator Date

8.2 This Procedure with changes has been reviewed with the Operations Specialists and updates have been approved or denied. The Procedure has been reviewed and all applicable changes have been made to subsequent Procedures. Refer to Operating Procedure Standard GST-OPS-0085 for change management.

	The Procedure updates/redlines are **approved.** Operations Specialist or Designee to complete Section 8.3.
	The Procedure updates/redlines are **denied.** Operations Specialist or Designee to complete Section 8.3.
Review Comments:	

Operations Supervisor/Manager Date

Operations Specialist Date

8.3 This document has been retained based on corporate record retention policies by the operations specialist or designee.

Operations Specialist or Designee Date

9 REVISION HISTORY

9.1 Record of Changes

Revision Number	Description of Change	Requested by	Approved by	Revision Date	Effective Date
0	Initial Release of Document	Jakob Potts	Donnie Kidd	11/19/2024	11/19/2024

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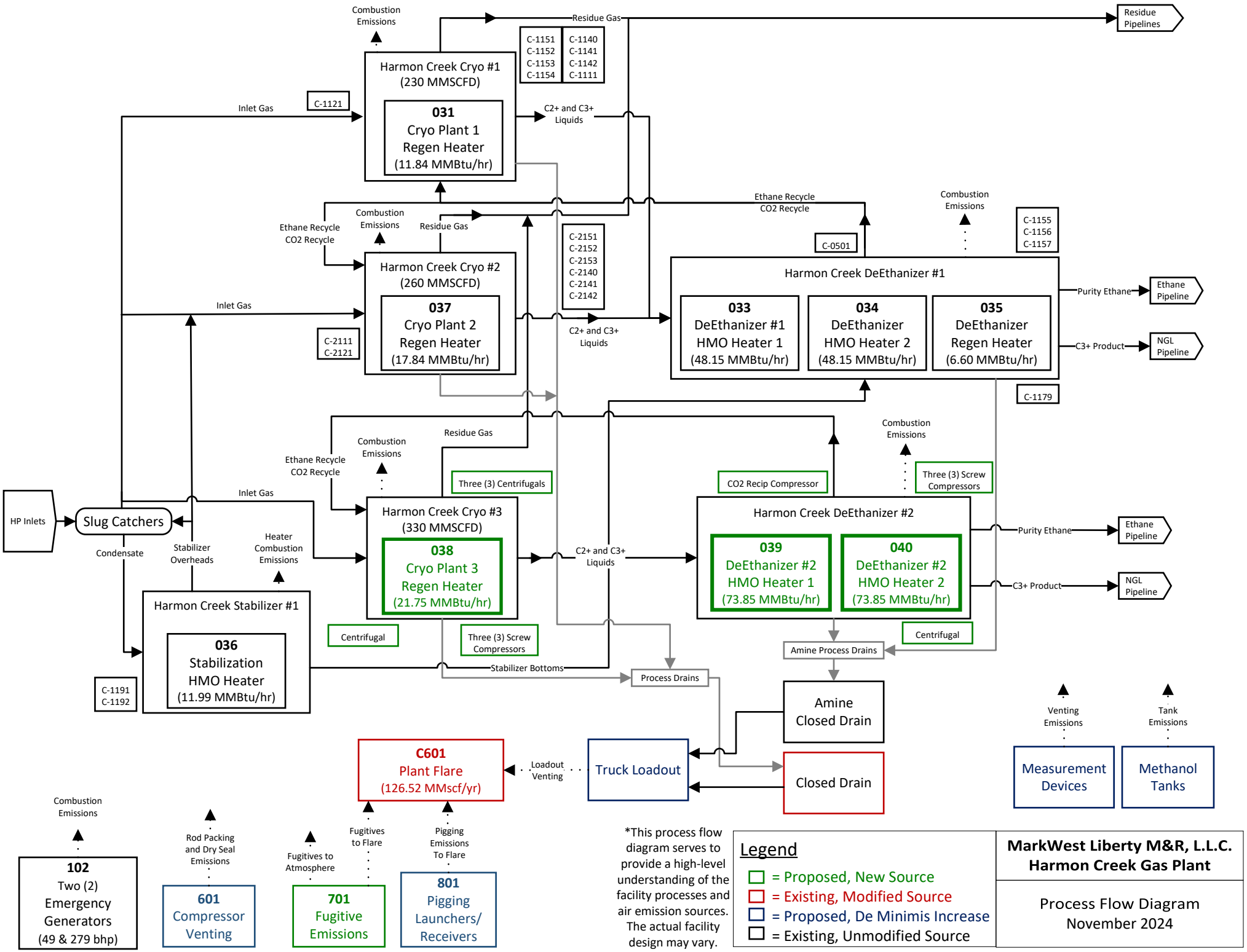
Attachment 6

Updated Process Flow Diagram


Combustion Emissions
Residue Gas
Residue Pipelines
C-1151
C-1152
C-1153
C-1154
C-1140
C-1141
C-1142
C-1111
Harmon Creek Cryo #1
(230 MMSCFD)
031
Cryo Plant 1
Regen Heater
(11.84 MMBtu/hr)
Inlet Gas
C-1121
C2+ and C3+ Liquids
Ethane Recycle
CO2 Recycle
Combustion Emissions
Residue Gas
Harmon Creek Cryo #2
(260 MMSCFD)
037
Cryo Plant 2
Regen Heater
(17.84 MMBtu/hr)
Inlet Gas
C-2111
C-2121
C-2151
C-2152
C-2153
C-2140
C-2141
C-2142
C2+ and C3+ Liquids
Ethane Recycle
CO2 Recycle
C-0501
Combustion Emissions
C-1155
C-1156
C-1157
Harmon Creek DeEthanizer #1
033
DeEthanizer #1
HMO Heater 1
(48.15 MMBtu/hr)
034
DeEthanizer
HMO Heater 2
(48.15 MMBtu/hr)
035
DeEthanizer
Regen Heater
(6.60 MMBtu/hr)
Purity Ethane
Ethane Pipeline
C3+ Product
NGL Pipeline
C-1179
Ethane Recycle
CO2 Recycle
Combustion Emissions
Residue Gas
Three (3) Centrifugals
Harmon Creek Cryo #3
(330 MMSCFD)
038
Cryo Plant 3
Regen Heater
(21.75 MMBtu/hr)
Inlet Gas
HP Inlets
Slug Catchers
Condensate
Stabilizer Overheads
Heater Combustion Emissions
Harmon Creek Stabilizer #1
036
Stabilization
HMO Heater
(11.99 MMBtu/hr)
C-1191
C-1192
Centrifugal
Three (3) Screw Compressors
Stabilizer Bottoms
C2+ and C3+ Liquids
CO2 Recip Compressor
Combustion Emissions
Three (3) Screw Compressors
Harmon Creek DeEthanizer #2
039
DeEthanizer #2
HMO Heater 1
(73.85 MMBtu/hr)
040
DeEthanizer #2
HMO Heater 2
(73.85 MMBtu/hr)
Purity Ethane
Ethane Pipeline
C3+ Product
NGL Pipeline
Centrifugal
Amine Process Drains
Process Drains
Amine Closed Drain
Closed Drain
Truck Loadout
Loadout Venting
C601
Plant Flare
(126.52 MMscf/yr)
Venting Emissions
Tank Emissions
Measurement Devices
Methanol Tanks
Combustion Emissions
102
Two (2)
Emergency
Generators
(49 & 279 bhp)
Rod Packing and Dry Seal Emissions
601
Compressor
Venting
Fugitives to Atmosphere
701
Fugitive
Emissions
Fugitives to Flare
Pigging Emissions To Flare
801
Pigging
Launchers/
Receivers
*This process flow diagram serves to provide a high-level understanding of the facility processes and air emission sources. The actual facility design may vary.
Legend
= Proposed, New Source
= Existing, Modified Source
= Proposed, De Minimis Increase
= Existing, Unmodified Source
MarkWest Liberty M&R, L.L.C.
Harmon Creek Gas Plant
Process Flow Diagram
November 2024

Attachment 7

Closed Drain and Amine Closed Drain Tank
Emission Estimates

MarkWest Liberty Midstream & Resources, L.L.C.
Harmon Creek Gas Plant
Closed Drain Tank Estimates

Closed Drain Tank Emission Estimates

Closed Drain Tank Estimates

Emission Rate	12.67	(mmscf/yr)
Density	0.056	(lb/scf)
Total Emissions	707,074	(lb/yr)
Recovery Rate	98%	
Total Emissions	14,141	(lb/yr)

Pollutant	Mass %	Emissions tpy
VOC	23.89%	1.689
Methane	77.01%	5.445
Carbon Dioxide	0.21%	0.015
n-Hexane	0.19%	0.013
Benzene	0.030%	0.002
Toluene	0.053%	0.004
Ethylbenzene	0.030%	0.002
Xylene	0.010%	0.001
Total HAPs	0.41%	0.029

[1] The emission estimates provided under this section have been estimated using the best information available. The closed drain tank emissions are included in the facility-wide summary under the flare emissions.

[2] The emission rate was calculated using AP-42 Chapter 7 Section 7.1.3.1.1 Standing and Section 7.1.3.1.2 Working Losses

[3] The tank loss emissions assume inlet composition. Fractional compositions are not available for tank liquids.

[4] The tank volume is based on engineering calculations of 550 acf.

[5] The throughput is based on 300,000 gal/year, which is conservatively 3x the current actual.

MarkWest Liberty Midstream & Resources, L.L.C.
Harmon Creek Gas Plant
Amine Closed Drain Tank Estimates

Amine Closed Drain Tank Emission Estimates

Amine Closed Drain Tank Estimates

Emission Rate	0.83	(mmscf/yr)
Density	0.110	(lb/scf)
Total Emissions	91,348	(lb/yr)
Recovery Rate	98%	
Total Emissions	1,827	(lb/yr)

Pollutant	Mass %	Emissions tpy
VOC	0.04%	0.000
Methane	0.23%	0.002
Carbon Dioxide	88.98%	0.813
n-Hexane	0.00%	0.000
Benzene	0.000%	0.000
Toluene	0.00%	0.000
Ethylbenzene	0.00%	0.000
Xylene	0.00%	0.000
Total HAPs	0.00%	0.000

[1] The emission estimates provided under this section have been estimated using the best information available. The amine drain tank emissions are included in the facility-wide summary under the flare emissions based on the flare volume.

[2] The emission rate was calculated using AP-42 Chapter 7 Section 7.1.3.1.1 Standing and Section 7.1.3.1.2 Working Losses

[3] The tank loss emissions assume the composition with the highest HC content anticipated to be routed to the amine closed drain tank. Fractional compositions are not available for tank liquids.

[4] The tank volume is based on engineering calculations of 193 acf.

[5] The throughput is based on 10,080 gal/year, which is conservatively 3x the current actual with a 20% factor.