MMGL TXPH, LLC

13727 Noel Rd, Suite 1200 Dallas, TX 75240
Ph. 972.701.8377 Fax 972.960.1252

April 7, 2025

VIA STEERS

To: Texas Commission on Environmental Quality

Re: MMGL TXPH, LLC
CN606186393
RN110661022
Permit # 155476
APD-CERT Submittal
Mathers Ranch 159-148 22H

Dear Air Permits Initial Review Team:

MMGL TXPH, LLC (MMGL) is submitting this APD-CERT for the Mathers Ranch 159-148 22H (Facility). This APD-CERT is being submitted to certify normal operation Facility emissions which have been updated to reflect current Facility operations. Maintenance, start-up, and shutdown emissions are being claimed under 30 TAC §106.359 and are not being certified with this submittal.

If you have any questions concerning the submittal or wish to discuss the information provided with this letter, please contact Ms. Liz Barksdale, Senior Environmental Analyst, at (972) 628-1480.

Sincerely,
MMGL TXPH, LLC

INTRODUCTION

MMGL TXPH, LLC (MMGL) owns and operates Mathers Ranch 159-148 22H (Facility), an oil and natural gas production facility located in Hemphill County, Texas. Oil production is expected to be 25 barrels per day (BPD) and water production is expected to be 50 BPD. Maintenance, start-up, and shutdown (MSS) emissions are being claimed under 30 TAC §106.359 and are not being certified with this submittal.

The following supporting documentation has been included in this submittal:

1. List of each source of air emissions at the site and summary of the certified emission rates.
2. Process description.

PROCESS DESCRIPTION

The Facility receives gas and liquids from the wellhead(s). The gas and liquids from the wellhead(s) are sent to the heater treater(s), where gas is sent to sales, oil is sent to the oil storage tank(s), and produced water is sent to the produced water storage tank(s). Vapors from the storage tanks are vented to the atmosphere. Emissions from MSS activities are also included in this application.

During normal operations, the produced water and oil are transported offsite via truck.

Breathing, working and flash losses from the storage tanks were estimated using ProMax.

One (1) Caterpillar G3306NA compressor engine(s) (ENG-1) is utilized as a gas lift to aid in production by reinjecting gas into the well or as sales to push gas into the pipeline.

The gas analysis used in the fugitive calculations is a representative sample and the liquid analysis used in the ProMax is from a representative Facility.

The Facility was constructed after September 18, 2015 and prior to December 6, 2022; therefore, the site is subject to the LDAR requirements of NSPS Subpart OOOOa. The tanks are not subject to NSPS Subpart Kb as they are located prior to custody transfer. The site is equipped with intermittent and/or low bleed pneumatic controllers, which are not subject to NSPS Subpart OOOOa. The storage tanks are potentially subject to NSPS Subpart OOOOa; however, tank emissions less than 6 tons per year of VOC per tank.

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Certification of Emission Limits
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I.	**Company and Site Information**	
A.	Company Name: MMGL TXPH, LLC	
B.	Responsible Official Name: Sean Craven	
Responsible Official's Title: Environmental Manager		
Mailing Address: 13727 Noel Road, Suite 1200		
City: Dallas		
County: Dallas		
State: TX		
ZIP Code: 75240		
Telephone: 972-628-1572		
Fax: N/A		
Email Address: sean.craven@meritenergy.com		
C.	Site Name: Mathers Ranch 159-148 22H	
Street Address: (*if different from above)*		
If "NO" street address describe the physical location with driving directions:		
FROM CANADIAN, TAKE HWY 83 2 MI N AND TURN E ON LAKE MARVIN RD FM 2266. DRIVE FOR 9.9 MI & TURN		
N ON LEASE ROAD. DRIVE 0.2 MI AND TURN W. DRIVE 0.3 MI TO LOCATION.		
City or nearest city: Canadian		
County: Hemphill		
ZIP Code: 79014		
D.	TCEQ Account Identification Number *(leave blank if unknown)*:	
E.	TCEQ Customer Reference Number *(leave blank if unknown)*: CN606186393	
TCEQ Regulated Entity Number *(leave blank if unknown)*: RN110661022		
F.	Does the site have a Title V Permit?	☐ YES ☒ NO
G.	Title V Permit Number:	
H.	Is this a small business?	☐ YES ☒ NO
II.	**Attach the Following Documentations**	
A.	Copies of a previously completed Form PI-7 and all supporting documentation *(if applicable)*.	
B.	A list of each source of air emissions at the site.	
C.	A summary of the certified emission rates.	
D.	A process description.	

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III. Maintain Records On Site to Demonstrate Continuing Compliance and Make the Records Available on Request
The emission rates listed on the certification shall reflect the certified emissions for the stationary sources at the site. The records demonstrating compliance with this certification must comply with applicable rules and must be maintained at the site or, for sites that normally operate unattended, at an office within Texas having day-to-day operational control of the site. Records must be kept for at least five years and must be made available upon request. For more information regarding records for permits by rule, see 30 TAC § 106.8, Recordkeeping.
IV. Purpose of this Certification *(choose and complete all that are appropriate)*
This certification is intended to establish emission rates below state and federal rule thresholds and triggers for:
☒ 30 TAC § 106.4 for Permits by Rule
☒ Permit by Rule Number: 155476
☐ HRVOC Emissions Cap and Trade Program
☐ Emissions Banking and Trading Program (other than HRVOC)
☐ 30 TAC Chapter 115 for Volatile Organic Compounds
☐ 30 TAC Chapter 117 for Nitrogen Oxides
☒ 40 CFR Part 60, Subpart: NSPS OOOOa
☐ 40 CFR Part 61, Subpart:
☒ 40 CFR Part 63, Subpart: NESHAP ZZZZ
☐ Title V Permit Major Source Applicability
☐ Other:

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V. Certification by Responsible Official	
All representations in this certification of emissions are conditions upon which the stationary source shall operate. This certification reflects the maximum emission rates for the operation of this facility. The facility will operate in compliance with all regulations of the Texas Commission on Environmental Quality and with Federal U.S. Environmental Protection Agency regulations governing air pollution. It shall be unlawful for any person to vary from such representation unless the certification is first revised. The signature below indicates that, based on information and belief formed after reasonable inquiry, the statements, and information contained in the attached documents are true, accurate, and complete.	
Name: Sean Craven	
Title: Environmental Manager	
Original Signature Required:	Signed electronically in STEERS
Date:	

Reminder: The original of this certification must be sent to the TCEQ through ePermits. A copy must also be maintained on site or, for sites that normally operate unattended, at an office within Texas having day-to-day operational control of the site.

Texas Commission on Environmental Quality
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Certification of Emission Limits

EMISSION RATE DATA									
								Maximum Certified Emission Rates	
FIN	Facility Name	EPN	Point Name	Authorization Type	Authorization Date	Permit or Registration Number (if applicable)	Air Contaminant Name	lb/hr	T/yr
ENG-1	Caterpillar G3306NA Compressor Engine (145 Hp)	ENG-1	Caterpillar G3306NA Compressor Engine (145 Hp)	PBR	1/11/2023	155476	NOx	7.69	33.70
				PBR	1/11/2023	155476	CO	0.45	1.96
				PBR	1/11/2023	155476	VOC	0.05	0.55
				PBR	1/11/2023	155476	SO2	<0.01	<0.01
				PBR	1/11/2023	155476	PM10	0.02	0.09
HT-1	Heater Treater (0.75 MMBtu/hr)	HT-1	Heater Treater (0.75 MMBtu/hr)	PBR	1/11/2023	155476	NOx	0.05	0.24
				PBR	1/11/2023	155476	CO	0.05	0.20
				PBR	1/11/2023	155476	VOC	<0.01	0.01
				PBR	1/11/2023	155476	SO2	<0.01	<0.01
				PBR	1/11/2023	155476	PM10	<0.01	0.02
T-1	Oil Storage Tank (300-bbl)	T-1	Oil Storage Tank (300-bbl)	PBR	1/11/2023	155476	VOC	0.76	3.33
				PBR	1/11/2023	155476	H2S	<0.001	<0.001
T-2	Oil Storage Tank (300-bbl)	T-2	Oil Storage Tank (300-bbl)	PBR	1/11/2023	155476	VOC	0.76	3.33
				PBR	1/11/2023	155476	H2S	<0.001	<0.001
T-3	Produced Water Storage Tank (300-bbl)	T-3	Produced Water Storage Tank (300-bbl)	PBR	1/11/2023	155476	VOC	0.01	0.05
				PBR	1/11/2023	155476	H2S	<0.001	<0.001
T-4	Produced Water Storage Tank (300-bbl)	T-4	Produced Water Storage Tank (300-bbl)	PBR	1/11/2023	155476	VOC	0.01	0.05
				PBR	1/11/2023	155476	H2S	<0.001	<0.001
LOAD	Loading Emissions	LOAD	Loading Emissions	PBR	1/11/2023	155476	VOC	36.82	0.65
				PBR	1/11/2023	155476	H2S	<0.01	<0.001
FUG	Site Fugitives	FUG	Site Fugitives	PBR	1/11/2023	155476	VOC	0.79	3.46
				PBR	1/11/2023	155476	H2S	<0.001	<0.001
MSS	Maintenance, Startup, Shutdown Emissions	MSS	Maintenance, Startup, Shutdown Emissions	PBR	1/11/2023	155476	VOC	41.68	0.37
						Emission Totals:	**NOx**	**-**	**33.94**
							CO	**-**	**2.16**
							VOC	**-**	**11.82**
							SO_2	**-**	**0.004**
							PM_{10}	**-**	**0.11**

SUMMARY TABLE

ESTIMATED EMISSIONS															
EPN/Emission Source	Specific VOC or Other Pollutants	VOC		NO_x		CO		PM_{10}		$PM_{2.5}$		H_2S		SO_2	
		lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
ENG-1 / Caterpillar G3306NA Compressor Engine (145 Hp)		0.05	0.55	7.69	33.70	0.45	1.96	0.02	0.09	0.02	0.09	--	--	<0.01	<0.01
HT-1 / Heater Treater (0.75 MMBtu/hr)		<0.01	0.01	0.05	0.24	0.05	0.20	<0.01	0.02	<0.01	0.02	--	--	<0.01	<0.01
T-1 / Oil Storage Tank (300-bbl)		0.76	3.33	--	--	--	--	--	--	--	--	<0.001	<0.001	--	--
T-2 / Oil Storage Tank (300-bbl)		0.76	3.33	--	--	--	--	--	--	--	--	<0.001	<0.001	--	--
T-3 / Produced Water Storage Tank (300-bbl)		0.01	0.05	--	--	--	--	--	--	--	--	<0.001	<0.001	--	--
T-4 / Produced Water Storage Tank (300-bbl)		0.01	0.05	--	--	--	--	--	--	--	--	<0.001	<0.001	--	--
LOAD / Loading Emissions		36.82	0.65	--	--	--	--	--	--	--	--	<0.01	<0.001	--	--
FUG / Site Fugitives		0.79	3.46	--	--	--	--	--	--	--	--	<0.001	<0.001	--	--
MSS / Blowdown Emissions		33.49	0.10	--	--	--	--	--	--	--	--	--	--	--	--
MSS / Tank Cleaning		8.13	0.02	--	--	--	--	--	--	--	--	--	--	--	--
MSS / General MSS		0.06	0.25	--	--	--	--	--	--	--	--	--	--	--	--
TOTAL EMISSIONS (TPY):			11.82		33.94		2.16		0.11		0.11		<0.001		0.004
MAXIMUM OPERATING SCHEDULE:		Hours/Day		24		Days/Week		7		Weeks/Year		52		Hours/Year	

TABLE 1

POTENTIAL EMISSIONS SUMMARY
MATHERS RANCH 159-148 22H
MMGL TXPH, LLC
HEMPHILL COUNTY, TEXAS

Emissions Source	EPN	NO_x		VOC		CO		$PM_{10}/PM_{2.5}$		SO_2		H_2S		TOTAL HAPs	
		(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)
Caterpillar G3306NA Compressor Engine (145 Hp)	ENG-1	7.69	33.70	0.05	0.55	0.45	1.96	0.02	0.09	0.001	0.003	--	--	0.08	0.36
Heater Treater (0.75 MMBtu/hr)	HT-1	0.05	0.24	0.003	0.01	0.05	0.20	0.004	0.02	0.0003	0.001	--	--	--	--
Oil Storage Tank (300-bbl)	T-1	--	--	0.76	3.33	--	--	--	--	--	--	<0.001	<0.001	0.03	0.12
Oil Storage Tank (300-bbl)	T-2	--	--	0.76	3.33	--	--	--	--	--	--	<0.001	<0.001	0.03	0.12
Produced Water Storage Tank (300-bbl)	T-3	--	--	0.01	0.05	--	--	--	--	--	--	<0.001	<0.001	0.0004	0.002
Produced Water Storage Tank (300-bbl)	T-4	--	--	0.01	0.05	--	--	--	--	--	--	<0.001	<0.001	0.0004	0.002
Loading Emissions	LOAD	--	--	36.82	0.65	--	--	--	--	--	--	0.003	<0.001	1.72	0.02
Site Fugitives	FUG	--	--	0.79	3.46	--	--	--	--	--	--	<0.001	<0.001	0.04	0.16
Blowdown Emissions	MSS	--	--	33.49	0.10	--	--	--	--	--	--	--	--	0.03	0.0001
Tank Cleaning	MSS	--	--	8.13	0.02	--	--	--	--	--	--	--	--	--	--
General MSS	MSS	--	--	0.06	0.25	--	--	--	--	--	--	--	--	--	--
Total Facility Emissions		**7.75**	**33.94**	**80.88**	**11.82**	**0.49**	**2.16**	**0.03**	**0.11**	**0.001**	**0.004**	**0.003**	**<0.001**	**1.92**	**0.80**
Plus Formaldehyde				**0.07**	**0.32**										
Total				**80.96**	**12.14**										

Note: General MSS is based on default TCEQ MSS calculations.

TABLE 2

POTENTIAL EMISSIONS
CATERPILLAR G3306NA COMPRESSOR ENGINE (ENG-1)
MATHERS RANCH 159-148 22H
MMGL TXPH, LLC
HEMPHILL COUNTY, TEXAS

Pollutant	Horsepower	Operating Hours	Emission Factors		Potential Emission Rate [3]	
			(grams/Hp-hr) [1]	(lb/MMBtu) [2]	(lb/hr)	(T/yr)
NOx	145	8,760	24.09	--	7.69	33.70
VOC	145	8,760	0.16	--	0.05	0.22
CO	145	8,760	1.40	--	0.45	1.96
PM	145	8,760	--	0.019410	0.02	0.09
SO2	145	8,760	--	0.000588	0.001	0.003
Formaldehyde	145	8,760	0.23	--	0.07	0.32
Acetaldehyde	145	8,760	--	0.00279	0.003	0.01
Acrolein	145	8,760	--	0.00263	0.003	0.01
Benzene	145	8,760	--	0.00158	0.002	0.01
Toluene	145	8,760	--	0.000558	0.001	0.003
Ethylbenzene	145	8,760	--	0.0000248	0.00003	0.0001
Xylene	145	8,760	--	0.000195	0.0002	0.001

Notes:

1. Emission factors for NOx, VOC, and CO are from manufacturer's data.
2. Emission factors for SO2, HAPs, and PM are based on AP-42 , Table 3.2-3, 4-stroke rich-burn engines, 7/00. Formaldehyde based on manufacturer's data.
3. Potential emissions based on emission factors, maximum horsepower, max. fuel consumption rate, and 8,760 hours of operation per year. Engine only burns sweet gas as fuel.

TABLE 3

POTENTIAL EMISSIONS
HEATER TREATER (HT-1)
MATHERS RANCH 159-148 22H
MMGL TXPH, LLC
HEMPHILL COUNTY, TEXAS

Pollutant	Max Firing Rate (MMBtu/hr)	Gas Heating Value (MMBtu/scf)	Emission Factors (lb/MMSCF) [1]	Potential Emission Rates [2]	
				(lb/hr)	(T/yr)
NOx	0.75	1,381	100.00	0.05	0.24
VOC	0.75	1,381	5.50	0.003	0.01
CO	0.75	1,381	84.00	0.05	0.20
PM	0.75	1,381	7.60	0.004	0.02
SO2	0.75	1,381	0.60	0.0003	0.001

Notes:

1. Emission factors obtained from AP-42 Table 1.4-1 through 1.4-3 for commercial boilers.
2. Potential emissions based on AP-42 emission factors, maximum firing rate, fuel heating value, and 8,760 hours per year of operation. Heater only burns sweet gas.

TABLE 4

POTENTIAL EMISSIONS
STORAGE TANKS
MATHERS RANCH 159-148 22H
MMGL TXPH, LLC
HEMPHILL COUNTY, TEXAS

Source	EU-ID	Annual Throughput [1] (gallons/year)	Tank Capacity (gallons)	Potential VOC Emissions					Potential H2S Emissions			Potential HAP Emissions		
				Annual Breathing Losses [2] (T/yr)	Annual Working Losses [2] (T/yr)	Annual Flash Losses [3] (T/yr)	Total VOC Emissions [4]		H2S [5]	H2S Tank Emissions [6]		HAP [5]	HAP Tank Emissions [6]	
							(lb/hr)	(T/yr)	(% of VOC)	(lb/hr)	(T/yr)	(% of VOC)	(lb/hr)	(T/yr)
Oil Storage Tank (300-bbl)	T-1	191,625	12,600	0.98	0.66	1.69	0.76	3.33	0.01%	0.00005	0.0002	3.72%	0.03	0.12
Oil Storage Tank (300-bbl)	T-2	191,625	12,600	0.98	0.66	1.69	0.76	3.33	0.01%	0.00005	0.0002	3.72%	0.03	0.12
Produced Water Storage Tank (300-bbl)	T-3	383,250	12,600	0.01	0.01	0.03	0.01	0.05	0.04%	0.000004	0.00002	3.40%	0.0004	0.002
Produced Water Storage Tank (300-bbl)	T-4	383,250	12,600	0.01	0.01	0.03	0.01	0.05	0.04%	0.000004	0.00002	3.40%	0.0004	0.002

Notes:

1. Based on maximum annual oil throughput value of 9,125-bbl/yr and maximum annual produced water throughput value of 18,250-bbl/yr.
2. Annual breathing and working losses were determined using ProMax simulation.
3. Annual flash emissions from the storage tanks were determined using ProMax simulation.
4. Total VOC Emissions = ((Breathing Losses (T/yr) + Working Losses (T/yr))) + Flash Emissions (T/yr)
5. HAP/H2S percent of VOC determined using ProMax simulation.
6. Total H2S or HAP Emissions = Total VOC Emissions x H2S or HAP (%).

TABLE 5

POTENTIAL EMISSIONS
TRUCK LOADING (LOAD)
MATHERS RANCH 159-148 22H
MMGL TXPH, LLC
HEMPHILL COUNTY, TEXAS

Material Name	EU-ID	Saturation Factor [1] (S)	True Vapor Pressure [2] (P)		Molecular Weight of Vapors [2] (M)	Temp of Loaded Liquid [2] (F)		Emission Factor [1] (lb VOC/10^3 gal)		Annual Throughput [3] (gals)	Estimated Hourly Throughput [3] (gal)	Weight Percent of VOC in HC Vapors (%)	Total Uncontrolled VOC Emissions		Total H2S Emissions		Total HAP Emissions	
			Max	Avg	(lb/lb-mole)	Max	Avg	Max	Avg				(lb/hr) [4]	(T/yr) [5]	(lb/hr) [4]	(T/yr) [5]	(lb/hr) [4]	(T/yr) [5]
Oil	C LOAD	0.6	11.62	9.22	43	95	66.55	6.80	5.69	383,250	8,000	91.09%	36.65	0.65	0.002	3.40E-05	1.72	0.02
Produced Water	PW LOAD	0.6	13.26	12.27	23	95	66.55	4.10	4.00	766,500	8,000	100.00%	0.16	0.004	0.002	0.00001	0.16	0.004
												Total	**36.82**	**0.65**	**0.003**	**4.31E-05**	**1.89**	**0.03**

Notes:

1. Per AP-42, 5th Edition (6/08), Section 5.2, Equation 1: Saturation Factor = 0.6 for submerged loading: dedicated normal service
2. True vapor pressure, weight of vapors and temp of loaded liquid obtained from Promax.
3. Throughput is the amount of oil/water loaded out from the storage tanks. It is estimated that one truck can load 8,000 gallons in one hour.
4. Uncontrolled Hourly VOC/HAP Emissions calculated from Promax.
5. Uncontrolled Annual VOC/HAP Emissions calculated using Promax.

TABLE 6

POTENTIAL EMISSIONS
SITEWIDE FUGITIVES (FUG)
MATHERS RANCH 159-148 22H
MMGL TXPH, LLC
HEMPHILL COUNTY, TEXAS

Component Type	Type of Service	Estimated Equipment At Site [1]	Emission Factor lb/hr/component [2]	% VOC [3]	% H2S	% HAP [3]	VOC Emissions		H2S Emissions		HAP Emissions	
							(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)
Flanges	Light Oil	44	0.000243	99.96%	--	8.11%	0.01	0.05	--	--	0.001	0.004
	Water/Oil	44	0.000006	99.96%	--	8.11%	0.0003	0.001	--	--	0.00002	0.0001
Valves	Gas	139	0.009920	35.72%	0.003%	1.20%	0.49	2.16	0.00005	0.0002	0.02	0.07
	Light Oil	24	0.005500	99.96%	--	8.11%	0.13	0.58	--	--	0.01	0.05
	Water/Oil	24	0.000216	99.96%	--	8.11%	0.01	0.02	--	--	0.0004	0.002
Connectors	Gas	372	0.000440	35.72%	0.003%	1.20%	0.06	0.26	0.000005	0.00002	0.002	0.01
	Light Oil	38	0.000463	99.96%	--	8.11%	0.02	0.08	--	--	0.001	0.01
	Water/Oil	38	0.000243	99.96%	--	8.11%	0.01	0.04	--	--	0.001	0.003
Open-Ended Lines	Gas	11	0.004410	35.72%	0.003%	1.20%	0.02	0.08	0.000002	0.00001	0.001	0.003
Other	Light Oil	1	0.016500	99.96%	--	8.11%	0.02	0.07	--	--	0.001	0.01
	Water/Oil	1	0.030900	99.96%	--	8.11%	0.03	0.14	--	--	0.003	0.01
Total Component Count		**736**				**Total**	**0.79**	**3.46**	**5.23E-05**	**2.29E-04**	**0.04**	**0.16**

Notes:

1. Number of each component and type of service estimated based on a similar site.
2. Emission factors based on EPA's oil and gas production operations factors for process piping fugitive emissions.
3. Percent VOC, H2S, and HAP based on a representative sample and ProMax (refer to Tables 9 & 10).

TABLE 7

POTENTIAL EMISSIONS FROM BLOWDOWNS (MSS-BD)
MATHERS RANCH 159-148 22H
MMGL TXPH, LLC
HEMPHILL COUNTY, TEXAS

Input Parameters

Number of Blowdowns per Year	6	(6 events per engine)
Number of Blowdowns per Hour	1	
Blowdown Volume per Event (scf/event)	1500	

Gas Stream Properties

Gas Stream Temperature (^{o}F)	60	
Gas Stream Pressure (psia)	14.7	
Gas Stream Molecular Weight (lb/lb-mol)	23.708	(from Gas Analysis)
Gas Vented Per Event (lb/event) [1]	93.75	
Max VOC Percentage in Gas Stream (wt%)	35.72%	(from Gas Analysis)
Max Benzene Percentage in Gas Stream (wt%)	0.03%	(from Gas Analysis)

Pollutant	lb/hr [2]	T/yr [3]
Total VOC	33.49	0.10
Total Benzene	0.03	0.0001

Notes

1. Calculation for Gas Vented Per Event (lb/event):
   Gas Vented Per Event (lb/event) = (Volume Vented, scf/event) * (Gas Stream Pressure, psia) * (Gas Stream Molecular Weight, lb/lb-mol) / (R, scf-psia/R-lbmol) / (Gas Stream Temperature, R)
2. Calculation for hourly emissions:
   VOC (lb/hr) = (Gas Vented Per Event, lb/event) * (% VOC) * (Events per hour)
3. Calculation for annual emissions:
   VOC (T/yr) = (Gas Vented Per Event, lb/event) * (% VOC) * (Events per year) / (2,000 lb/T)

TABLE 8

POTENTIAL EMISSIONS FROM MSS ACTIVITIES (MSS)
MATHERS RANCH 159-148 22H
MMGL TXPH, LLC
HEMPHILL COUNTY, TEXAS

Summary of MSS Activities						
Activity	VOC[1]		PM		Other HAPs	
	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)	(lb/hr)	(T/yr)
Engine, compressor, turbine and other combustion facilities maintenance	0.06	0.25	-	-	-	-
Repair, adjustment, calibration, lubrication and cleaning of site process equipment			-	-	-	-
Replacement of piping components, pneumatic controllers, boiler refractories, wet and dry seals, meters, instruments, analyzers, screens and filters			-	-	-	-
Turbine or engine component swaps			-	-	-	-
Piping used to bypass a facility during maintenance			-	-	-	-
Pigging and purging of piping	112.47	0.56	-	-	-	-
Abrasive blasting, surface preparation and surface coating of facilities and structures used at the site	8.13	0.02	0.68	0.001	0.08	0.0002
Total =	**120.65**	**0.83**	**0.68**	**0.001**	**0.08**	**0.0002**

MSS - Pigging Operations

Description	Pigging
Number of Events per Year	10
Number of Events per hour	1
Volume per Event, scf	5000
Stream Specific Gravity	0.8241
Air MW, lb/mole	28.96
Fuel Stream Density, lb/scf	0.063
VOC Percentage in Gas Stream, wt%	35.72%
VOC Hourly Emission Rate (lb/hr):	112.47
VOC Annual Emission Rate (T/yr):	0.56

MSS - Sandblasting

Description	Sandblasting	
Application Rate[1]	2,000	lb/hr
Operating Hours	4	hr/yr
PM10 Emission Factor[1]	0.00034	lb/lb usage
PM2.5 Emission Factor[1]	0.00005	lb/lb usage
PM10 Emissions	**0.68**	**lb/hr**
PM10 Emissions	**0.001**	**T/yr**
PM2.5 Emissions	**0.10**	**lb/hr**
PM2.5 Emissions	**<0.01**	**T/yr**

MSS - Solvent Cleaning

Description	Solvent Cleaning	
Annual Usage	5	gal/yr
Maximum Hourly Usage	1	gal/hr
Density	6.5	lb/gal
VOC Wt%	100%	-
Dipropylene Glycol Methyl Ether Wt%	1%	-
HAP Emissions	**0.08**	**lb/hr**
HAP Emissions	**0.0002**	**T/yr**
VOC Emissions	**8.13**	**lb/hr**
VOC Emissions	**0.02**	**T/yr**

Notes:

1. Defaults from TCEQ emissions spreadsheet.

TABLE 9

GAS ANALYSIS
MATHERS RANCH 159-148 22H
MMGL TXPH, LLC
HEMPHILL COUNTY, TEXAS

Component	Molecular Weight	Mole % [1]	lb/100 mole	Wt % Total	Wt % Hydrocarbon	Wt % VOC [2]
Hydrogen Sulfide	34.08	0.0023%	0.001	0.003%	--	--
Water	18.01	1.10%	0.20	0.83%	--	--
Nitrogen	28.01	1.05%	0.29	1.23%	--	--
Carbon Dioxide	44.01	0.77%	0.34	1.42%	--	--
Methane	16.04	70.52%	11.31	47.40%	47.40%	--
Ethane	30.07	11.62%	3.49	14.64%	14.64%	--
Propane	44.10	8.09%	3.57	14.96%	14.96%	15.50%
i-Butane	58.12	1.19%	0.69	2.90%	2.90%	3.00%
n-Butane	58.12	2.74%	1.59	6.67%	6.67%	6.91%
i-Pentane	72.15	0.85%	0.61	2.56%	2.56%	2.65%
n-Pentane	72.15	0.81%	0.58	2.44%	2.44%	2.53%
Other Hexanes	86.17	0.52%	0.45	1.88%	1.88%	1.95%
Heptanes	100.20	0.28%	0.28	1.18%	1.18%	1.23%
Octanes+	114.23	0.15%	0.18	0.74%	0.74%	0.76%
Benzene	78.11	0.01%	0.01	0.03%	0.03%	0.03%
Toluene	92.14	0.04%	0.03	0.14%	0.14%	0.14%
Ethylbenzene	106.17	0.002%	0.002	0.01%	0.009%	0.009%
Xylenes	106.17	0.02%	0.02	0.07%	0.07%	0.07%
n-Hexane	86.17	0.25%	0.22	0.91%	0.91%	0.94%
Total	--	100.00%	23.86	100.00%	96.52%	35.72%

Notes:

1. Representative gas analysis and extended HAPs based on a sample taken 08/15/2024. H2S is represented as 23 ppm to allow for changes in gas quality.
2. Wt % VOC is the VOC % in the hydrocarbon portion of the gas.

TABLE 10

LIQUID ANALYSIS
MATHERS RANCH 159-148 22H
MMGL TXPH, LLC
HEMPHILL COUNTY, TEXAS

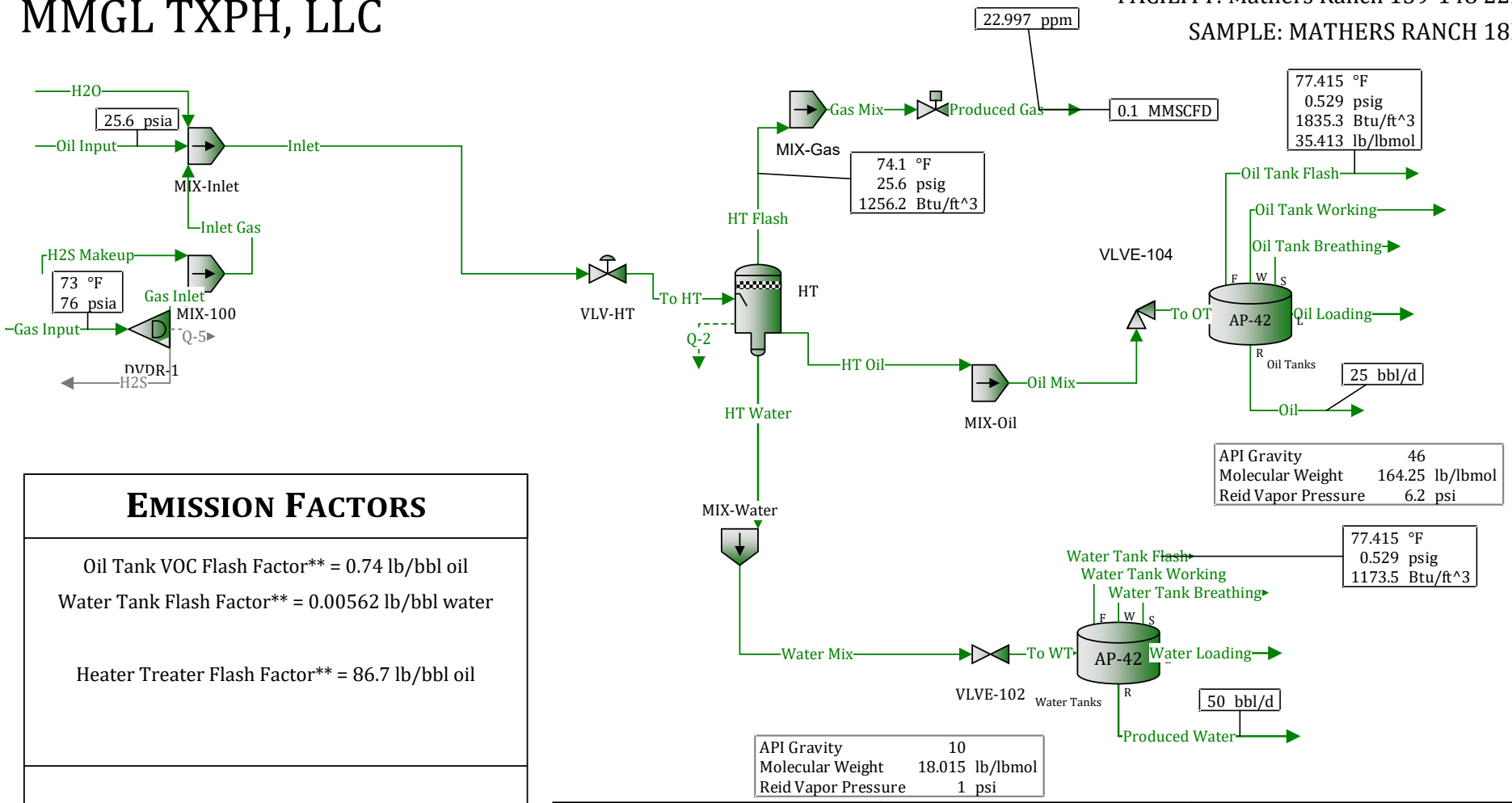
Component	Molecular Weight	Mole % [1]	lb/100 mole	Wt % Total	Wt % Hydrocarbon	Wt % VOC [2]
Water	18.01	0.07%	0.01	0.01%	--	--
Nitrogen	28.01	0.00005%	0.00001	0.00001%	--	--
Methane	16.04	0.01%	0.00	0.001%	0.001%	--
Ethane	30.07	0.15%	0.04	0.04%	0.04%	--
Propane	44.10	1.67%	0.74	0.72%	0.72%	0.72%
i-Butane	58.12	1.00%	0.58	0.57%	0.57%	0.57%
n-Butane	58.12	3.54%	2.05	2.00%	2.00%	2.00%
i-Pentane	72.15	3.03%	2.19	2.13%	2.13%	2.13%
n-Pentane	72.15	3.94%	2.84	2.77%	2.77%	2.77%
Other Hexanes	86.17	4.22%	3.64	3.54%	3.54%	3.54%
Heptanes	100.20	11.64%	11.67	11.36%	11.36%	11.36%
Octanes+	114.23	61.81%	70.60	68.75%	68.75%	68.75%
Benzene	78.11	0.11%	0.09	0.08%	0.08%	0.08%
Toluene	92.14	1.56%	1.44	1.40%	1.40%	1.40%
Ethylbenzene	106.17	0.29%	0.31	0.30%	0.30%	0.30%
Xylenes	106.17	2.48%	2.63	2.56%	2.56%	2.56%
n-Hexane	86.17	4.49%	3.87	3.77%	3.77%	3.77%
Total	--	100.00%	102.70	100.00%	99.99%	99.96%

Notes:

1. Liquid analysis based on ProMax.
2. Wt % VOC is the VOC % in the hydrocarbon portion of the gas.

MMGL TXPH, LLC

FACILITY: Mathers Ranch 159-148 22H
SAMPLE: MATHERS RANCH 18H



Emission Factors

Oil Tank VOC Flash Factor** = 0.74 lb/bbl oil

Water Tank Flash Factor** = 0.00562 lb/bbl water

Heater Treater Flash Factor** = 86.7 lb/bbl oil

Oil Tank Total Volume Factor*** = 12.42 SCF/bbl oil

Water Tank Volume Factor*** = 0.3324 SCF/bbl water

Heater Treater Volume Factor*** = 4,000 SCF/bbl oil

HC Flash HAPs	Loading HAPs	Loading Parameters
Benzene = 0.094 wt% of VOC	Benzene = 0.1 wt% of VOC	Bulk Liquid Temp = 66.5 °F
Toluene = 0.441 wt% of VOC	Toluene = 0.43 wt% of VOC	True Vapor Pressure = 9.22 psia
Ethylbenzene = 0.03 wt% of VOC	Ethylbenzene = 0.03 wt% of VOC	Vapor Molecular Weight (Oil) = 43.4 lb/lbmol
Xylenes = 0.23 wt% of VOC	Xylenes = 0.21 wt% of VOC	Vapor Molecular Weight (Water) = 22.946 lb/lbmol
n-Hexane = 2.91 wt% of VOC	n-Hexane = 2.9 wt% of VOC	Liquid Density = 6.57 lb/gal

*GOR is the total flash volume from all vessels per barrel of stock tank oil.
**Flash Factors are the pounds of VOC emissions per barrel of stock tank oil/stock tank water.
***Volume Factors are the total flash volume per barrel of stock tank oil/stock tank water.

Last Edit: 2/5/2025

Certificate of Analysis

Number: 1030-24080790-001A

Houston Laboratories
8820 Interchange Drive
Houston, TX 77054
Phone 713-660-0901

Liz Morgan
Merit Energy Company
13727 Noel Road, Suite 1200
Dallas, TX 75240

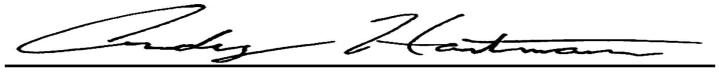
Station Name: Mathers Ranch 18H
Cylinder No: 1111-000345
Instrument 1: HGC 19A + 19B, Front TCD #19A
Instrument 2: HGC 7A, HP6890 Signal 1
Instrument 3: 1030_GC32, 850 MIB_1 - Front TCD
Instrument 4: High Temp, HTSD
Analyzed: 09/04/2024 19:05:55 by WIM

Report Date: 09/10/2024
Sampled By:
Sample Of: Liquid Spot
Sample Date: 08/15/2024
Sample Conditions: 25.6 psig, @ 74.1 °F
Received Date: 08/23/2024
Login Date: 08/26/2024
Method: GPA 2103M

Analytical Data

Components	Mol. %	MW	Wt. %	Sp. Gravity	L.V. %
Nitrogen	0.016	28.013	0.003	0.8069	0.003
Methane	0.567	16.043	0.062	0.3000	0.160
Carbon Dioxide	0.030	44.010	0.009	0.8172	0.009
Ethane	1.958	30.069	0.401	0.3563	0.870
Propane	5.670	44.096	1.703	0.5072	2.597
Iso-Butane	1.781	58.122	0.705	0.5628	0.969
n-Butane	5.671	58.122	2.245	0.5842	2.972
Iso-Pentane	3.824	72.149	1.879	0.6251	2.325
n-Pentane	4.617	72.149	2.269	0.6307	2.782
i-Hexanes	5.144	86.175	3.019	0.6641	3.516
n-Hexane	4.408	86.175	2.587	0.6641	3.013
2,2,4-Trimethylpentane	0.046	114.229	0.036	0.6964	0.040
Benzene	0.122	78.112	0.065	0.8844	0.057
Heptanes	10.324	100.202	7.046	0.6882	7.918
Toluene	1.468	92.138	0.921	0.8719	0.817
Octanes	15.818	114.229	12.306	0.7066	13.470
Ethylbenzene	0.246	106.165	0.178	0.8716	0.158
Xylenes	2.128	106.165	1.539	0.8732	1.363
Nonanes	5.972	128.255	5.217	0.7222	5.587
Decanes Plus	30.190	281.166	57.810	0.8703	51.374
	100.000		100.000		100.000

Calculated Physical Properties	Total	C10+
Specific Gravity at 60°F	0.7734	0.8703
API Gravity at 60°F	51.459	31.093
Molecular Weight	146.825	281.166
Pounds per Gallon (in Vacuum)	6.448	7.256
Pounds per Gallon (in Air)	6.441	7.248
Cu. Ft. Vapor per Gallon @ 14.696 psia	16.666	9.793



Andy Hartman, Laboratory Director

Quality Assurance: The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality assurance, unless otherwise stated. The test results apply to the sample as received.

Houston Laboratories
8820 Interchange Drive
Houston, TX 77054
Phone 713-660-0901

Certificate of Analysis

Number: 1030-24080790-001A

Liz Morgan
Merit Energy Company
13727 Noel Road, Suite 1200
Dallas, TX 75240

Station Name:	Mathers Ranch 18H	Report Date:	09/10/2024
Method:	GPA 2103M	Sampled By:	
Cylinder No:	1111-000345	Sample Of:	Liquid Spot
Instrument 1:	HGC 19A + 19B, Front TCD #19A	Sample Date:	08/15/2024
Instrument 2:	High Temp, HTSD	Sample Conditions:	25.6 psig, @ 74.1 °F
Analyzed:	09/03/2024 09:06:23 by SMS	Received Date:	08/23/2024
		Login Date:	08/26/2024

Analytical Data

Components	Mol. %	Wt. %	L.V. %
Nitrogen	0.016	0.003	0.003
Methane	0.567	0.062	0.160
Carbon Dioxide	0.030	0.009	0.009
Ethane	1.958	0.401	0.870
Propane	5.670	1.703	2.597
Iso-Butane	1.781	0.705	0.969
n-Butane	5.671	2.245	2.972
Iso-Pentane	3.824	1.879	2.325
n-Pentane	4.617	2.269	2.782
i-Hexanes	5.144	3.019	3.516
n-Hexane	4.408	2.587	3.013
2,2,4-Trimethylpentane	0.046	0.036	0.040
Benzene	0.122	0.065	0.057
Heptanes	10.324	7.046	7.918
Toluene	1.468	0.921	0.817
Octanes	15.818	12.306	13.470
Ethylbenzene	0.246	0.178	0.158
Xylenes	2.128	1.539	1.363
Nonanes	5.972	5.217	5.587
C10	4.713	5.200	5.031
C11	3.579	4.360	4.153
C12	2.691	3.593	3.377
C13	2.426	3.525	3.275
C14	2.240	3.519	3.236
C15	1.781	3.008	2.741
C16	1.371	2.500	2.256
C17	1.232	2.397	2.143
C18	1.116	2.300	2.044
C19	0.949	2.050	1.811
C20	0.770	1.738	1.527
C21	0.753	1.800	1.572
C22	0.600	1.477	1.283
C23	0.602	1.541	1.331
C24	0.507	1.348	1.159
C25	0.456	1.263	1.082
C26	0.407	1.165	0.994
C27	0.382	1.130	0.959
C28	0.328	1.003	0.849
C29	0.299	0.939	0.792
C30 Plus	2.988	11.954	9.759
	100.000	100.000	100.000

Certificate of Analysis

Number: 1030-24080790-001A

Houston Laboratories
8820 Interchange Drive
Houston, TX 77054
Phone 713-660-0901

Liz Morgan
Merit Energy Company
13727 Noel Road, Suite 1200
Dallas, TX 75240

Station Name:	Mathers Ranch 18H	Report Date:	09/10/2024
Method:	GPA 2103M	Sampled By:	
Cylinder No:	1111-000345	Sample Of:	Liquid Spot
Instrument 1:	HGC 19A + 19B, Front TCD #19A	Sample Date:	08/15/2024
Instrument 2:	High Temp, HTSD	Sample Conditions:	25.6 psig, @ 74.1 °F
Analyzed:	09/03/2024 09:06:23 by SMS	Received Date:	08/23/2024
		Login Date:	08/26/2024

Calculated Physical Properties	**Total**	**C30+**
Specific Gravity at 60°F	0.7734	0.9318
API Gravity at 60°F	51.459	20.364
Molecular Weight	146.825	487.186
Pounds per Gallon (in Vacuum)	6.448	7.768
Pounds per Gallon (in Air)	6.441	7.760
Cu. Ft. Vapor per Gallon @ 14.696 psia	16.666	6.051

Andy Hartman, Laboratory Director

Quality Assurance: The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality assurance, unless otherwise stated. The test results apply to the sample as received.

Certificate of Analysis

Number: 9050-24080051-001A

Meno Laboratory
104 East US Highway 60
Meno, OK 73760

Aug. 21, 2024

Sean Craven
Merit Energy
1510 East Thomas Rd
Kalkaska, MI 49646

Station Name: MATHERS RANCH 1515-157 CL WX 18H
Method: GPA 2286
Cylinder No: 2500-00139
Analyzed: 08/20/2024 12:26:35 by DL

Sampled By: Tim Lebsack
Sample Of: Natural Gas Spot
Sample Date: 08/15/2024
Sample Conditions: 76.0 psia, @ 73.0 °F

Analytical Data

Components	Mol. %	Wt. %	GPM at 14.696 psia
Nitrogen	1.084	1.332	
Carbon Dioxide	0.803	1.550	
Methane	73.312	51.584	
Ethane	11.848	15.626	3.174
Propane	7.683	14.860	2.120
Iso-Butane	1.071	2.730	0.351
n-Butane	2.353	5.999	0.743
Iso-Pentane	0.637	2.016	0.233
n-Pentane	0.589	1.864	0.214
i-Hexanes	0.227	0.851	0.092
n-Hexane	0.135	0.525	0.057
Benzene	0.004	0.015	0.001
Cyclohexane	0.053	0.200	0.018
i-Heptanes	0.101	0.395	0.040
n-Heptane	0.012	0.053	0.006
Toluene	0.005	0.021	0.002
i-Octanes	0.047	0.193	0.019
n-Octane	0.006	0.030	0.003
Ethylbenzene	0.001	0.004	0.000
Xylenes	0.005	0.024	0.002
i-Nonanes	0.012	0.057	0.004
n-Nonane	0.002	0.013	0.001
Decane Plus	0.010	0.058	0.005
	100.000	100.000	7.085

GPM TOTAL C2+ 7.085

Calculated Physical Properties	Total	C10+
Calculated Molecular Weight	22.80	144.65
GPA 2172 Calculation:		
Calculated Gross BTU per ft³ @ 14.696 psia & 60°F		
Real Gas Dry BTU	1340.0	7800.9
Water Sat. Gas Base BTU	1316.6	7632.4
Relative Density Real Gas	0.7903	4.9945
Compressibility Factor	0.9958	

Comments: H2S Field Content 0.0003 %

Hydrocarbon Laboratory Manager

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

Certificate of Analysis

Number: 9050-24080051-001A

Meno Laboratory
104 East US Highway 60
Meno, OK 73760

Sean Craven
Merit Energy
1510 East Thomas Rd
Kalkaska, MI 49646

Aug. 21, 2024

Station Name: MATHERS RANCH 1515-157 CL WX 18H
Method: GPA 2286
Cylinder No: 2500-00139
Analyzed: 08/20/2024 12:26:35 by DL

Sampled By: Tim Lebsack
Sample Of: Natural Gas Spot
Sample Date: 08/15/2024
Sample Conditions: 76.0 psia, @ 73.0 °F

Analytical Data

Components	Mol. %	Wt. %	GPM at 14.696 psia
Nitrogen	1.084	1.332	
Carbon Dioxide	0.803	1.550	
Methane	73.312	51.584	
Ethane	11.848	15.626	3.174
Propane	7.683	14.860	2.120
Iso-Butane	1.071	2.730	0.351
n-Butane	2.353	5.999	0.743
Iso-Pentane	0.637	2.016	0.233
n-Pentane	0.589	1.864	0.214
Hexanes	0.362	1.376	0.149
Heptanes Plus	0.258	1.063	0.101
	100.000	100.000	7.085

GPM TOTAL C2+	7.085
GPM TOTAL C3+	3.911
GPM TOTAL iC5+	0.697

Calculated Physical Properties	**Total**
Relative Density Real Gas	0.7903
Calculated Molecular Weight	22.80
Compressibility Factor	0.9958

GPA 2172 Calculation:

Calculated Gross BTU per ft³ @ 14.696 psia & 60°F

Real Gas Dry BTU	1340
Water Sat. Gas Base BTU	1317

Comments: H2S Field Content 0.0003 %

Hydrocarbon Laboratory Manager

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

Certificate of Analysis

Number: 9050-24080051-001A

Meno Laboratory
104 East US Highway 60
Meno, OK 73760

Sean Craven
Merit Energy
1510 East Thomas Rd
Kalkaska, MI 49646

Aug. 21, 2024

Station Name: MATHERS RANCH 1515-157 CL WX 18H
Method: GPA 2286
Cylinder No: 2500-00139
Analyzed: 08/20/2024 12:26:35 by DL

Sampled By: Tim Lebsack
Sample Of: Natural Gas Spot
Sample Date: 08/15/2024
Sample Conditions: 76.0 psia, @ 73.0 °F

Analytical Data

Components	Mol. %	Wt. %	GPM at 14.696 psia
Nitrogen	1.084	1.332	
Carbon Dioxide	0.803	1.550	
Methane	73.312	51.584	
Ethane	11.848	15.626	3.174
Propane	7.683	14.860	2.120
Iso-butane	1.071	2.730	0.351
n-Butane	2.353	5.999	0.743
Iso-pentane	0.637	2.016	0.233
n-Pentane	0.589	1.864	0.214
Hexanes Plus	0.620	2.439	0.250
	100.000	100.000	7.085

GPM TOTAL C2+	7.085
GPM TOTAL C3+	3.911
GPM TOTAL iC5+	0.697

Calculated Physical Properties	**Total**	**C6+**
Relative Density Real Gas	0.7903	3.0980
Calculated Molecular Weight	22.80	89.73
Compressibility Factor	0.9958	
GPA 2172 Calculation:		
Calculated Gross BTU per ft³ @ 14.696 psia & 60°F		
Real Gas Dry BTU	1340.00	4872.23
Water Sat. Gas Base BTU	1316.60	4787.23

Comments: H2S Field Content 0.0003 %

Hydrocarbon Laboratory Manager

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

G3306

GAS ENGINE TECHNICAL DATA

CATERPILLAR®

ENGINE SPEED (rpm):	1800	FUEL:	Nat Gas
COMPRESSION RATIO:	10.5:1	FUEL SYSTEM:	LPG IMPCO
JACKET WATER OUTLET (°F):	210	FUEL PRESSURE RANGE(psig):	1.5-5.0
ASPIRATION:	NA	FUEL METHANE NUMBER:	80
COOLING SYSTEM:	JW+OC	FUEL LHV (Btu/scf):	905
IGNITION SYSTEM:	MAG	ALTITUDE CAPABILITY AT 77°F INLET AIR TEMP. (ft):	500
EXHAUST MANIFOLD:	WC	APPLICATION:	Gas Compression
COMBUSTION:	Standard Setting		
EXHAUST OXYGEN (% O2):	2.0		

RATING		NOTES	LOAD	100%	75%	50%
ENGINE POWER	(WITHOUT FAN)	(1)	bhp	145	109	73
ENGINE EFFICIENCY	(ISO 3046/1)	(2)	%	33.7	31.5	27.9
ENGINE EFFICIENCY	(NOMINAL)	(2)	%	33.7	31.5	27.9
ENGINE DATA						
FUEL CONSUMPTION	(ISO 3046/1)	(3)	Btu/bhp-hr	7547	8069	9136
FUEL CONSUMPTION	(NOMINAL)	(3)	Btu/bhp-hr	7547	8069	9136
AIR FLOW (77°F, 14.7 psia)	(WET)	(4) (5)	scfm	224	181	138
AIR FLOW	(WET)	(4) (5)	lb/hr	995	804	610
INLET MAN. PRESSURE		(6)	in Hg(abs)	26.4	22.3	17.8
INLET MAN. TEMPERATURE	(MEASURED IN PLENUM)	(7)	°F	88	88	88
TIMING		(8)	°BTDC	30	30	30
EXHAUST TEMPERATURE - ENGINE OUTLET		(9)	°F	1040	993	943
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(WET)	(10) (5)	ft3/min	696	544	399
EXHAUST GAS MASS FLOW	(WET)	(10) (5)	lb/hr	1050	848	644
EMISSIONS DATA - ENGINE OUT						
NOx (as NO2)		(11)(12)	g/bhp-hr	24.09	21.09	22.10
CO		(11)(13)	g/bhp-hr	1.40	1.50	1.50
THC (mol. wt. of 15.84)		(11)(13)	g/bhp-hr	1.60	1.46	1.91
NMHC (mol. wt. of 15.84)		(11)(13)	g/bhp-hr	0.24	0.22	0.29
NMNEHC (VOCs) (mol. wt. of 15.84)		(11)(13)(14)	g/bhp-hr	0.16	0.15	0.19
HCHO (Formaldehyde)		(11)(13)	g/bhp-hr	0.23	0.24	0.28
CO2		(11)(13)	g/bhp-hr	492	526	596
EXHAUST OXYGEN		(11)(15)	% DRY	2.0	2.4	2.6
LAMBDA		(11)(15)		1.13	1.14	1.14
ENERGY BALANCE DATA						
LHV INPUT		(16)	Btu/min	18217	14608	11039
HEAT REJECTION TO JACKET WATER (JW)		(17)(21)	Btu/min	5652	4965	4215
HEAT REJECTION TO ATMOSPHERE		(18)	Btu/min	729	584	442
HEAT REJECTION TO LUBE OIL (OC)		(19)(21)	Btu/min	925	812	689
HEAT REJECTION TO EXHAUST (LHV TO 77°F)		(20)	Btu/min	4769	3640	2619
HEAT REJECTION TO EXHAUST (LHV TO 350°F)		(20)	Btu/min	3361	2522	1759

CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1. (Standard reference conditions of 77°F, 29.60 in Hg barometric pressure, 500 ft. altitude.) No overload permitted at rating shown. Consult the altitude deration factor chart for applications that exceed the rated altitude or temperature.

Emission levels are at engine exhaust flange prior to any after treatment. Values are based on engine operating at steady state conditions. Tolerances specified are dependent upon fuel quality. Fuel methane number cannot vary more than ± 3. Part load data may require engine adjustment.

For notes information consult page three.

FUEL USAGE GUIDE

CAT METHANE NUMBER	25	30	35	40	45	50	55	60	65	70	75	80	100
SET POINT TIMING	-	14	16	17	19	20	22	24	25	27	28	30	30
DERATION FACTOR	0	1	1	1	1	1	1	1	1	1	1	1	1

ALTITUDE DERATION FACTORS AT RATED SPEED

INLET AIR TEMP °F	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
130	0.93	0.89	0.86	0.83	0.80	0.77	0.74	0.71	0.68	0.65	0.63	0.60	0.58
120	0.94	0.91	0.88	0.84	0.81	0.78	0.75	0.72	0.69	0.66	0.64	0.61	0.59
110	0.96	0.92	0.89	0.86	0.82	0.79	0.76	0.73	0.70	0.68	0.65	0.62	0.60
100	0.98	0.94	0.91	0.87	0.84	0.81	0.78	0.75	0.72	0.69	0.66	0.63	0.61
90	0.99	0.96	0.92	0.89	0.85	0.82	0.79	0.76	0.73	0.70	0.67	0.65	0.62
80	1	0.98	0.94	0.90	0.87	0.84	0.80	0.77	0.74	0.71	0.69	0.66	0.63
70	1	0.99	0.96	0.92	0.89	0.85	0.82	0.79	0.76	0.73	0.70	0.67	0.64
60	1	1	0.98	0.94	0.90	0.87	0.84	0.80	0.77	0.74	0.71	0.68	0.66
50	1	1	0.99	0.96	0.92	0.89	0.85	0.82	0.79	0.76	0.73	0.70	0.67

ALTITUDE (FEET ABOVE SEA LEVEL)

MINIMUM SPEED CAPABILITY AT THE RATED SPEED'S SITE TORQUE (RPM)

INLET AIR TEMP °F	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
130	1000	1010	1050	1090	1140	1180	1230	1280	1330	1380	1440	1500	1560
120	1000	1000	1030	1070	1120	1160	1210	1250	1310	1360	1420	1470	1540
110	1000	1000	1020	1060	1100	1140	1180	1230	1280	1330	1390	1450	1510
100	1000	1000	1000	1040	1080	1120	1160	1210	1260	1310	1370	1420	1480
90	1000	1000	1000	1020	1060	1100	1140	1190	1240	1290	1340	1400	1460
80	1000	1000	1000	1000	1040	1080	1120	1170	1220	1270	1320	1370	1430
70	1000	1000	1000	1000	1020	1060	1100	1150	1190	1240	1290	1350	1400
60	1000	1000	1000	1000	1000	1040	1080	1130	1170	1220	1270	1320	1380
50	1000	1000	1000	1000	1000	1020	1060	1100	1150	1200	1240	1300	1350

ALTITUDE (FEET ABOVE SEA LEVEL)

FUEL USAGE GUIDE:

This table shows the derate factor required for a given fuel. Note that deration occurs as the methane number decreases. Methane number is a scale to measure detonation characteristics of various fuels. The methane number of a fuel is determined by using the Caterpillar Methane Number Calculation program.

ALTITUDE DERATION FACTORS:

This table shows the deration required for various air inlet temperatures and altitudes. Use this information along with the fuel usage guide chart to help determine actual engine power for your site.

ACTUAL ENGINE RATING:

To determine the actual rating of the engine at site conditions, one must consider separately, limitations due to fuel characteristics and air system limitations. The Fuel Usage Guide deration establishes fuel limitations. The Altitude/Temperature deration factor and RPC (reference the Caterpillar Methane Program) are added together to establish air system limitations. To determine the actual power available, take the lowest rating between 1) and 2).

1) Fuel Usage Guide Deration
2) 1-((1-Altitude/Temperature Deration) + (1-RPC))

MINIMUM SPEED CAPABILITY AT THE RATED SPEED'S SITE TORQUE (RPM):

This table shows the minimum allowable engine turndown speed where the engine will maintain the Rated Speed's Torque for the given ambient conditions.

NOTES:

1. Engine rating is with one engine driven jacket water pump. Tolerance is ± 3% of full load.
2. ISO 3046/1 engine efficiency tolerance is (+)0, (-)5% of full load % efficiency value. Nominal engine efficiency tolerance is ± 5.0% of full load % efficiency value.
3. ISO 3046/1 fuel consumption tolerance is (+)5, (-)0% of full load data. Nominal fuel consumption tolerance is ± 5.0% of full load data.
4. Air flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 5 %.
5. Inlet and Exhaust Restrictions must not exceed A&I limits based on full load flow rates from the standard technical data sheet.
6. Inlet manifold pressure is a nominal value with a tolerance of ± 5 %.
7. Inlet manifold temperature is a nominal value with a tolerance of ± 9°F.
8. Timing indicated is for use with the minimum fuel methane number specified. Consult the appropriate fuel usage guide for timing at other methane numbers.
9. Exhaust temperature is a nominal value with a tolerance of (+)63°F, (-)54°F.
10. Exhaust flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 6 %.
11. Emissions data is at engine exhaust flange prior to any after treatment.
12. NOx values are "Not to Exceed".
13. CO, CO2, THC, NMHC, NMNEHC, and HCHO values are "Not to Exceed" levels. THC, NMHC, and NMNEHC do not include aldehydes.
14. VOCs - Volatile organic compounds as defined in US EPA 40 CFR 60, subpart JJJJ
15. Exhaust Oxygen tolerance is ± 0.5.
16. LHV rate tolerance is ± 5.0%.
17. Heat rejection to jacket water value displayed includes heat to jacket water alone. Value is based on treated water. Tolerance is ± 10% of full load data.
18. Heat rejection to atmosphere based on treated water. Tolerance is ± 50% of full load data.
19. Lube oil heat rate based on treated water. Tolerance is ± 20% of full load data.
20. Exhaust heat rate based on treated water. Tolerance is ± 10% of full load data.
21. Total Jacket Water Circuit heat rejection is calculated as: (JW x 1.1) + (OC x 1.2). Heat exchanger sizing criterion is maximum circuit heat rejection at site conditions, with applied tolerances. A cooling system safety factor may be multiplied by the total circuit heat rejection to provide additional margin.

ENGINE POWER (bhp):	145	COOLING SYSTEM:	JW+OC
ENGINE SPEED (rpm):	1800		
EXHAUST MANIFOLD:	WC	JACKET WATER OUTLET (°F):	210

Free Field Mechanical and Exhaust Noise

SOUND PRESSURE LEVEL (dB)											
			Octave Band Center Frequency (OBCF)								
100% Load Data			dB(A)	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Mechanical Sound	Distance from the Engine (ft)	3.3	91.7	72.4	82.4	83.4	84.9	86.9	86.4	81.9	77.9
		23.0	81.7	65.6	76.1	74.1	72.6	78.1	76.1	70.6	65.6
		49.2	75.7	59.6	70.1	68.1	66.6	72.1	70.1	64.6	59.6
Exhaust Sound	Distance from the Engine (ft)	4.9	110.4	109	111	109	101	104	104.5	102	99
		23.0	97	95.5	98	91	86.5	89	90.5	91.5	87.5
		49.2	90.4	90.2	93.2	87.7	80.7	82.7	83.2	84.7	79.7

Sound Data

Data Variability Statement:
Sound data presented by Caterpillar has been measured in accordance with ISO 6798 in a Grade 3 test environment. Measurements made in accordance with ISO 6798 will result in some amount of uncertainty. The uncertainties depend not only on the accuracies with which sound pressure levels and measurement surface areas are determined, but also on the 'near-field error' which increases for smaller measurement distances and lower frequencies. The uncertainty for a Grade 3 test environment, that has a source that produces sounds that are uniformly distributed in frequency over the frequency range of interest, is equal to 4 dB (A-weighted). This uncertainty is expressed as the largest value of the standard deviation.