MPLX, L.P.
1515 Arapahoe Street
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September 24, 2021

Via STEERS

Air Permits Initial Review Team (APIRT)
Texas Commission on Environmental Quality (TCEQ)
12100 Park 35 Circle, MC 161
Building C, Third Floor
Austin, TX 78753

Re: TCEQ Non-Rule Standard Permit Revision
Registration No. 153270
MarkWest Tornado GP L.L.C.
Tornado Gas Plant – Loving County, Texas
Customer Reference Number (CN) 605563352
Regulated Entity Reference Number (RN) 110481942

Dear APIRT:

MarkWest Tornado GP L.L.C (MarkWest) owns and operates a natural gas processing plant located in Loving County, Texas (Tornado Gas Plant). MarkWest has been assigned TCEQ Customer Number (CN) CN605563352. The Tornado Gas Plant has been assigned TCEQ Regulated Entity Number (RN) RN110481942. Operations at the site are authorized under the Oil and Gas non-rule standard permit (NRSP) (6002) Registration No. 153270. The Tornado Gas Plant is a major source with respect to the federal operating permits program (Title V) and a minor source with respect to the Prevention of Significant Deterioration (PSD) program.

With this NRSP revision, the Tornado Gas Plant proposes to increase the following representations:

- Gas flowrate to the flare during planned maintenance, start-up, and shutdown (MSS) activities;
- Thermal Oxidizer (TO) downtime;
- Produced water throughput; and
- Fugitive component counts.

MarkWest submitted the new project notification (Notification Number 153270, Project No. 328758) for this project on May 12, 2021 via TCEQ State of Texas Environmental Electronic Reporting System (STEERS). This registration demonstrates that the site complies with the NRSP requirements and, therefore, may be authorized to operate under the specified Standard Permit provisions.

MarkWest is submitting this registration through TCEQ STEERS. The $50 pre-construction notification fee and $850.00 NRSP registration fee for the Tornado Gas Plant has been submitted to the TCEQ Revenue Section via electronic payment.

If you have any questions or comments about the information presented in this application, please feel free to contact me via email at rkileo@marathonpetroleum.com or call me at (303) 476-5762.

Sincerely,

Rebecca T. Kileo

Rebecca Kileo
G&P Engineer II

Enclosure

cc: Air Section Manager, TCEQ Region 7 (Midland)
Mr. Edward Cimaroli, MPLX L.P. (electronically)
Ms. Katie Jeziorski, Trinity Consultants (electronically)

TCEQ NON-RULE STANDARD PERMIT REVISION REGISTRATION NO. 153270

MarkWest Tornado GP L.L.C / Tornado Gas Plant

Prepared By:

Rebecca Kileo –G&P Engineer II

MARKWEST TORNADO GP L.L.C.
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Katie Jeziorski – Managing Consultant
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TRINITY CONSULTANTS
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Fax (972) 385-9203

September 2021

Project 214401.0138

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1. REGISTRATION FEE

Per Section 6002(f)(5)(C) of the Non-Rule Standard Permit (NRSP), an $850 fee is required to be submitted for this registration. Per Section 6002(f)(4)(B), a separate $50 fee was made at the time of the pre-construction notification submittal on May 12, 2021 (Permit Number [No.] 153270, Project No. 328758). The combined Standard Permit fee totals to $900 (i.e. $850 registration fee plus $50 notification fee).

The $850 fee associated with this registration has been submitted to the Texas Commission on Environmental Quality (TCEQ) via electronic payment in the State of Texas Environmental Electronic Reporting System (STEERS).

2. EXECUTIVE SUMMARY

MarkWest Tornado GP L.L.C. (MarkWest) owns and operates a natural gas processing plant located in Loving County, Texas (Tornado Gas Plant). MarkWest has been assigned TCEQ Customer Number (CN) CN605563352. The Tornado Gas Plant has been assigned TCEQ Regulated Entity Number (RN) RN110481942. Operations at the site are authorized under the Oil and Gas NRSP (6002) Registration No. 153270. An emergency generator is authorized under Permit By Rule (PBR) 106.511 and is maintained under separate documentation.

The Tornado Gas Plant is located in Loving County, TX. Loving County is currently designated as an attainment or unclassified area for all pollutants.[1] The Tornado Gas Plant is a minor source with respect to the Prevention of Significant Deterioration (PSD) program and a major source with respect to the federal operating permits program (Title V).

MarkWest submitted the new project notification (Permit No. 153270, Project No. 328758) for this project on May 12, 2021 via STEERS. This Standard Permit Registration is being submitted before the required timeline of 90 days from the start of operation per Section (f)(5)(A) of the Air Quality Standard Permit for Oil and Gas Handling and Production Facilities. This registration demonstrates that the site complies with the NRSP requirements and, therefore, may be authorized to operate under the specified Standard Permit provisions.

With this NRSP revision, the Tornado Gas Plant proposes to increase the following representations:

- Gas flowrate to the flare during planned maintenance, start-up, and shutdown (MSS) activities;
- Thermal Oxidizer (TO) downtime;
- Produced water throughput; and
- Fugitive component counts.

This registration includes the supporting documentation for the equipment and operations at the Tornado Gas Plant, including a plot plan, process description, process flow diagram (PFD), emissions data, impacts assessment, gas analysis, and review of potentially applicable regulatory requirements. The plot plan is included in Appendix A of this registration.

[1] The United States Environmental Protection Agency (U.S. EPA) Green Book. Source:

https://www3.epa.gov/airquality/greenbook/ancl.html#TX, accessed in September 2021.

3. PROCESS DESCRIPTION AND PROCESS FLOW DIAGRAM

This process description includes site-wide operations including the amine inlet treater with glycol dehydrator and associated equipment in addition to existing sources. The Tornado Gas Plant is a cryogenic natural gas processing plant that produces a residue gas product and a natural gas liquid (NGL) product. Natural gas enters the Tornado Gas Plant from various lines and flows into the inlet separators. The inlet separators separate heavier hydrocarbons from the incoming natural gas.

After inlet separation, the natural gas enters an amine inlet treating system (Emission Point Number [EPN] AMINE-IN), which uses an aqueous amine solution to remove CO_2 and H_2S. CO_2 and H_2S exit with the amine from the bottom of the contactor. The inlet amine unit flash tank is used to flash off high ethane content vapors. The emissions from the inlet amine unit flash tank are routed to the fuel gas system. The fuel gas is then combusted by various units that use fuel gas on-site. The inlet amine solution is heated and regenerated using a hot oil heater (EPN HTR-4). The acid gas released from the regeneration process is routed to a vertical TO for control (EPN TO-2).

The gas from the amine inlet treater system enters the glycol dehydration unit (FIN TEGDEHY) for removal of water prior to the cryogenic process. The gas is treated with lean triethylene glycol (TEG) in the glycol contactor which absorbs most of the water from it. Note that the TEG also absorbs small amounts of hydrocarbons including benzene, toluene, ethylbenzene, and xylene (BTEX). The treated gas then continues to the mole sieve dehydration system. The rich TEG is depressurized in the flash tank, and the resultant vapors, which contain some BTEX, flow to the fuel gas system (EPN FLASHVENT). The depressurized rich TEG then flows to the glycol reboiler (EPN HTR-5) where a heater boils the water out of the TEG. The lean TEG is then pumped back to the glycol contactor. The steam from the glycol reboiler, which also contains some BTEX, flows to the JACTO system which condenses nearly all of the vapor. The resultant condensate is sent to the closed drain. The uncondensed vapors, containing BTEX, are sent to the combustor where they are destroyed with 95% control efficiency (EPN STILLCOMB).

The gas from the glycol dehydration unit enters the mole sieve dehydrator beds for removal of any traces of water prior to the cryogenic process. Dehydrated high pressure gas is used for regeneration. The regeneration gas is heated by a mol sieve regeneration heater (EPN HTR-3). The hot gas flows from the heater to the dehydrator vessel being regenerated, and water is removed from the molecular sieve.

The dehydrated gas then flows through a cryogenic processing system to separate the mixed NGLs from the gas stream using differences in relative volatility. The condensed hydrocarbons form the Y-grade NGLs that are sent downstream for further processing. The high methane content residue gas is compressed by engine-driven compressors, so it can be routed to sales via pipeline (EPNs ENG-1 through ENG-7). A small portion of the residue gas is used as fuel for various heaters and engines. Refrigeration compression for the cryogenic process is achieved by electric-driven screw compressors. Ethane rejection will be achieved with minimal process changes. During ethane rejection, the NGL amine treating system is not in use.

The NGL amine treating system (EPN AMINE) uses an aqueous amine solution to remove CO_2 and H_2S. CO_2 and H_2S exit with the amine from the bottom of the contactor. The amine unit flash tank is used to flash off high ethane content vapors. The emissions from the amine unit flash tank are routed to the fuel gas system, where it is mixed with residue gas from the cryogenic process. The fuel gas is then combusted by various units that use fuel gas on-site. The amine solution is heated and regenerated using an amine regeneration reboiler (EPN HTR-2). The acid gas released from the regeneration process is routed to the TO for control

(EPN TO-1). Additionally, there are 2,000 hours per year downtime for both TOs, during which the acid gas from the regeneration processes is routed to the flare for control (EPN FLR-1 TO DT).

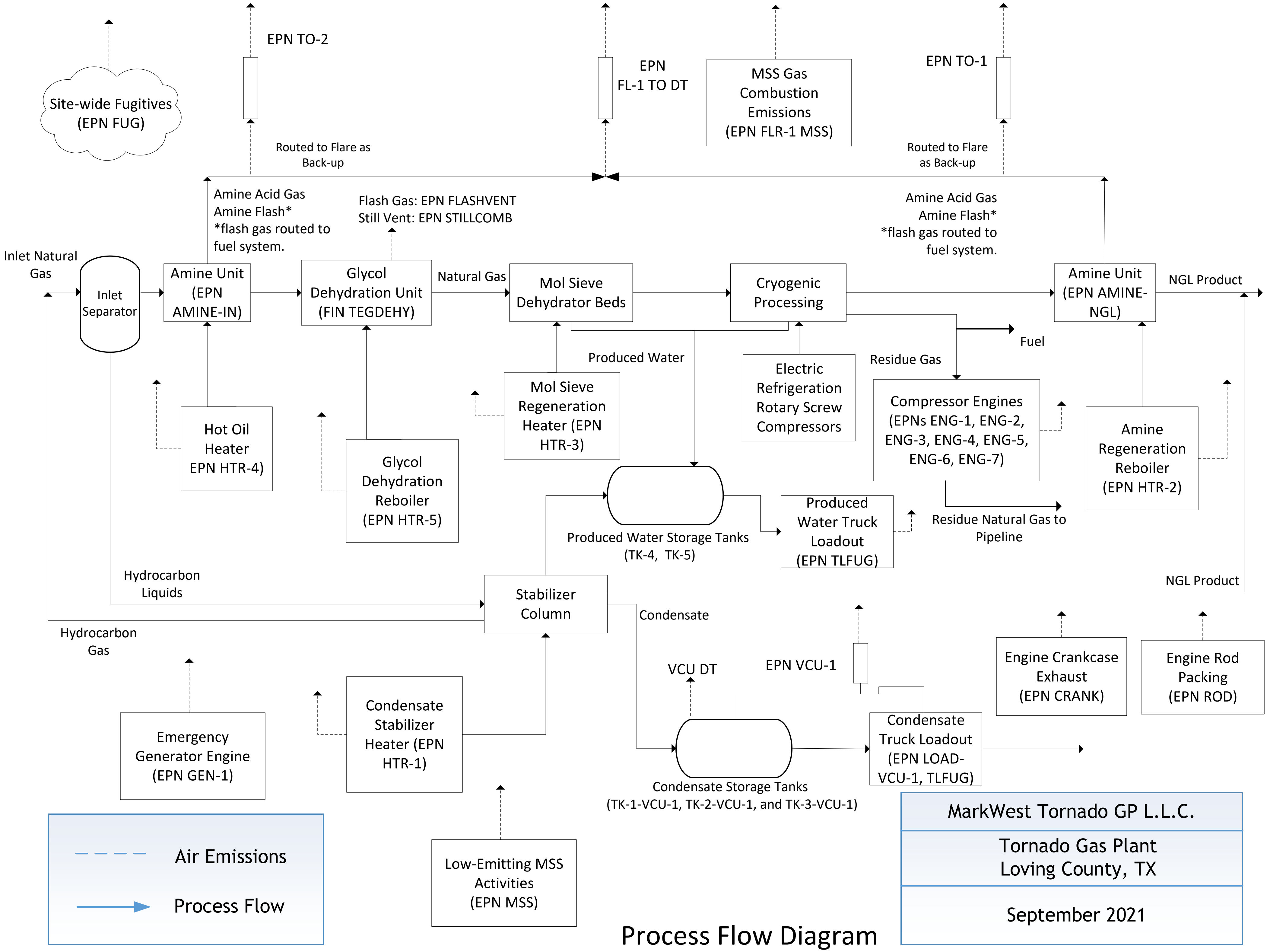
After the inlet separation, the heavy hydrocarbons are piped to the first stabilizer column, where initial separation returns light hydrocarbon gas to the inlet stream. The stabilizer is heated by a condensate stabilizer heater (EPN HTR-1) when the second column is in use. The distillation column has two modes of operation. During single tower operation, the NGL liquid stream produced out of the first distillation column is comingled with the cryogenic gas processing NGL stream. The comingled NGL stream is then sent to pipeline. During the double tower operation, the second distillation column produces an overhead NGL product, which is condensed and comingled with the cryogenic gas processing NGL stream and sent to pipeline, as well as a liquid 9 RVP condensate product. The condensate is cooled and sent to atmospheric storage tanks (EPNs TK-1-VCU-1, TK-2-VCU-1, and TK-3-VCU-1). The condensate storage tanks are controlled by the VCU (EPN VCU-1). Additionally, there are 350 hours per year of VCU downtime, during which the condensate tanks is vented to the atmosphere. Condensate is stabilized to a level suitable for trucking and is loaded into tank trucks (EPN TLFUG). The truck loading of condensate is controlled by the VCU (EPN LOAD – VCU-1). Truck loading will not occur during VCU downtime.

Water separated from the cryogenic gas process, condensate stabilization, mol sieve dehydration, skid drains, and storms drains are stored in two produced water atmospheric tanks (EPNs TK-4 and TK-5).

Additional emissions from the site include fugitive emissions from equipment leaks (EPN FUG), an emergency generator authorized under Title 30 of the Texas Administrative Code (30 TAC) Section §106.511 (EPN GEN-1), crankcase exhaust from the natural gas-fired compressor engines (EPN CRANK), continuous leaks from reciprocating compressor rod packing seals (EPN ROD), and MSS activities (EPNs MSS and FLR-1 MSS). The pneumatic devices at the site are driven by instrument air. Therefore, there are no emissions from the pneumatic devices. The MSS activities are performed at the Tornado Gas Plant to ensure the site will operate in a manner that is safe, efficient, and environmentally sound. These periodic maintenance activities (planned and predictable) include, but are not limited to, the following activities:

- Compressor blowdowns;
- Vessel blowdowns;
- Plant turnarounds;
- Pipeline maintenance;
- Pipeline pigging operations;
- VCU downtime; and
- Low Emitting MSS Activities.

A process flow diagram is included at the end of this section.



Process Flow Diagram

4. EMISSIONS SUMMARY

EMISSIONS SUMMARY

Hourly and Annual Emissions

EPN / Emission Source	VOC [1]		NO_X		CO		PM_{10}		$PM_{2.5}$		SO_2		H_2S		HAPs	
	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
ENG-1 / Cat G3608 A4 Engine	1.54	6.76	1.82	7.97	0.79	3.45	0.19	0.83	0.19	0.83	0.02	0.07	--	--	0.48	2.09
ENG-2 / Cat G3608 A4 Engine	1.54	6.76	1.82	7.97	0.79	3.45	0.19	0.83	0.19	0.83	0.02	0.07	--	--	0.48	2.09
ENG-3 / Cat G3608 A4 Engine	1.54	6.76	1.82	7.97	0.79	3.45	0.19	0.83	0.19	0.83	0.02	0.07	--	--	0.48	2.09
ENG-4 / Cat G3608 A4 Engine	1.54	6.76	1.82	7.97	0.79	3.45	0.19	0.83	0.19	0.83	0.02	0.07	--	--	0.48	2.09
ENG-5 / Cat G3608 A4 Engine	1.54	6.76	1.82	7.97	0.79	3.45	0.19	0.83	0.19	0.83	0.02	0.07	--	--	0.48	2.09
ENG-6 / Cat G3608 A4 Engine	1.54	6.76	1.82	7.97	0.79	3.45	0.19	0.83	0.19	0.83	0.02	0.07	--	--	0.48	2.09
ENG-7 / Cat G3608 A4 Engine	1.54	6.76	1.82	7.97	0.79	3.45	0.19	0.83	0.19	0.83	0.02	0.07	--	--	0.48	2.09
CRANK / Crankcase	0.17	0.75	0.14	0.61	0.38	1.64	--	--	--	--	--	--	--	--	--	--
ROD / Rod Packing	0.21	0.92	--	--	--	--	--	--	--	--	--	--	6.14E-06	2.69E-05	0.01	0.05
AMINE-NGL / NGL Amine Treater[2]	1.16	5.09	--	--	--	--	--	--	--	--	--	--	2.71E-03	0.01	1.14E-03	5.00E-03
AMINE-IN / Amine Unit Inlet Treater[2]	3.12	13.69	--	--	--	--	--	--	--	--	--	--	4.11E-04	1.80E-03	0.07	0.31
HTR-1 / Condensate Stabilizer Heater	0.32	1.40	0.67	2.93	0.68	2.97	0.23	1.01	0.23	1.01	9.81E-03	0.04	1.49E-04	6.53E-04	0.03	0.14
HTR-2 / Amine Regeneration Reboiler	0.26	1.16	0.55	2.42	0.56	2.45	0.19	0.83	0.19	0.83	8.10E-03	0.04	1.23E-04	5.39E-04	0.03	0.11
HTR-3 / Mol Sieve Regeneration	0.04	0.18	0.76	3.35	0.57	2.51	0.06	0.25	0.06	0.25	4.59E-03	0.02	6.98E-05	3.06E-04	0.01	0.06
HTR-4 / Hot Oil Heater	0.88	3.85	1.66	7.29	1.90	8.30	0.65	2.84	0.65	2.84	0.03	0.12	4.14E-04	1.81E-03	0.09	0.37
HTR-5 / Glycol Reboiler	0.01	0.06	0.25	1.07	0.18	0.81	0.02	0.08	0.02	0.08	1.47E-03	6.44E-03	2.24E-05	9.79E-05	4.63E-03	0.02
STILLCOMB / Glycol Dehydration Unit Still Vent	0.93	4.06	1.44	6.32	2.88	12.63	--	--	--	--	0.01	0.05	3.25E-04	1.43E-03	0.41	1.78
FLASHVENT / Glycol Dehydration Unit Flash Gas	0.16	0.71	--	--	--	--	--	--	--	--	--	--	2.50E-05	1.10E-04	9.74E-03	0.04
TK-1 - VCU-1 / Condensate Tank[3,4]	0.04	0.48	--	--	--	--	--	--	--	--	--	--	1.00E-16	1.32E-15	5.28E-03	0.07
TK-2 - VCU-1 / Condensate Tank[3,4]	0.04	0.48	--	--	--	--	--	--	--	--	--	--	1.00E-16	1.32E-15	5.28E-03	0.07
TK-3 - VCU-1 / Condensate Tank[3,4]	0.04	0.48	--	--	--	--	--	--	--	--	--	--	1.00E-16	1.32E-15	5.28E-03	0.07
TK-4 / Produced Water Tank[3]	0.03	0.15	--	--	--	--	--	--	--	--	--	--	9.64E-17	4.22E-16	5.03E-03	0.02
TK-5 / Produced Water Tank[3]	0.03	0.15	--	--	--	--	--	--	--	--	--	--	9.64E-17	4.22E-16	5.03E-03	0.02

EMISSIONS SUMMARY

Hourly and Annual Emissions

EPN / Emission Source	VOC [1]		NO_X		CO		PM_{10}		$PM_{2.5}$		SO_2		H_2S		HAPs	
	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
VCU-1 / Waste Gas Combustion Emissions (Condensate Tanks, Loading)	2.48	2.84	0.10	0.42	0.14	0.60	--	--	--	--	1.31E-04	5.75E-04	1.40E-06	0.41	0.35	0.41
TO-1 / Thermal Oxidizer to Control Amine Acid Gas	0.06	0.25	1.11	4.85	0.63	2.77	0.08	0.35	0.08	0.35	7.02	30.73	0.04	0.18	5.53E-05	2.42E-04
TO-2 / Thermal Oxidizer to Control Inlet Amine Acid Gas	0.05	0.23	5.31	23.27	2.66	11.64	0.33	1.45	0.33	1.45	3.86	16.90	0.02	0.10	1.46E-03	6.40E-03
FUG / Site-wide Fugitives	0.55	2.41	--	--	--	--	--	--	--	--	--	--	1.41E-04	6.18E-04	8.18E-06	3.58E-05
TLFUG / Fugitives from Condensate and Produced Water Loading	2.22	1.39	--	--	--	--	--	--	--	--	--	--	--	--	0.32	0.20
LOAD - VCU-1/ Condensate Loading[5]	1.90	2.08	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FLR-1 MSS / Flare Pilot and MSS Gas Combustion Emissions	618.50	46.39	322.58	24.19	643.99	48.30	--	--	--	--	1.65	0.12	0.02	1.35E-03	--	--
FLR-1 TO DT / TO Downtime Emissions routed to the flare	40.89	40.89	8.99	8.99	77.04	77.04	--	--	--	--	7.05	7.05	0.08	0.08	2.77	2.77
MSS / Low-emitting MSS Activities	0.06	0.25	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GEN-1/ Emergency Generator (PBR 106.511)	0.59	0.03	71.08	3.55	5.85	0.29	0.39	0.02	0.39	0.02	9.07	0.45	--	--	0.11	5.54E-03
TOTAL EMISSIONS (TPY):		**177.67**		**145.03**		**196.12**		**12.64**		**12.64**		**56.03**		**0.78**		**21.19**
Maximum Operating Schedule:	**Hours/Day**	24		**Days/Week**	7		**Weeks/Year**	52		**Hours/Year**	8760					

[1] VOC emissions include formaldehyde.

[2] Thermal Oxidizer (Unit TO-1) will control non-condensable (acid gas) emissions from the amine unit (Unit AMINE-NGL). The amine flash gas will be routed to the amine unit reboiler for 95% control. The second Thermial Oxidizer (TO-2) will control non-condensable (acid gas) emissions from the inlet amine unit treater (Unit AMINE-IN). The amine flash gas will be routed to the amine regeneration reboiler unit for 95% control.

[3] Since the storage tanks are filled in parallel, the total emissions are divided by the number of tanks.

[4] The emissions from condensate loading and the emissions from Units TK-1 through TK-3 will all be controlled by a vapor combustion unit (Unit VCU-1). Emissions from TK-1 through TK-3 during VCU downtime are represented as combined with controlled emissions.

[5] Emissions from condensate loading will be controlled by a vapor combustion unit (Unit VCU-1). Produced water and fugitive condensate loading emissions are represented as TLFUG. Truck loading will not occur during VCU downtime.

5. EMISSIONS DATA AND CALCULATIONS

This section provides a summary of the emissions calculation methodologies used to estimate emissions from the proposed equipment and activities at the Tornado Gas Plant. Detailed emissions calculation tables are included at the end of this section. Program outputs (e.g., BR&E ProMax) used to quantify emissions are included at the end of this section.

Site-wide emission calculations are included for reference. However, only emission units affected by this revision are listed below. No other units are changing as part of this revision application.

5.1 Flare

The flare at the Tornado Gas Plant is utilized for control of the planned MSS activities and amine acid gas during TO downtime. A pilot stream operates for 8,760 hours per year.

5.1.1 Pilot Gas Combustion

The pilot for the flare (EPN FLR-1) is fired by natural gas/fuel gas/field gas and is assumed to operate 8,760 hours per year. NO_X and CO emission factors are obtained per TCEQ's guidance on flares. H_2S emissions are based on an H_2S content of 0.313 grains/100 scf. It is assumed that all elemental sulfur combusted by the flare is converted to SO_2 and that VOCs are controlled by the flare with a 98% destruction and removal efficiency (DRE). The flare pilot gas emissions are not proposed to change as part of this revision.

5.1.2 Waste Gas Combustion

Some planned MSS activities are routed to the flare (EPN FLR-1 MSS) for destruction. Emissions from MSS activities are calculated using mass balance based on the MSS activity volume, speciated composition of MSS waste stream, event duration, and the number of simultaneous activities. The inlet gas analysis is conservatively assumed to be representative of all MSS activities. NO_X and CO emission factors are obtained per TCEQ's guidance on flares. FLR-1 MSS controls VOC constituents with a 98% efficiency. Additionally, 2,000 hours per year downtime for the TO is proposed, during which the acid gas from the regeneration process will be routed to the flare for control (EPN FLR-1 TO DT).

5.2 Atmospheric Storage Tanks

Working, breathing, and flash (W/B/F) emissions from the produced water storage tanks are calculated using BR&E ProMax simulation software. The produced water tank throughput is assumed to be 1% condensate and 99% water. There are no proposed changes to the condensate storage tanks as part of this revision.

5.3 Atmospheric Truck Loading

Produced water is loaded into tanker trucks and removed offsite (FIN LOAD-2). The produced water loading operations are uncontrolled and vent to the atmosphere. Uncontrolled condensate loading operations are vented to the atmosphere (EPN TLFUG). The capture efficiency of 98.7% is based on documentation held by MarkWest that documents leak tested trucks. The produced water loading throughput is assumed to be 1% VOC. Emissions result from vapors in the tanker truck that are displaced by the loaded liquids.

U.S. EPA AP-42 emission factors are used to estimate emissions from truck loading. The loading method for the Tornado GP is submerged loading, dedicated normal service. The loading loss emission factor is calculated using the following equation from AP-42:

$$L_L = \frac{12.46 \times SPM}{T}$$

Where,
LL = loading loss (lb/1,000 gal loaded)
S = saturation factor (from AP-42, Section 5.2, Table 5.2-1)
P = true vapor pressure of loaded liquid (psia)
M = molecular weight of vapor (lb/lb-mol)
T = temperature of bulk liquid (°R = °F + 460)

The liquid analysis used for the calculations was obtained from a similar facility and can be found in Section 11. The vapor pressure and molecular weight of the liquid are obtained from the ProMax output file. There are no proposed changes to the condensate loading with this revision.

5.4 Fugitives

VOC emissions from leaking components are determined using an estimated component count, representative gas and liquid analyses, and the corresponding oil and gas production emission factors provided in TCEQ's Equipment Leak Fugitives guidance document. Emission calculations take into account control efficiencies gained from the NRSP leak detection and repair (LDAR) program. The fugitive component count is based on the facility's most recent component count, which includes an adjacent metering station. The maximum concentration of each constituent in the inlet gas composition is used to calculate the speciated VOC emissions for the fugitive components.

NON-RULE STANDARD PERMIT LIMIT COMPARISON

Air Contaminant	Site-Wide Emission Totals			Standard Permit Limits per 6002(h).		
	Steady-state or <30 psig periodic release (lb/hr)	≥ 30 psig periodic (up to 600 hr/yr) (lb/hr)	Total [1] (tpy)	Steady-state or <30 psig periodic release (lb/hr)	≥ 30 psig (up to 600 hr/yr) (lb/hr)	Total (tpy)
Total VOC	--	--	177.64	--	--	250
Total crude oil or condensate VOC	4.91	--	--	145	318	--
Total natural gas VOC	20.50	659.39	--	750	1635	--
Benzene	2.99	--	1.19	7	15.4	10.2
H_2S	0.16	--	0.78	10.8	9.8	47
SO_2	19.75	--	55.57	93.2	--	250
NO_x	33.71	--	141.48	121	--	250
CO	93.14	--	195.83	104	--	250
PM_{10}	2.88	--	12.62	28	--	15
$PM_{2.5}$	2.88	--	12.62	28	--	15

[1] The total in the NRSP limit comparison table does not match the site-wide totals due to the inclusion of the emergency generator engine which is authorized via PBR.

MarkWest Tornado GP L.L.C. - Tornado Gas Plant

Engine Emission Calculations

Engine Input Information	
Engine Make/Model	Caterpillar, G3608 with ADEM A4
EPN(s):	ENG-1 through ENG-7 (7 engines)
Engine Type	4-stroke, lean burn (4SLB)

Engine Parameters			
Specification	**Value**	**Units**	**Notes**
Hours of Operation	8,760	hr/yr	-
Maximum Horsepower	2,500	hp	Manufacturer
Maximum Speed	1,000	rpm	Manufacturer
Volumetric Exhaust	16,073	scfm	Manufacturer
Fuel HHV	992	Btu/scf	Nominal
Fuel Usage Rate	7,585	BTU/hp-hr	Manufacturer
Heat Input Rating	19.0	MMBtu/hr	Calculated
Hourly Fuel Usage	19.1	Mscf/hr	Calculated
Annual Fuel Usage	167.5	MMscf/yr	Calculated
Stack Temp	831	deg F	Manufacturer
Stack Height	20	ft	Design Specification
Stack Diameter	1.7	ft	Design Specification
Stack Velocity	118.0	ft/s	Calculated

Uncontrolled Emissions for Criteria Pollutants, VOCs, and HAPs Per Engine				
Pollutant	**EF (g/hp-hr)**	**Emissions (lb/hr)**	**(tpy)**	**Notes**
NO_x[1]	0.30	1.7	7.24	Manufacturer
CO[1]	2.57	14.2	62.04	Manufacturer
VOC[1]	1.03	5.7	24.86	Manufacturer
$PM/PM_{10}/PM_{2.5}$[2]	0.03	0.19	0.83	AP-42 Table 3.2-2 (4SLB)
SO_2[3]	-	0.016	0.070	Pipeline Quality Natural Gas[3]
Total HAPs[2]	-	1.23	5.4	AP-42 Table 3.2-2 (4SLB)
Formaldehyde[1]	0.16	0.86	3.8	Manufacturer

Controlled Emissions (Oxidation Catalyst) for Criteria Pollutants, VOCs, and HAPs Per Engine					
Pollutant	**EF (g/hp-hr)**	**EF (With Safety Factor)[4] (g/hp-hr)**	**Emissions (lb/hr)**	**(tpy)**	**Notes**
NO_x	0.30	0.33	1.8	7.97	Oxidation Catalyst
CO	0.13	0.14	0.8	3.45	Oxidation Catalyst
VOC	0.26	-	1.4	6.28	Oxidation Catalyst
$PM/PM_{10}/PM_{2.5}$	0.03	-	0.19	0.83	AP-42 Table 3.2-2 (4SLB)
SO_2	-	-	0.016	0.070	Pipeline Quality Natural Gas[3]
Total HAPs	-	-	0.48	2.1	AP-42 Table 3.2-2 (4SLB)
Formaldehyde	0.02	-	0.11	0.48	Manufacturer

[1] Based on manufacturer's data sheet
[2] AP-42 (7/2000) Table 3.2-2, 4-stroke lean burn
[3] SO_2 emissions calculated based on fuel gas H2S content of 0.313 gr/100 scf
0.313 grains H_2S/100 scf * 1 lb H_2S/7000 grains H_2S *(64 g/mol SO_2) / (34 g/mol H_2S) * Fuel usage Mscf/hr
[4] A safety factor has been added to NOx and CO emissions ----> Safety Factor 10%

Crankcase Emission Calculations

EPN: CRANK

Engine Parameters			
Specification	**Value**	**Units**	**Notes**
Hours of Operation	8,760	hr/yr	-
Maximum Horsepower	2,500	hp	Manufacturer

Pollutant	EF	Emissions - Per Crankcase		Emissions - Total	
	(g/hp-hr)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
NO_X[1]	0.003600	0.02	0.09	0.14	0.61
CO[1]	0.009720	0.05	0.23	0.38	1.64
VOC[1]	0.004440	0.02	0.11	0.17	0.75

[1] Based on MarkWest testing for the same make and model of the engines on site.

[2] Gas Vented to Atmosphere per engine (lb/hr) = Horsepower (hp) x Emission Factor (g/hp-hr) / 453.6 (g/lb)

Example Hourly Emission Rate per engine (lb/hr) = 2,500 hp | 0.003600 g / hp-hr | lb / 453.6 g = 0.02 lb/hr

Rod Packing Emission Calculations

Rod Packing Volume to Atmosphere (Entire Plant):

Gas Compressed	Number of Compressors [1]	Number of Continuously Operating Compressors [1]	Leak Factor [2] (scf/hr)	Total Volume NG Emitted (scf/hr)	Total Volume NG Emitted [3] (scf/yr)
Residue	7	7	1.95	14	119,779

[1] Number of compressors ~~were~~ provided via email from Becky Kileo, MarkWest, to Katie Jeziorski, Trinity.

[2] The gas leak factor is conservatively based on the methane composition of the inlet gas applied to the 40 CFR Part 98, Subpart W compressor rod packing leak factor.

[3] Example Calculation:

Compressor Rod Packing leaks (scf/yr) = # of continuously operating compressors * LF (scf/hr) * annual hours of operation (8,760 hrs/yr)

Hours of operation: 8,760

Emissions from Uncontrolled Rod Packing Venting (Entire Plant):

Compound [1]	Composition [1] (Mole %)	MW (lb/lb-mole)	Gas Vented to Atmosphere [2] (lb/hr)	Total Gas Vented to Atmosphere [3, 4] (lb/hr)	Total Gas Vented to Atmosphere [3, 4] (tpy)
H_2S	0.000	34.080	6.14E-06	6.14E-06	2.69E-05
Nitrogen	0.018	12.007	7.90E-03	7.90E-03	0.035
CO_2	0.021	44.010	0.03	0.03	0.145
Methane	0.724	16.040	0.42	0.42	1.834
Ethane	0.124	30.070	0.13	0.13	0.587
Propane	0.067	44.100	0.11	0.11	0.468
i-Butane	0.009	58.120	0.02	0.02	0.079
n-Butane	0.021	58.120	0.04	0.04	0.194
n-Pentane	0.005	72.150	0.01	0.01	0.055
i-Pentane	0.004	72.150	0.01	0.01	0.051
n-Hexane	0.004	78.178	0.01	0.01	0.050
Heptanes	0.001	100.210	1.99E-03	1.99E-03	0.009
Octanes	0.001	114.230	2.51E-03	2.51E-03	0.011
VOC [5]			**0.21**	**0.21**	**0.92**
HAPS [6]			**0.01**	**0.01**	**0.05**

[1] Speciated composition is calculated based on the flowrate of rod packing venting and conservatively the composition of inlet gas.

[2] Gas Vented to Atmosphere (lb/hr) = Hourly Flowrate (scf/hr) x Mole Percent x MW (lb/lb-mole) / 379.5 (scf/lb-mole)

Example Propane Inlet Gas Hourly Emission Rate (lb/hr) = $\frac{13.7\ \text{scf}}{\text{hr}} \times 0.067 \times \frac{44.10\ \text{lb}}{\text{lb-mole}} \times \frac{\text{lb-mole}}{379.5\ \text{scf}} = \frac{0.11\ \text{lb}}{\text{hr}}$

[3] Total Hourly Emissions (lb/hr) represents the sum of the inlet gas and stabilizer overhead gas hourly emissions to atmosphere.

[4] Total Annual Emissions (tpy) = Total Hourly Emissions (lb/yr) x Hours of Operation (hr/yr) x (1 ton / 2,000 lb)

Example Annual Propane Emission Rate Vented to Atmosphere (tpy) = $\frac{0.11\ \text{lb}}{\text{hr}} \times \frac{8760\ \text{hr}}{\text{yr}} \times \frac{1\ \text{ton}}{2{,}000\ \text{lb}} = \frac{0.47\ \text{tpy}}{\text{yr}}$

[5] Total VOC taken as the sum of NMNEHC.

[6] Total HAPs taken as the sum of all hazardous air pollutants.

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Amine Unit Emission Calculations

Amine Information	
EPN	**AMINE**
Description	**Liquid NGL Treating Unit**
Feed NGL	5050 lbmol/hr
Lean Amine	216 gpm
Unit:	AMINE-1

Stream	Units	Flash Gas	Acid Gas
Temperature	F	122.96	120.00
Pressure	psig	65.0	8.0
Flowrate	lb/hr	111.59	5946.39
Vapor Volume Flow	MMSCFD	0.032	1.29
Density	lb/ft^3	0.42	0.15
Composition		Mass Flow (tpy)	Mass Flow (tpy)
Nitrogen		0.00	0.00
Carbon Dioxide		12.02	25093.54
Methane		14.29	1.78
Ethane		354.75	65.97
Propane		87.08	17.42
i-Butane		2.43	2.04
n-Butane		10.66	2.87
i-Pentane		0.70	0.14
n-Pentane		0.758	0.15
n-Hexane		0.10	0.022
n-Heptane		0.012	0.0040
n-Octane		0.00	0.00
Hydrogen Sulfide		0.24	16.51
Total Hydrocarbons (tpy)		470.78	90.40
Total VOC (tpy)		101.74	22.64
Total HAP (tpy)		0.10	0.022
H_2S (tpy)		0.24	16.51

Uncontrolled Emissions [1]			
	Flash Gas	**Acid Gas**	**Unit**
VOC	23.23	5.17	lb/hr
	101.74	22.64	tpy
HAP	0.023	0.0050	lb/hr
	0.10	0.022	tpy
H_2S	0.054	3.77	lb/hr
	0.24	16.51	tpy

[1] Uncontrolled amine emissions are obtained from a DOW simulation. Amine flash gas is sent to the amine unit reboiler for 95% control. Amine acid gas is sent to the thermal oxidizer (TO) or to the flare during TO downtime.

Controlled Emissions [1]		
	Flash Gas	**Unit**
VOC	1.16	lb/hr
	5.09	tpy
HAP	0.001	lb/hr
	0.01	tpy
H_2S	0.003	lb/hr
	0.01	tpy

[1] Amine flash gas is sent to the amine unit reboiler for a Control efficiency of 95%

Amine Unit Emission Calculations

Amine Information	
EPN	**AMINE-IN**
Description	**Inlet Treating Unit**
Feed Inlet	744.47 lbmol/hr
Lean Amine	71,984 gpm
Unit:	AMINE-IN

Stream	Units	Flash Gas	Acid Gas	Flash gas (controlled)
Temperature	F	155.70	120.00	--
Pressure	psig	70.0	8.0	--
Flowrate	lb/hr	496.11	31260	--
Vapor Volume Flow	MMSCFD	0.194	6.78	--
Density	lb/ft^3	0.30	0.15	--
Composition		Mass Flow (tpy)	Mass Flow (tpy)	Mass Flow (tpy)
Nitrogen		9.43	2.66	9.43
Carbon Dioxide		436.34	132297.61	436.34
Methane		962.14	81.92	48.1068
Ethane		416.53	60.89	20.8265
Propane		142.29	8.18	7.1147
i-Butane		37.51	5.19	1.87555
n-Butane		51.65	3.37	2.5823
i-Pentane		16.20	1.69	0.8098
n-Pentane		12.82	1.32	0.6411
n-Hexane		6.28	0.58	0.31395
n-Heptane		5.63	0.67	0.28165
n-Octane		1.29	0.12	0.06465
Hydrogen Sulfide		0.04	9.08	0.0018
Total Hydrocarbons (tpy)		1652.34	163.95	528.3908
Total VOC (tpy)		273.67	21.13	13.6855
Total HAP (tpy)		6.28	0.582	0.31395
H_2S (tpy)		0.04	9.08	0.0018

Uncontrolled Emissions [1]				
	Flash Gas	**Acid Gas**	**Flash Gas (controlled)**	**Unit**
VOC	62.48	4.82	3.12	lb/hr
	273.67	21.13	13.69	tpy
HAP	1.434	0.1329	0.0717	lb/hr
	6.28	0.582	0.314	tpy
H_2S	0.008	2.07	4.11E-04	lb/hr
	0.04	9.08	1.80E-03	tpy

[1] Uncontrolled amine emissions are obtained from a DOW simulation. Amine flash gas is routed back to the fuel gas and combusted in the reboiler for 95% control. Amine acid gas is sent to the thermal oxidizer (TO-2) or to the flare during TO downtime.

Heater Emissions

Heater Input Data

EPN	UNIT	HEAT RATE (MMBtu/hr)	HEATING VALUE (BTU/scf)	RUNTIME (hr/yr)
HTR-1	Condensate Stabilizer Heater	16.7	992	8,760
HTR-2	Amine Regenerator Reboiler	13.8	992	8,760
HTR-3	Mol Sieve Regeneration	7.8	992	8,760
HTR-4	Hot Oil Heater	46.2	992	8,760
HTR-5	Glycol Reboiler	2.5	992	8,760

Emission Factors [1]

	Emission Factors (lb/MMscf)					Emission Factors (lb/MMBtu)				
	$PM/PM_{10}/PM_{2.5}$	NO_x	CO	SO_2	VOC	$PM/PM_{10}/PM_{2.5}$	NO_x	CO	SO_2	VOC
HTR-1 [1]				0.6		0.0138	0.0401	0.0407	0.0006	0.0192
HTR-2 [1]				0.6		0.0138	0.0401	0.0407	0.0006	0.0192
HTR-3 [2,3]	7.6	100	75	0.6	5.5	0.0075	0.0980	0.0735	0.0006	0.0054
HTR-4 [1]				0.6		0.0140	0.0360	0.0410	0.0006	0.0190
HTR-5 [2,3]	7.6	100	75	0.6	5.5	0.0075	0.0980	0.0735	0.0006	0.0054

[1] Emission factors for PM, NO_X, CO, and VOC based on manufacturer's data. Emission factor for SO_2 based on AP-42 Table 1.4-2

[2] Emission factors based on AP-42 Section 1.4 Natural Gas Combustion for External Combustion Sources, Table 1.4-1 & 1.4-2 (July 1998) for Small Boilers Uncontrolled (<100 MMBtu/hr Heat Input)

Default heating value of 1020 to convert MMscf to MMBtu

[3] CO emission factor for HTR-3 and HTR-5 based on NRSP limit for heaters.

Heater Emission Calculations [1]

EPN	MAXIMUM HOURLY EMISSIONS						ANNUAL EMISSIONS					
	$PM/PM_{10}/PM_{2.5}$ (lb/hr)	NO_X (lb/hr)	CO (lb/hr)	SO_2 (lb/hr)	VOC (lb/hr)	H_2S [2] (lb/hr)	$PM/PM_{10}/PM_{2.5}$ (tpy)	NO_X (tpy)	CO (tpy)	SO_2 (tpy)	VOC (tpy)	H_2S [2] (tpy)
HTR-1	0.23	0.67	0.68	9.81E-03	0.32	1.49E-04	1.01	2.93	2.97	0.043	1.40	6.53E-04
HTR-2	0.19	0.55	0.56	8.10E-03	0.26	1.23E-04	0.83	2.42	2.45	0.035	1.16	5.39E-04
HTR-3	0.06	0.76	0.57	4.59E-03	0.04	6.98E-05	0.25	3.35	2.51	0.020	0.18	3.06E-04
HTR-4	0.65	1.66	1.90	0.03	0.88	4.14E-04	2.84	7.29	8.30	0.119	3.85	1.81E-03
HTR-5	0.02	0.25	0.18	1.47E-03	0.01	2.24E-05	0.08	1.07	0.81	6.441E-03	0.06	9.79E-05
Total	**1.14**	**3.90**	**3.89**	**0.051**	**1.52**	**7.78E-04**	**5.01**	**17.06**	**17.05**	**0.22**	**6.65**	**3.41E-03**

[1] Emissions calculated using the following equations:

Hourly Emissions (lb/hr) = (Heat Rate [MMBtu/hr]) x (Emission Factor [lb/MMscf]) / Avg. natural gas Heat Value [Btu/scf])

Annual Emissions (tpy) = (Hourly Emissions [lb/hr]) x (Runtime [hr/yr]) / (2000 lb/ton)

[2] H_2S emissions fuel content of 0.313 grains of hydrogen sulfide per 100 scf and combustion efficiency of 98%

H_2S lb/hr = (1-0.98) * 0.313 gr H_2S/100 scf * Fuel usage (scf/hr) * 1 lb/7000 gr

MarkWest Tornado GP L.L.C. - Tornado Gas Plant

Glycol Dehydration Unit Calculations

Controlled Emissions [1]

			FIN: / **EPN:**	**TEGDEHY** / **STILLCOMB**	**TEGDEHY** / **FLASHVENT**			**FIN:** / **EPN:**	**TEGDEHY** / **STILLCOMB**	**TEGDEHY** / **FLASHVENT**
Component	**Uncontrolled Still Vent Hourly Emissions (lbs/hr)**	**Uncontrolled Flash Gas Hourly Emissions (lbs/hr)**	**Condenser Controlled Hourly Emissions [2] (lbs/hr)**	**Combustor Controlled Hourly Emissions (lbs/hr)**	**Flash Gas Controlled Hourly Emissions (lb/hr)**	**Uncontrolled Still Vent Annual Emissions (tpy)**	**Uncontrolled Flash Gas Annual Emissions (tpy)**	**Condenser Controlled Annual Emissions [2, 3] (tpy)**	**Combustor Controlled Annual Emissions [3] (tpy)**	**Flash Gas Controlled Annual Emissions [3] (tpy)**
Hydrogen Sulfide	0.0325	0.0005	0.0065	0.0003	0.0000	0.1425	0.0022	0.0285	0.0014	0.0001
Methane	7.7323	2.9466	1.5465	0.0773	0.1473	33.8673	12.9060	6.7735	0.3387	0.6453
Ethane	10.7093	1.7470	2.1419	0.1071	0.0874	46.9069	7.6517	9.3814	0.4691	0.3826
Propane	15.5022	1.2533	3.1004	0.1550	0.0627	67.8996	5.4896	13.5799	0.6790	0.2745
Isobutane	3.5846	0.2486	0.7169	0.0358	0.0124	15.7004	1.0889	3.1401	0.1570	0.0544
n-Butane	10.5115	0.6265	2.1023	0.1051	0.0313	46.0406	2.7440	9.2081	0.4604	0.1372
Isopentane	2.6508	0.1699	0.5302	0.0265	0.0085	11.6105	0.7443	2.3221	0.1161	0.0372
n-Pentane	3.7247	0.2084	0.7449	0.0372	0.0104	16.3141	0.9129	3.2628	0.1631	0.0456
Cyclopentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
n-Hexane [4]	2.8128	0.1180	0.5626	0.0281	0.0059	12.3202	0.5170	2.4640	0.1232	0.0259
Cyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
other Hexanes	2.0755	0.1058	0.4151	0.0208	0.0053	9.0906	0.4633	1.8181	0.0909	0.0232
Heptanes	6.6234	0.1893	1.3247	0.0662	0.0095	29.0107	0.8292	5.8021	0.2901	0.0415
Methylcyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Benzene	12.5917	0.0315	2.5183	0.1259	0.0016	55.1517	0.1380	11.0303	0.5515	0.0069
Toluene	14.1357	0.0309	2.8271	0.1414	0.0015	61.9143	0.1352	12.3829	0.6191	0.0068
Ethylbenzene	1.7006	0.0028	0.3401	0.0170	0.0001	7.4487	0.0125	1.4897	0.0745	0.0006
Xylenes	9.3847	0.0115	1.8769	0.0938	0.0006	41.1051	0.0505	8.2210	0.4111	0.0025
C8+ Heavies	7.3594	0.2431	1.4719	0.0736	0.0122	32.2344	1.0647	6.4469	0.3223	0.0532
Total Emissions	111.1318	7.9338	22.2264	1.1113	0.3967	486.7575	34.7502	97.3515	4.8676	1.7375
Total VOC Emissions	**92.6577**	**3.2398**	**18.5315**	**0.9266**	**0.1620**	**405.8408**	**14.1903**	**81.1682**	**4.0584**	**0.7095**
Total HAP Emissions	**40.6256**	**0.1948**	**8.1251**	**0.4063**	**0.0097**	**177.9399**	**0.8532**	**35.5880**	**1.7794**	**0.0427**

[1] Flash tank emissions are routed to the fuel gas system for 95% control (EPN FLASHVENT). The regenerator still vent is controlled by a JATCO unit that includes a BTEX condenser for 80% control and then a combustor with 95% control (EPN STILLCOMB).

[2] The glycol dehydration unit still vent is controlled first by a condenser (JATCO unit) and then by a combustor. The condenser controlled column shows the emissions after the condenser and prior to the combustor.

[3] Emission rate based on normal operations of 8,760 hours per year.

[4] It is conservatively assumed half of the "other hexanes" in the gas analysis is "n-hexane".

Combustion Device Emissions for Glycol Dehydration Unit

Emission Unit: Glycol Dehydration Unit Combustor (EPN STILLCOMB)
Source Description: Glycol Dehydration Unit Combustor

Heat Input and Flow Rate Calculation

Parameters	Value	Unit	Notes
Vapor MW	20.97	lb/lb-mol	Molecular Weight of Inlet Stream
Gross Heating Value	2,300.00	Btu/scf	Typical Vapor Heat Content
Glycol Dehydration Flow Rate Hourly	4,542	scf/hr	Maximum Flow Rate for Combustor
Glycol Dehydration Operating Hours	8,760	hrs/yr	
Glycol Dehydration Flow Rate Annual	39,785,000	scf/yr	Glycol dehydration condenser flow rate * 8760 hr/yr
Combustor VOC Destruction Efficiency	95%	%	Combustor Destruction Efficiency
Pilot			
Hourly Volume Flow Rate	17.0	scf/hr	Design Specification
Natural gas heat value	992	Btu/scf	Nominal
Pilot Operation	8,760	hrs/yr	
Annual Volume Flow Rate	0.15	MMscf/yr	
Hourly Heat Rate	0.017	MMBtu/hr	
Annual Heat Rate	147.7	MMBtu/yr	

Emission Rates

	NO_X [1]	CO [1]	VOC [2]	SO_2 [4]	H_2S [3]	HAP [2]	Units	Notes
Emission Factors	0.138	0.2755					lb/MMBtu	TCEQ Air Permit Technical Guidance for Chemical Sources: Flares and Vapor Oxidizers (RG-109, 10/2000).
					0.00045		lb H_2S/Mscf	Fuel Gas Specification, 0.313 gr H_2S/100 scf
Emissions	**1.44**	**2.88**	**--**	**0.01**	**3.80E-07**	**--**	lb/hr	lb/MMBtu * Btu/scf / 1,000,000 Btu/MMBtu * scf/hr (NO_X and CO)
	6.32	**12.63**	**--**	**0.05**	**1.66E-06**	**--**	tpy	lb/MMBtu * Btu/scf / 1,000,000 Btu/MMBtu * scf/yr / 2,000 lb/ton (NO_X and CO)

[1] NO_X and CO emission factors are based on high-BTU streams from TCEQ Air Permit Technical Guidance for Chemical Sources: Flares and Vapor Oxidizers (RG-109, 10/2000).

[2] There are assumed to be no VOC or HAP emissions from the combustor pilot gas. All process emissions of VOC and HAPs are accounted for with the glycol dehydration unit emissions.

[3] Pilot gas H_2S emissions are based on a fuel content of 0.313 grains of H_2S per 100 scf. Process emissions of H_2S are accounted for with the glycol dehydration unit emissions.

[4] SO_2 emissions are based on the assumed 100% conversion of combusted H_2S into SO_2.

Storage Tank Uncontrolled Emissions

Throughput for Storage Tanks

FIN	Tank Description	Maximum Daily Throughput (bbl/day) [1]	Control Efficiency[2]
TK-1	Condensate Tank	1,562	98%
TK-2	Condensate Tank		
TK-3	Condensate Tank		
TK-4	Produced Water Tank	35	0%
TK-5	Produced Water Tank		

[1] Maximum daily throughput represents the total across all condensate and produced water tanks.

[2] The flashing, working, and breathing emissions from the condensate storage tanks will be controlled using the VCU.

Uncontrolled Speciated Tank Emissions [1,2]

Component	TK-1 through TK-3 (Condensate Tanks)		TK-4 and TK-5 (Produced Water Tanks)	
	Hourly Emissions	Annual Emissions	Hourly Emissions	Annual Emissions
	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Nitrogen	--	--	--	--
Carbon Dioxide	3.43E-12	1.50E-11	6.60E-14	2.89E-13
Methane	--	--	--	--
Ethane	3.60E-08	1.58E-07	6.93E-10	3.04E-09
Propane	4.43E-05	1.94E-04	8.51E-07	3.73E-06
i-Butane	1.22E-03	5.35E-03	2.34E-05	1.03E-04
n-Butane	0.04	0.19	8.43E-04	3.69E-03
i-Pentane	0.70	3.05	0.01	0.06
n-Pentane	0.72	3.16	0.01	0.06
n-Hexane	0.26	1.16	5.03E-03	0.022
n-Heptane	0.08	0.37	1.60E-03	7.000E-03
n-Octane	0.01	0.06	2.67E-04	1.17E-03
Water	--	--	--	--
Hydrogen Sulfide	5.02E-15	2.20E-14	9.64E-17	4.22E-16
Total VOC	**1.83**	**8.00**	**0.03**	**0.153**
Total HAP	**0.26**	**1.16**	**5.03E-03**	**0.02**

[1] Speciated emissions calculated using ProMax.

[2] Produced water tank emissions are assumed to be 1% of emissions from an equivalent condensate tank

Controlled Speciated Tank Emissions [1,2,3,4]

Component	TK-1 through TK-3 (Condensate Tanks)		TK-4 and TK-5 (Produced Water Tanks)	
	Hourly Emissions	Annual Emissions	Hourly Emissions	Annual Emissions
	(lb/hr)	(tpy)	(lb/hr)	(tpy)
Nitrogen	--	--	--	--
Carbon Dioxide	6.87E-14	9.02E-13	6.60E-14	2.89E-13
Methane	--	--	--	--
Ethane	7.20E-10	9.45E-09	6.93E-10	3.04E-09
Propane	8.86E-07	1.16E-05	8.51E-07	3.73E-06
i-Butane	2.44E-05	3.21E-04	2.34E-05	1.03E-04
n-Butane	8.80E-04	0.01	8.43E-04	3.69E-03
i-Pentane	0.014	0.18	0.01	0.06
n-Pentane	0.014	0.19	0.01	0.06
n-Hexane	5.284E-03	0.069	5.03E-03	0.02
n-Heptane	1.68E-03	0.022	1.60E-03	7.00E-03
n-Octane	2.83E-04	3.71E-03	2.67E-04	1.17E-03
Water	--	--	--	--
Hydrogen Sulfide	1.00E-16	1.32E-15	9.64E-17	4.22E-16
Total VOC	**0.037**	**0.48**	**0.03**	**0.153**
Total HAP	**5.284E-03**	**0.07**	**5.03E-03**	**0.02**

[1] Controlled emissions are based on normal operations. F/W/B emissions from condensate storage tanks are sent to and controlled by the VCU but are represented under FINs TK-1 through TK-3.

[2] Speciated emissions calculated using ProMax.

[3] Produced water tank emissions are assumed to be 1% of emissions from an equivalent condensate tank

[4] Annual emissions include 350 hours per year of VCU downtime. These emissions will exhaust from the tanks.

VCU-1 Emissions (Normal Operations)

Emission Unit: Vapor Combustion Unit (VCU)
Source Description: Condensate Tanks and Condensate Loading VCU Emissions

VOC Heat Input and Flow Rate Calculation

Parameters	Value	Unit	Notes
Condensate Tank Emissions Flow Rate	0.001	MMSCFD	ProMax
Condensate Loading Emissions Flow Rate	0.002	MMSCFD	ProMax
Total Flow Rate	91.1	scf/hr	
Total Flow Rate With 25% Safety Factor	113.9	scf/hr	Safety factor applied to account for variations in vapor flow into Flare.
	1.0	MMscf/yr	
Mass Density of Stream	12.161	lb/ft^3	Weighted Average of Stream Mass Densities based on flowrate
Total Mass Flowrate	1384.5	lb/hr	Total flowrate (scf/hr) * Mass density (lb/scf)
Heating Value	4138.0	Btu/ft^3	Maximum gas heating value
Total Heating Rate	0.5	MMBtu/hr	Heating value (Btu/ft^3) * Mass flow (scf/hr) * (MMBtu/10^6 Btu)
Pilot			
Hourly Volume Flow Rate	65.0	scf/hr	Design Specification
Natural gas heat value	1165	Btu/scf	Nominal
Pilot Operation	8,760	hrs/yr	
Annual Volume Flow Rate	569,400	scf/yr	
Hourly Heat Rate	0.076	MMBtu/hr	
Annual Heat Rate	663.4	MMBtu/yr	

Emission Rates

	NO_X	CO	VOC[1]	SO_2[2]	H_2S[1,2]	HAP[1]	Units	Notes
Emission Factors	0.140	0.2000					lb/MMBtu	Manufacturer Specifications
				0.00045	0.00045		lb H2S/MScf	Fuel Gas Specification, 0.313 gr H2S/100scf
			99.17		0.000	14.023	lb/hr	Mass Flow Rate from crude oil tanks and loading. Controlled crude oil tank emissions are represented under the individual emission units being controlled (TK-1 through TK-3).
			113.4		2.20E-14	16.20	tpy	
	25%	25%	25%	25%	25%	25%	%	Safety Factor
	0.18	0.25					lb/MMBtu	Unit Emission Rate with Safety Factor
Emissions	**0.10**	**0.14**	**2.48**	**1.31E-04**	**1.40E-06**	**0.35**	lb/hr	lb/MMBtu * MMBtu/hr (unless noted otherwise)
	0.42	**0.60**	**2.84**	**5.75E-04**	**1.40E-06**	**0.41**	tpy	lb/hr * 8760 hr/yr*2000 lb/ton (unless noted otherwise)

[1] Efficiency for combustion of VOC, H_2S and HAPs in VCU is: 98%
[2] SO_2 emissions based on fuel content of 0.313 grains of H_2S per 100 scf
H_2S lb/Mscf = .313 gr H_2S/100 scf * 1 lb/7000 gr * 1000 scf/MScf

Thermal Oxidizer Emission Calculations

Thermal Oxidizer Information	
EPN	**TO-1**
Decsription	**Horizontal Thermal Oxidizer**
Make/Model	ZEECO, Z-HTO
Capacity	2.0 MMSCFD

Stream	Units	Acid Gas	Notes
Fuel usage:	Mscf/hr	8.0	Design Specification
Fuel usage:	MMscf/yr	69.8	Fuel usage (Mscf/hr) * Operating hours * MMscf/1000 Mscf
Fuel heat value:	Btu/scf	992.00	Nominal
Heat input rate:	MMBtu/hr	7.91	Fuel Usage (MScf/hr) * Fuel Heat Value (Btu/Scf) * (1000 Scf/MScf) * (MMBtu/10^6 Btu
Unit DRE:	%	98.9%	Manufacturer guarantee
Operating hours:	hr/yr	8760	

Thermal Oxidizer Emissions	**Uncontrolled Amine Acid Gas Emissions (tpy)**	**Controlled Emissions (tpy)**
Composition	Mass Flow (tpy)	Mass Flow[1] (tpy)
Nitrogen	0.00	0.00
Carbon Dioxide	25093.54	25093.54
Methane	1.78	1.96E-02
Ethane	65.97	0.73
Propane	17.42	1.92E-01
Isobutane	2.04	2.24E-02
n-Butane	2.87	3.16E-02
Isopentane	0.14	1.49E-03
n-Pentane	0.15	1.60E-03
n-Hexane	0.022	2.42E-04
n-Heptane	0.0040	4.40E-05
n-Octane	0.00	0.00
Hydrogen Sulfide	16.51	1.82E-01
Total Hydrocarbons (tpy)	90.40	9.94E-01
Total VOC (tpy)	22.64	2.49E-01
Total HAP (tpy)	0.022	2.42E-04
H_2S (tpy)	16.51	1.82E-01

Emission Calculations from Combustion of the Thermal Oxidizer

NO_x	CO	VOC	H_2S	SO_2	PM	n-Hexane	Total HAPs	Units
0.140	0.080	-	-	-	0.010	-	-	lb/MMBtu[2]
1.107	0.63	-	-	-	0.08	-	-	lb/hr[3]
4.85	2.77	-	-	-	0.35	-	-	tons/yr[4]

Total Emissions

NO_x	CO	VOC	H_2S[5]	SO_2	TSP	n-Hexane	Total HAPs	Units
1.11	0.63	0.057	0.041	7.016	0.079	0.000055	0.000055	lb/hr
4.85	2.77	0.25	0.18	30.73	0.35	0.000242	0.000242	tons/yr

Notes

1 For HC, Controlled lb/hr = Flow (lb/hr) * (1 - DRE%)
For non-HC, Controlled lb/hr = Uncontrolled lb/hr
2 Emission factors from manufacturers specifications
3 lb/hr emissions calculated as follows:
For NOx, CO and PM: lb/hr = EF (lb/MMBtu) * Fuel consumption (MMBtu/hr)
4 tons/yr = lb/hr * Hours of operation (hr/yr) * 1ton/2000lb
5 99% combustion H_2S; 100% conversion to SO_2

Thermal Oxidizer Emission Calculations

Thermal Oxidizer Information	
EPN	**TO-2**
Description	**Vertical Thermal Oxidizer**
Capacity	6.89 MMSCFD

Stream	Units	Acid Gas	Notes
Fuel usage:	Mscf/hr	32.6	Design Specification
Fuel usage:	MMscf/yr	285.2	Fuel usage (Mscf/hr) * Operating hours * MMscf/1000Mscf
Fuel heat value:	Btu/scf	1020.00	Nominal
Heat input rate:	MMBtu/hr	33.21	Fuel Usage (MScf/hr) * Fuel Heat Value (Btu/Scf) * (1000 Scf/MScf) * (MMBtu/10^6 Btu
Unit DRE:	%	98.9%	Manufacturer guarantee
Operating hours:	hr/yr	8,760	

Thermal Oxidizer Emissions	**Uncontrolled Amine Acid Gas Emissions (tpy)**	**Controlled Emissions (tpy)**
Composition	Mass Flow (tpy)	Mass Flow[1] (tpy)
Nitrogen	2.66	2.66
Carbon Dioxide	132297.61	132297.61
Methane	81.92	9.01E-01
Ethane	60.89	0.67
Propane	8.18	9.00E-02
Isobutane	5.19	5.71E-02
n-Butane	3.37	3.71E-02
Isopentane	1.69	1.86E-02
n-Pentane	1.32	1.46E-02
n-Hexane	0.582	6.40E-03
n-Heptane	0.6710	7.38E-03
n-Octane	0.12	0.00
Hydrogen Sulfide	9.08	9.98E-02
Total Hydrocarbons (tpy)	163.95	1.80
Total VOC (tpy)	21.13	0.23
Total HAP (tpy)	0.582	6.40E-03
H_2S (tpy)	9.08	0.10

Emission Calculations from Combustion of the Thermal Oxidizer

NO_x	CO	VOC	H_2S	SO_2	PM	n-Hexane	Total HAPs	Units
0.160	0.080	-	-	-	0.010	-	-	lb/MMBtu[2]
5.314	2.66	-	-	-	0.33	-	-	lb/hr[3]
23.27	11.64	-	-	-	1.45	-	-	tons/yr[4]

Total Emissions

NO_x	CO	VOC	H_2S[5]	SO_2	TSP	n-Hexane	Total HAPs	Units
5.31	2.66	0.053	0.023	3.858	0.332	0.001462	0.001462	lb/hr
23.27	11.64	0.23	0.10	16.90	1.45	0.006402	0.006402	tons/yr

Notes

[1] For HC, Controlled lb/hr = Flow (lb/hr) * (1 - DRE%)
For non-HC, Controlled lb/hr = Uncontrolled lb/hr
[2] Emission factors from manufacturers specifications
[3] lb/hr emissions calculated as follows:
For NOx, CO and PM: lb/hr = EF (lb/MMBtu) * Fuel consumption (MMBtu/hr)
[4] tons/yr = lb/hr * Hours of operation (hr/yr) * 1ton/2000lb
[5] 99% combustion H_2S; 100% conversion to SO_2

Site-Wide Fugitive Emissions

EPN: **FUG**

Emission Factors and Emission Rates for VOCs and HAPs

Equipment Type	Emission Factor[1]	Source Count[2]	VOC C3+	Control Efficiency	VOC Emission Rate			H_2S Emission Rate			HAP Emission Rate		
					Uncontrolled	Controlled		Uncontrolled	Controlled		Uncontrolled	Controlled	
	(lb/hr/ source)		(%)	(%)	(lb/hr)	(lb/hr)	(tpy)	(lb/hr)	(lb/hr)	(tpy)	(lb/hr)	(lb/hr)	(tpy)
Valves - Gas	0.009920	2,500	11.26%	97%	2.793	0.084	0.367	2.480E-03	7.441E-05	3.259E-04	1.439E-04	4.316E-06	1.890E-05
Connectors/Flanges - Gas	0.000860	3,935	11.26%	97%	0.381	0.011	0.050	3.385E-04	1.015E-05	4.447E-05	1.963E-05	5.889E-07	2.579E-06
Compressor Seals - Gas	0.019400	8	11.26%	95%	0.017	8.717E-04	3.818E-03	1.548E-05	7.741E-07	3.390E-06	8.979E-07	4.490E-08	1.966E-07
Relief Valves - Gas	0.019400	113	11.26%	97%	0.247	7.409E-03	0.032	2.193E-04	6.580E-06	2.882E-05	1.272E-05	3.816E-07	1.671E-06
Other - Gas	0.019400	52	11.26%	95%	0.113	5.666E-03	0.025	1.006E-04	5.031E-06	2.204E-05	5.836E-06	2.918E-07	1.278E-06
Valves - Light Oil	0.005510	1,789	100.00%	97%	9.857	0.296	1.295	9.857E-04	2.957E-05	1.295E-04	5.717E-05	1.715E-06	7.512E-06
Pump Seals - Light Oil	0.028700	35	100.00%	93%	0.992	0.069	0.304	9.924E-05	6.947E-06	3.043E-05	5.756E-06	4.029E-07	1.765E-06
Connectors - Light Oil	0.000463	4,858	100.00%	97%	2.249	0.067	0.296	2.249E-04	6.748E-06	2.956E-05	1.305E-05	3.914E-07	1.714E-06
Flanges - Light Oil	0.000243	149	100.00%	97%	0.036	1.086E-03	4.756E-03	3.620E-06	1.086E-07	4.756E-07	2.099E-07	6.298E-09	2.759E-08
Other - Light Oil	0.016500	8	100.00%	95%	0.132	6.584E-03	0.029	1.317E-05	6.584E-07	2.884E-06	7.637E-07	3.818E-08	1.672E-07
Total					**16.82**	**0.55**	**2.41**	**0.0045**	**0.00014**	**0.00062**	**0.00**	**0.000**	**0.000**

[1] Factors are from TCEQ Air Permit Technical Guidance for Chemical Sources: Fugitive Guidance. Emission Factors - Oil and Gas Production Operations, June 2018.

[2] Source counts are site-specific.

Condensate and Produced Water Loading Emissions

Emission unit number(s): LOAD-1 and LOAD-2
Source description: Condensate and Produced Water Loadout

Equation[1]:

$$L_L = \frac{12.46 * SPM}{T}$$

Variables[1]:

L_L - Loading Loss (lbs/1000 gal loaded)
S - Saturation Factor (From Table 5.2-1 of AP-42, Section 5.2)
P - True Vapor Pressure of Loaded Liquid (psia)
M - Molecular Weight of Vapor (lb/lb mol)
T- Temperature of Bulk Liquid (°R = [°F + 460])

Hourly Emissions

												Uncontrolled Total	Controlled (EPN: VCU-1)	Uncontrolled (TLFUG)
FIN	**Material Loaded**	**Loading Method**	**S [2]**	**P_{max} [3] (psia)**	**M [4] (lb/lbmol)**	**T [5] (°R)**	**L_L (lbs/1000 gal)**	**VOC Content [6] (wt%)**	**Maximum Hourly Throughput [7] (gal/hr)**	**Capture Efficiency[8]**	**Control Efficiency**	**Maximum Hourly Emissions [9] (lb/hr)**	**Maximum Hourly Emissions [11] (lb/hr)**	**Maximum Hourly Emissions [11] (lb/hr)**
LOAD-1	Condensate	Submerged	0.60	12.09	75	560.0	12.05	100.0	8,000	98.7%	98%	96.38	1.90	1.25
LOAD-2	Produced Water	Submerged	0.60	12.09	75	560.0	12.05	1.0	8,000	0%	0%	0.96	0.00	0.96
											Total VOC Emissions=	**97.34**	**1.90**	**2.22**

Annual Emissions

												Uncontrolled Total	Controlled (EPN: VCU-1)	Uncontrolled (TLFUG)
FIN	**Material Loaded**	**Loading Method**	**S [2]**	**P_{avg} [3] (psia)**	**M [4] (lb/lbmol)**	**T [5] (°R)**	**L_L (lbs/1000 gal)**	**VOC Content [6] (wt%)**	**Annual Throughput [7] (gal/yr)**	**Capture Efficiency[8]**	**Control Efficiency**	**Annual Emissions [10] (tpy)**	**Annual Emissions [11] (tpy)**	**Annual Emissions [11] (tpy)**
LOAD-1	Condensate	Submerged	0.60	8.47	75	536.7	8.80	100.0	23,945,460	98.7%	98%	105.38	2.08	1.37
LOAD-2	Produced Water	Submerged	0.60	8.47	75	536.7	8.80	1.0	536,550	0%	0%	0.02	0.00	0.02
											Total VOC Emissions =	**105.41**	**2.08**	**1.39**

1 Loading Loss Equation and Variables are from AP-42, Section 5.2, Transportation and Marketing of Petroleum Liquids.
2 The S-factor is based on submerged normal service.
3 The true vapor pressure is based on site design of crude oil RVP 9. The hourly TVP is based on 100 F and annual average TVP is based on avg temp of 76.7 F.
4 The hourly molecular weight of vapor is obtained from the Promax simulation, which is based on the condensate analysis.
5 The annual average maximum temperature for Midland, TX is taken from Table 7.1-7 in AP-72, Section 7.1 (November 2019) as 76.7°F. The hourly maximum temperature is assumed to be 100°F per TCEQ guidance.
6 Condensate is assumed to be 100% VOC.
7 The maximum hourly throughput is based on the capability of the tank truck to load liquids in one hour. Maximum annual loading throughput for condensate and produced water is based on projected facility throughput.
8 Assuming minimum capture efficiency for trucks per TCEQ guidance "Tank Truck Loading of Crude Oil or Condensate (Revised 11/13) APDG 6217v2". The captured condensate loading emissions are controlled by VCU-1 during normal operations.
9 Maximum Uncontrolled Hourly Emission Rate (lb/hr) = L_L (lbs/1,000 gal) x Maximum Hourly Throughput (gal/hr) x VOC Content (wt %)

Maximum Hourly Emission Rate for Condensate Loading (lb/hr) = $\frac{12.05 \text{ lbs}}{1{,}000 \text{ gal}} \cdot \frac{8{,}000 \text{ gal}}{\text{hr}} \cdot 100\% = \frac{96.38 \text{ lb}}{\text{hr}}$

10 Maximum Uncontrolled Annual Emission Rate (tpy) = L_L (lbs/1,000 gal) x Maximum Annual Throughput (gal/yr) / 2,000 (lbs/ton) x VOC Content (wt %)

Annual Emission Rate for Condensate Loading (tpy) = $\frac{8.80 \text{ lbs}}{1{,}000 \text{ gal}} \cdot \frac{23{,}945{,}460 \text{ gal}}{\text{yr}} \cdot \frac{1 \text{ ton}}{2{,}000 \text{ lb}} \cdot 100\% = \frac{105.38 \text{ tons}}{\text{yr}}$

Flare-1 MSS Emissions

Basis of Calculation:
Emissions from Maintenance, Start-up, and Shutdown (MSS) are calculated based on a mass balance as follows:

Maximum Uncontrolled Hourly Emissions (lb/hr) = [Volume of blowdown (scf/event)] x [mol % of speciated constituent] / [Event duration (hr/event)] / [Specific volume of stream component (scf/lb)] x [# blowndowns occurring simultaneously (units)]

Maximum Uncontrolled Annual Emissions (tpy) = [Volume of blowdown (scf/event)] x [mol % of speciated constituent] x [Total number of blowdown events per year (events/year)] / [Specific volume of stream component (scf/lb)] / [2,000 (lb/ton)]

Uncontrolled hourly and annual emissions are routed to MSS-FLR. MSS-FLR controls VOC constituents with a 98% control efficiency:

Controlled VOC Emissions (lb/hr or tpy) = [Uncontrolled VOC Emissions (lb/hr or tpy)] x (1 - 0.98)

EPN/FIN FLR-1 MSS
Description: Maintenance, Startup, and Shutdown Emissions Controlled by Flare
Destruction Efficiency: 98% Nominal

Flare MSS, Vessel Blowdowns, Compressor Blowdowns, Plant Turnarounds, Pigging

Blowdown volume: 2,000,000 Scf/hr
Total volume: 300,000,000 Scf/year

Inlet Composition	Mol%	MW[1]	MW*Mol%	Spec. Volume (scf/lb)[1]	Heating Value (Btu/scf)[2]	Mass Flow (lb/hr)[3]	Mass Flow (lb/yr)[4]	Mol% * Heating Value (Btu/scf)
Nitrogen	1.83	12.01	0.22	31.61	0	1156.1	173409.0	0.00
CO_2	2.08	16.04	0.33	23.66	0	1761.7	264247.9	0.00
H_2S	5.00E-04	34.08	0.00	11.14	596.0	0.9	134.7	0.00
Methane	72.44	16.04	11.62	23.66	909.8	61232.6	9184897.1	659.04
Ethane	12.38	30.07	3.72	12.62	1629.7	19612.5	2941868.1	201.69
Propane	6.73	44.10	2.97	8.61	2318.0	15643.6	2346538.3	156.03
i-Butane	0.87	58.12	0.50	6.53	3015.5	2649.5	397421.3	26.08
n-Butane	2.12	58.12	1.23	6.53	3015.5	6487.4	973108.0	63.87
i-Pentane	0.45	72.15	0.32	5.26	3710.9	1699.7	254949.0	16.59
n-Pentane	0.49	72.15	0.35	5.26	3710.9	1848.0	277192.9	18.04
n-Hexane	0.41	78.18	0.32	4.85	4373.3	1676.9	251529.2	17.80
n-Heptane	0.06	100.21	0.06	3.79	5064.0	290.5	43569.6	2.79
n-Octane	0.06	114.23	0.07	3.32	5754.7	367.2	55083.2	3.51
Benzene	0.03	78.11	0.02	4.86	5754.7	131.7	19759.1	1.84
Toluene	0.02	92.14	0.02	4.12	5754.7	97.1	14567.6	1.15
Ethylbenzene	0.001	106.17	0.001	3.57	5754.7	5.6	839.3	0.06
Xylene	0.005	106.17	0.005	3.57	5754.7	28.0	4196.4	0.29
Total	**99.95**		**21.76**			**114,688.7**	**17,203,310.8**	**1,168.8**

NO_X	CO	VOC	SO_2	H_2S	Units	Reference
0.1380	0.2755				lb/MMBtu	TCEQ RG-109 (October 2000) - high BTU
322.6	**644.0**	**618.5**	**1.654**	**0.018**	**lb/hr[5]**	
24.193	**48.299**	**46.388**	**0.124**	**0.001**	**tons/yr[6]**	

Flare-1 MSS Emissions

Total Facility Emissions

NO_X	CO	VOC	H_2S	SO_2	
322.58	643.99	618.50	0.02	1.65	lb/hr
24.19	48.30	46.39	1.35E-03	0.12	tons/yr

[1] Physical properties of hydrocarbons and gases are obtained from "The Physical Constants of Hydrocarbons" developed by the Thermodynamics Research Center Hydrocarbon Project, 1981, The Air Liquide Gas Encyclopedia (http://encyclopedia.airliquide.com /Encyclopedia.asp?GasID=59) and Engineering Toolbox (http://www.engineeringtoolbox.com/heating-values-fuel-gases-d_823.html), an

[2] Conversion from kJ/mol to Btu/scf:
[kJ/mol] * [454 mol/lbmol] * [1 lbmol/379.5 scf] * [1 Btu/1.055 kJ] = [Btu/scf]

[3] Hourly Flow (lb/hr) = Volume (Scf/hr) / Sp. Vol. (cf/lb) * Mol%

[4] Annual Flow (tons/yr) = Volume (Scf/yr) / Sp. Vol. (cf/lb) * Mol%

[5] Hourly emissions for blowdown events calculated as follows:
For NO_X and CO, lb/hr = EF (lb/MMBtu) * Volume (Scf/hr) * Heat value (Btu/scf) / 1,000,000 (Btu/MMBtu)
For VOC, lb/hr = VOC flow (lb/hr) * (1 - Control%)

[6] Annual emissions for blowdown events calculated as follows:
For NO_X and CO, tons/yr = EF (lb/MMBtu) * Volume (Scf/yr) * Heat value (Btu/scf) / 2000 (lb/ton) / 1,000,000 (Btu/MMBtu)
For VOC, tons/yr = VOC flow (tons/yr) * (1 - Control%)

Flare-1 Emissions During TO Downtime

Flare Waste Gas Emissions [1]

Input Data

Heating Value of Amine Acid Gas =	19.46	Btu/scf
Heating Value of Inlet Amine Acid Gas =	19.44	Btu/scf
Heating Value of Purge Gas =	1,020	Btu/scf
Purge Gas Volume [2] =	131,025.56	scf/hr
Amine Acid Gas Volume [3] =	53,737.50	scf/hr
Inlet Amine Acid Gas Volume [3] =	282,512.50	scf/hr
Gas Stream Heating Value[4] =	338.98	Btu/scf
Gas Stream Heat Input =	140.18	MMBtu/hr
Gas Stream Heat Input =	280,365.34	MMBtu/yr
Hours of Operation =	2,000	hr/yr

[1] There will be NO_X, CO, VOC, and HAP emissions associated with waste gas combustion.

[2] Purge gas volume calculated to meet minimum gas stream heating value requirements under 40 CFR §60.18(c)(3)(ii).

[3] Maximum Gas Volume based on facility DOW simulation acid gas stream forNGL treater amine unit and inlet treater amine unit.

[4] The gas stream heating value is the maximum between the two amine units.

Pollutant	Emission Factor (lb/MMBtu)	Source [1]	Hourly Emissions [2] (lb/hr)	Annual Emissions [3] (tpy)
NO_X	0.0641	TCEQ Guidance	8.99	8.99
CO	0.5496	TCEQ Guidance	77.04	77.04

[1] From TCEQ "Air Permit Guidance For Chemical Sources, Flare And Vapor Oxidizers" (Draft Oct. 2000) Table 4, emission factors for industrial flares combusting low-Btu vapors.

[2] Maximum Potential Hourly Emission Rate (lb/hr) = Gas Stream Heat Input (MMBtu/hr) x Emission Factor (lb/MMBtu)

Example NO_X Hourly Emission Rate (lb/hr) = $\frac{140.18\ \text{MMBtu}}{\text{hr}} \times \frac{0.064\ \text{lb}}{\text{MMBtu}} = \frac{8.99\ \text{lb}}{\text{hr}}$

[3] Maximum Potential Annual Emission Rate (tpy) = Gas Stream Heat Input (MMBtu/yr) x Emission Factor (lb/MMBtu) / (2,000 lb/ton)

Example NO_X Annual Emission Rate (tpy) = $\frac{280365.34\ \text{MMBtu}}{\text{yr}} \times \frac{0.064\ \text{lb}}{\text{MMBtu}} \times \frac{1\ \text{ton}}{2{,}000\ \text{lb}} = \frac{8.99\ \text{ton}}{\text{yr}}$

Flare-1 Emissions During TO Downtime

Compound [1]	Composition [1] Amine Acid Gas (Mole %)	Inlet Amine Acid Gas (Mole %)	Purge Gas (Mole %)	MW (lb/lb-mole)	DRE (%)	Gas Vented to Flare [2, 3] (lb/hr)	(tpy)	Controlled Emissions [4] (lb/hr)	(tpy)
Water	7.542	7.568	0.000	18.020		1015.17	1015.17	--	--
CO_2	91.930	92.190	2.084	44.010		30520.42	30520.42	30520.42	30520.42
H_2S	0.078	0.008	0.001	34.080	98%	3.83	3.83	0.08	0.08
Nitrogen	0.000	0.000	1.827	28.010		176.74	176.74	176.74	176.74
Methane	0.018	0.157	72.437	16.043	98%	4030.96	4030.96	80.619	80.62
Ethane	0.354	0.062	12.376	30.070	98%	1299.92	1299.92	26.00	25.998
Propane	0.064	0.006	6.731	44.097	98%	1028.76	1028.76	20.575	20.58
n-Butane	0.008	0.002	2.118	58.124	98%	425.81	425.81	8.516	8.52
i-Butane	0.006	0.003	0.865	58.124	98%	174.77	174.77	3.495	3.50
n-Pentane	0.000	0.001	0.486	72.151	98%	121.37	121.37	2.43	2.43
i-Pentane	0.000	0.001	0.447	72.151	98%	111.74	111.74	2.23	2.23
n-Hexane	0.000	0.000	0.407	86.178	98%	121.23	121.23	2.42	2.42
Heptanes	0.000	0.000	0.055	100.205	98%	19.18	19.18	0.38	0.38
Octanes	0.000	0.000	0.061	114.232	98%	24.33	24.33	0.49	0.49
Benzene	0.000	0.000	0.032	78.110	98%	8.63	8.63	0.17	0.17
Toluene	0.000	0.000	0.020	92.140	98%	6.36	6.36	0.13	0.13
Ethylbenzene	0.000	0.000	0.001	106.170	98%	0.37	0.37	7.33E-03	7.33E-03
Xylene	0.000	0.000	0.005	106.170	98%	1.83	1.83	0.04	0.04
VOC [5]						2044.38	2044.38	40.89	40.89
SO_2				64.06				7.05	7.05
HAPS [6]						138.42	138.42	2.77	2.77

[1] Speciated composition is the maximum of the acid gas stream for both the amine units from the DOW simulation of the facility and the site purge gas stream.

[2] Gas Vented to Flare (lb/hr) = Hourly Flowrate (scf/hr) x Mole Percent / 100 x MW (lb/lb-mole) / 379.5 (scf/lb-mole)

Example Propane Hourly Emission Rate (lb/hr) = $\frac{467{,}276 \text{ scf}}{\text{hr}} \times \frac{6.800\ \%}{100} \times \frac{44.10 \text{ lb}}{\text{lb-mole}} \times \frac{\text{lb-mole}}{379.5 \text{ scf}} = \frac{1028.76 \text{ lb}}{\text{hr}}$

[3] Annual Emissions (tpy) = Hourly Emissions (lb/yr) x Hours of Operation (hr/yr) x (1 ton / 2,000 lb)

Example Propane Vented to Flare Annual Emission Rate (tpy) = $\frac{1028.76 \text{ lb}}{\text{hr}} \times \frac{2000 \text{ hr}}{\text{yr}} \times \frac{1 \text{ ton}}{2{,}000 \text{ lb}} = \frac{1028.76 \text{ tpy}}{\text{yr}}$

[4] Controlled Hourly Emission Rate (lb/hr) = Gas Vented to Flare (lb/hr) x (1 - DRE)

Example Controlled Propane Hourly Emission Rate (lb/hr) = $\frac{1028.76 \text{ lb}}{\text{hr}} \times (1 - 98\ \%) = \frac{20.58 \text{ lb}}{\text{hr}}$

[5] Total VOC taken as the sum of NMNEHC.

[6] Total HAPs taken as the sum of all hazardous air pollutants.

Default VOC emissions for Miscellaneous MSS activities

Company Name	MarkWest Tornado GP L.L.C.
Site Name	Greenfield Gas Plant (Tornado Facility)

Source Name	MSS
EPN	MSS

Date of MSS activity	
Default VOC emissions (tpy) associated with miscellaneous MSS activities	**0.250**
Add default VOC emissions from miscellaneous MSS activities to the emissions summary	Yes

Bryan Research & Engineering, LLC

ProMax® 5.0

Simulation Report

Project: Tornado GP ProMax 2021-0904.pmx

Licensed to Trinity Consultants, Inc. and Affiliates

Client Name: MarkWest
Location: Tornado Facility
Job:

ProMax Filename: C:\Users\ABQ_Model\Desktop\Tornado GP ProMax 2021-0904.pmx
ProMax Version: 5.0.20169.0
Simulation Initiated: 9/4/2021 11:16:13 AM

Bryan Research & Engineering, LLC
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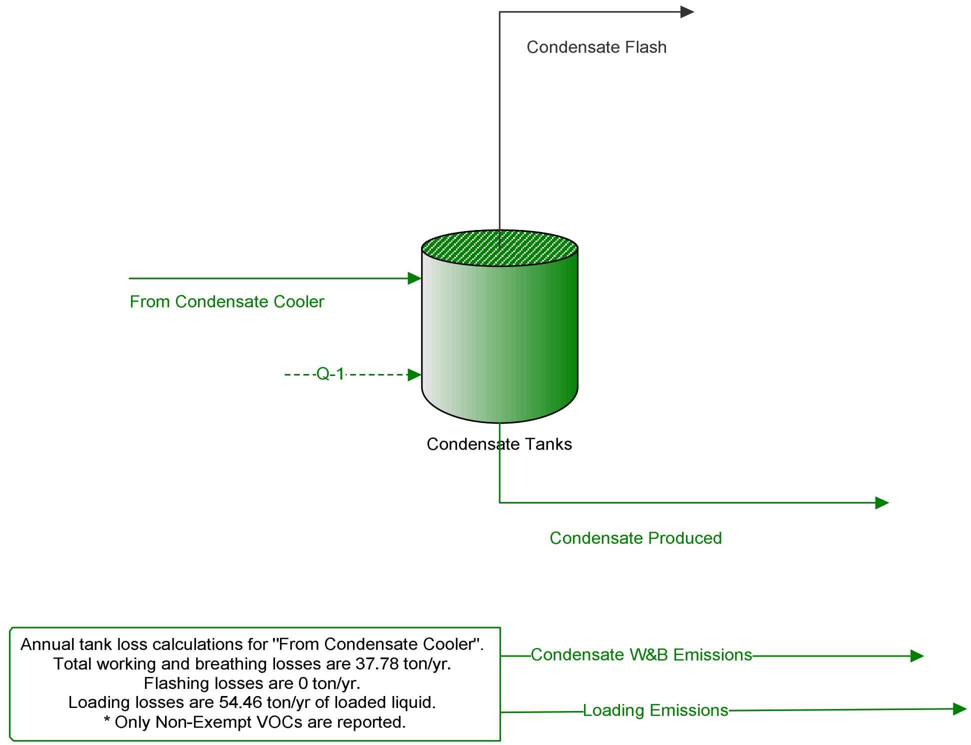
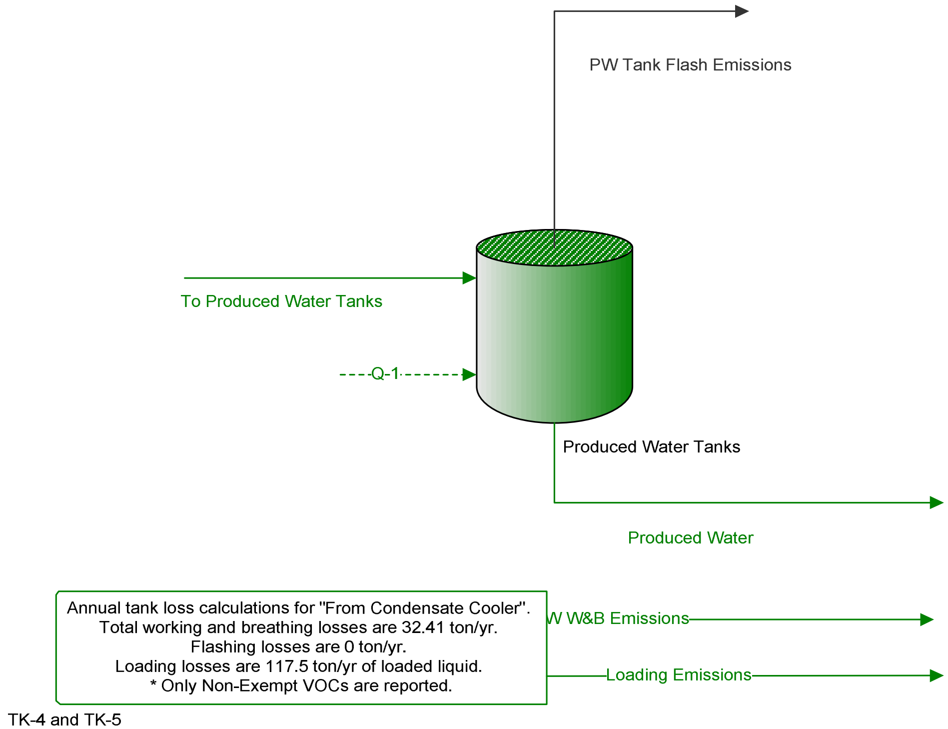
Report Navigator can be activated via the ProMax Navigator Toolbar.
An asterisk (*), throughout the report, denotes a user specified value.
A question mark (?) after a value, throughout the report, denotes an extrapolated or approximate value.


Condensate Flash
From Condensate Cooler
Q-1
Condensate Tanks
Condensate Produced
Annual tank loss calculations for "From Condensate Cooler".
Total working and breathing losses are 37.78 ton/yr.
Flashing losses are 0 ton/yr.
Loading losses are 54.46 ton/yr of loaded liquid.
* Only Non-Exempt VOCs are reported.
Condensate W&B Emissions
Loading Emissions

TK-1, TK-2, TK-3

Process Streams		Condensate Flash	Condensate Produced	Condensate W&B Emissions	From Condensate Cooler	Loading Emissions
Composition	Status:	Solved	Solved	Solved	Solved	Solved
Phase: **Total**	From Block:	Condensate Tanks	Condensate Tanks	--	--	--
	To Block:	--	--	--	Condensate Tanks	--
Mole Fraction			%	%	%	%
Nitrogen			0	0*	0*	0*
Carbon Dioxide			1.87000E-12	3.18838E-10*	1.87000E-12*	3.18838E-10*
Methane			0	0*	0*	0*
Ethane			4.66000E-08	4.89037E-06*	4.66000E-08*	4.89037E-06*
Propane			0.000159536	0.00410653*	0.000159536*	0.00410653*
i-Butane			0.00939083	0.0859320*	0.00939083*	0.0859320*
n-Butane			0.498443	3.09417*	0.498443*	3.09417*
i-Pentane			16.7286	39.4965*	16.7286*	39.4965*
n-Pentane			23.3658	40.8530*	23.3658*	40.8530*
n-Hexane			24.6160	12.5269*	24.6160*	12.5269*
n-Heptane			22.7209	3.43365*	22.7209*	3.43365*
n-Octane			12.0608	0.505747*	12.0608*	0.505747*
Water			0	0*	0*	0*
Hydrogen Sulfide			1.13000E-14	6.01613E-13*	1.13000E-14*	6.01613E-13*
Molar Flow		lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h
Nitrogen		0	0	0*	0*	0*
Carbon Dioxide		0	3.25160E-12	2.34088E-13*	3.25160E-12*	5.31172E-13*
Methane		0	0	0*	0*	0*
Ethane		0	8.10292E-08	3.59046E-09*	8.10292E-08*	8.14715E-09*
Propane		0	0.000277405	3.01498E-06*	0.000277405*	6.84131E-06*
i-Butane		0	0.0163290	6.30905E-05*	0.0163290*	0.000143159*
n-Butane		0	0.866705	0.00227171*	0.866705*	0.00515476*
i-Pentane		0	29.0881	0.0289979*	29.0881*	0.0657995*
n-Pentane		0	40.6290	0.0299939*	40.6290*	0.0680595*
n-Hexane		0	42.8029	0.00919714*	42.8029*	0.0208693*
n-Heptane		0	39.5077	0.00252095*	39.5077*	0.00572031*
n-Octane		0	20.9716	0.000371315*	20.9716*	0.000842554*
Water		0	0	0*	0*	0*
Hydrogen Sulfide		0	1.96487E-14	4.41699E-16*	1.96487E-14*	1.00226E-15*
Mass Fraction			%	%	%	%
Nitrogen			0	0	0*	0
Carbon Dioxide			9.46175E-13	1.88008E-10	9.46175E-13*	1.88008E-10
Methane			0	0	0*	0
Ethane			1.61098E-08	1.97024E-06	1.61098E-08*	1.97024E-06
Propane			8.08793E-05	0.00242622	8.08793E-05*	0.00242622
i-Butane			0.00627523	0.0669200	0.00627523*	0.0669200
n-Butane			0.333074	2.40960	0.333074*	2.40960
i-Pentane			13.8762	38.1809	13.8762*	38.1809
n-Pentane			19.3818	39.4923	19.3818*	39.4923
n-Hexane			24.3884	14.4639	24.3884*	14.4639
n-Heptane			26.1749	4.60989	26.1749*	4.60989
n-Octane			15.8392	0.774046	15.8392*	0.774046
Water			0	0	0*	0
Hydrogen Sulfide			4.42764E-15	2.74718E-13	4.42764E-15*	2.74718E-13
Mass Flow		lb/h	lb/h	lb/h	lb/h	lb/h
Nitrogen		0	0	0*	0*	0*
Carbon Dioxide		0	1.43101E-10	1.03021E-11*	1.43101E-10*	2.33766E-11*
Methane		0	0	0*	0*	0*
Ethane		0	2.43647E-06	1.07962E-07*	2.43647E-06*	2.44977E-07*
Propane		0	0.0122323	0.000132947*	0.0122323*	0.000301672*
i-Butane		0	0.949079	0.00366696*	0.949079*	0.00832073*
n-Butane		0	50.3748	0.132037*	50.3748*	0.299606*
i-Pentane		0	2098.67	2.09217*	2098.67*	4.74735*
n-Pentane		0	2931.33	2.16402*	2931.33*	4.91041*
n-Hexane		0	3688.56	0.792567*	3688.56*	1.79842*
n-Heptane		0	3958.74	0.252604*	3958.74*	0.573187*
n-Octane		0	2395.56	0.0424147*	2395.56*	0.0962436*
Water		0	0	0*	0*	0*
Hydrogen Sulfide		0	6.69645E-13	1.50535E-14*	6.69645E-13*	3.41580E-14*

Process Streams		Condensate Flash	Condensate Produced	Condensate W&B Emissions	From Condensate Cooler	Loading Emissions
Properties	Status:	Solved	Solved	Solved	Solved	Solved
Phase: **Total**	From Block:	Condensate Tanks	Condensate Tanks	--	--	--
	To Block:	--	--	--	Condensate Tanks	--
Property	**Units**					
Temperature	°F	80	80*	84.6552	125*	84.6552
Pressure	psia	8.99995	8.99995	7.08322	204.000*	7.08322
Mole Fraction Vapor	%		0	100	0	100
Mole Fraction Light Liquid	%		100	0	100	0
Mole Fraction Heavy Liquid	%		0	0	0	0
Molecular Weight	lb/lbmol		86.9794	74.6347	86.9794	74.6347
Mass Density	lb/ft^3		40.9082	0.0923803	39.5458	0.0923803
Molar Flow	lbmol/h	0	173.883	0.0734191	173.883	0.166596
Mass Flow	lb/h	0	15124.2	5.47961	15124.2	12.4338
Vapor Volumetric Flow	ft^3/h	0	369.711	59.3158	382.448	134.594
Liquid Volumetric Flow	gpm	0	46.0938	7.39522	47.6818	16.7806
Std Vapor Volumetric Flow	MMSCFD	0	1.58366	0.000668673	1.58366	0.00151729
Std Liquid Volumetric Flow	sgpm	0	45.5583	0.0172542	45.5583*	0.0391517
Compressibility			0.00330411	0.979649	0.0715108	0.979649
Specific Gravity			0.655909	2.57694	0.634064	2.57694
API Gravity			80.8967		80.3548	
Enthalpy	Btu/h	0	-1.50346E+07	-4819.72	-1.46512E+07	-10936.5
Mass Enthalpy	Btu/lb		-994.075	-879.574	-968.728	-879.574
Mass Cp	Btu/(lb*°F)		0.537216	0.402431	0.566771	0.402431
Ideal Gas CpCv Ratio			1.06111	1.07121	1.05704	1.07121
Dynamic Viscosity	cP		0.296402	0.00704690	0.242828	0.00704690
Kinematic Viscosity	cSt		0.452324	4.76209	0.383335	4.76209
Thermal Conductivity	Btu/(h*ft*°F)		0.0686472	0.00854064	0.0638223	0.00854064
Surface Tension	lbf/ft		0.00121311?		0.00103360	
Net Ideal Gas Heating Value	Btu/ft^3		4442.15	3827.35	4442.15	3827.35
Net Liquid Heating Value	Btu/lb		19221.3	19301.8	19221.3	19301.8
Gross Ideal Gas Heating Value	Btu/ft^3		4797.16	4138.04	4797.16	4138.04
Gross Liquid Heating Value	Btu/lb		20770.5	20882.1	20770.5	20882.1


PW Tank Flash Emissions
To Produced Water Tanks
Q-1
Produced Water Tanks
Produced Water
Annual tank loss calculations for "From Condensate Cooler".
Total working and breathing losses are 32.41 ton/yr.
Flashing losses are 0 ton/yr.
Loading losses are 117.5 ton/yr of loaded liquid.
* Only Non-Exempt VOCs are reported.
W W&B Emissions
Loading Emissions
TK-4 and TK-5

Process Streams		Loading Emissions	Produced Water	PW Tank Flash Emissions	PW W&B Emissions	To Produced Water Tanks
Composition	Status:	Solved	Solved	Solved	Solved	Solved
Phase: **Total**	From Block:	--	Produced Water Tanks	Produced Water Tanks	--	--
	To Block:	--	--	--	--	Produced Water Tanks
Mole Fraction		%	%		%	%
Nitrogen		0*	0		0*	0*
Carbon Dioxide		3.21078E-10*	1.87000E-12		3.21078E-10*	1.87000E-12*
Methane		0*	0		0*	0*
Ethane		4.93314E-06*	4.66000E-08		4.93314E-06*	4.66000E-08*
Propane		0.00413067*	0.000159536		0.00413067*	0.000159536*
i-Butane		0.0862734*	0.00939083		0.0862734*	0.00939083*
n-Butane		3.10446*	0.498443		3.10446*	0.498443*
i-Pentane		39.5386*	16.7286		39.5386*	16.7286*
n-Pentane		40.8604*	23.3658		40.8604*	23.3658*
n-Hexane		12.4918*	24.6160		12.4918*	24.6160*
n-Heptane		3.41340*	22.7209		3.41340*	22.7209*
n-Octane		0.500947*	12.0608		0.500947*	12.0608*
Water		0*	0		0*	0*
Hydrogen Sulfide		6.05360E-13*	1.13000E-14		6.05360E-13*	1.13000E-14*
Molar Flow		lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h
Nitrogen		0*	0	0	0*	0*
Carbon Dioxide		1.15427E-12*	7.28592E-14	0	3.00070E-13*	7.28592E-14*
Methane		0*	0	0	0*	0*
Ethane		1.77345E-08*	1.81564E-09	0	4.61036E-09*	1.81564E-09*
Propane		1.48497E-05*	6.21586E-06	0	3.86039E-06*	6.21586E-06*
i-Butane		0.000310151*	0.000365887	0	8.06284E-05*	0.000365887*
n-Butane		0.0111605*	0.0194204	0	0.00290133*	0.0194204*
i-Pentane		0.142140*	0.651782	0	0.0369515*	0.651782*
n-Pentane		0.146892*	0.910381	0	0.0381868*	0.910381*
n-Hexane		0.0449079*	0.959092	0	0.0116745*	0.959092*
n-Heptane		0.0122711*	0.885255	0	0.00319005*	0.885255*
n-Octane		0.00180089*	0.469914	0	0.000468169*	0.469914*
Water		0*	0	0	0*	0*
Hydrogen Sulfide		2.17625E-15*	4.40272E-16	0	5.65750E-16*	4.40272E-16*
Mass Fraction		%	%		%	%
Nitrogen		0	0		0	0*
Carbon Dioxide		1.89364E-10	9.46175E-13		1.89364E-10	9.46175E-13*
Methane		0	0		0	0*
Ethane		1.98785E-06	1.61098E-08		1.98785E-06	1.61098E-08*
Propane		0.00244094	8.08793E-05		0.00244094	8.08793E-05*
i-Butane		0.0671986	0.00627523		0.0671986	0.00627523*
n-Butane		2.41807	0.333074		2.41807	0.333074*
i-Pentane		38.2288	13.8762		38.2288	13.8762*
n-Pentane		39.5069	19.3818		39.5069	19.3818*
n-Hexane		14.4262	24.3884		14.4262	24.3884*
n-Heptane		4.58357	26.1749		4.58357	26.1749*
n-Octane		0.766845	15.8392		0.766845	15.8392*
Water		0	0		0	0*
Hydrogen Sulfide		2.76481E-13	4.42764E-15		2.76481E-13	4.42764E-15*
Mass Flow		lb/h	lb/h	lb/h	lb/h	lb/h
Nitrogen		0*	0	0	0*	0*
Carbon Dioxide		5.07988E-11*	3.20650E-12	0	1.32059E-11*	3.20650E-12*
Methane		0*	0	0	0*	0*
Ethane		5.33260E-07*	5.45944E-08	0	1.38629E-07*	5.45944E-08*
Propane		0.000654805*	0.000274092	0	0.000170226*	0.000274092*
i-Butane		0.0180267*	0.0212662	0	0.00468630*	0.0212662*
n-Butane		0.648670*	1.12876	0	0.168632*	1.12876*
i-Pentane		10.2552*	47.0253	0	2.66601*	47.0253*
n-Pentane		10.5981*	65.6829	0	2.75513*	65.6829*
n-Hexane		3.86995*	82.6501	0	1.00605*	82.6501*
n-Heptane		1.22959*	88.7042	0	0.319650*	88.7042*
n-Octane		0.205713*	53.6776	0	0.0534783*	53.6776*
Water		0*	0	0	0*	0*
Hydrogen Sulfide		7.41686E-14*	1.50049E-14	0	1.92813E-14*	1.50049E-14*

Process Streams		Loading Emissions	Produced Water	PW Tank Flash Emissions	PW W&B Emissions	To Produced Water Tanks
Properties	**Status:**	Solved	Solved	Solved	Solved	Solved
Phase: **Total**	**From Block:**	--	Produced Water Tanks	Produced Water Tanks	--	--
	To Block:	--	--	--	--	Produced Water Tanks
Property	**Units**					
Temperature	°F	83.6513	80	80	83.6513	125*
Pressure	psia	6.93754	8.99995	8.99995	6.93754	204.000*
Mole Fraction Vapor	%	100	0		100	0
Mole Fraction Light Liquid	%	0	100		0	100
Mole Fraction Heavy Liqui	%	0	0		0	0
Molecular Weight	lb/lbmol	74.6206	86.9794		74.6206	86.9794
Mass Density	lb/ft^3	0.0905996	40.9082		0.0905996	39.5458
Molar Flow	lbmol/h	0.359498	3.89622	0	0.0934569	3.89622
Mass Flow	lb/h	26.8259	338.890	0	6.97381	338.890
Vapor Volumetric Flow	ft^3/h	296.093	8.28417	0	76.9740	8.56958
Liquid Volumetric Flow	gpm	36.9155	1.03283	0	9.59675	1.06841
Std Vapor Volumetric Flow	MMSCFD	0.00327417	0.0354853	0	0.000851169	0.0354853
Std Liquid Volumetric Flow	sgpm	0.0844745	1.02083	0	0.0219604	1.02083*
Compressibility		0.979981	0.00330411		0.979981	0.0715108
Specific Gravity		2.57646	0.655909		2.57646	0.634064
API Gravity			80.8967			80.3548
Enthalpy	Btu/h	-23607.5	-336882	0	-6137.13	-328293
Mass Enthalpy	Btu/lb	-880.026	-994.075		-880.026	-968.728
Mass Cp	Btu/(lb*°F)	0.401794	0.537216		0.401794	0.566771
Ideal Gas CpCv Ratio		1.07134	1.06111		1.07134	1.05704
Dynamic Viscosity	cP	0.00703392	0.296402		0.00703392	0.242828
Kinematic Viscosity	cSt	4.84675	0.452324		4.84675	0.383335
Thermal Conductivity	Btu/(h*ft*°F)	0.00851012	0.0686472		0.00851012	0.0638223
Surface Tension	lbf/ft		0.00121311?			0.00103360
Net Ideal Gas Heating Val	Btu/ft^3	3826.64	4442.15		3826.64	4442.15
Net Liquid Heating Value	Btu/lb	19301.9	19221.3		19301.9	19221.3
Gross Ideal Gas Heating \	Btu/ft^3	4137.28	4797.16		4137.28	4797.16
Gross Liquid Heating Valu	Btu/lb	20882.3	20770.5		20882.3	20770.5

6. IMPACTS EVALUATION

The NRSP requires an impacts evaluation for National Ambient Air Quality Standards (NAAQS; nitrogen dioxide (NO_2) and SO_2), State Property Line Standards (H_2S and SO_2), and State Health Effects Review (benzene). As shown in the analyses provided within this section, the proposed NO_2 and benzene hourly emissions are above the de minimis thresholds presented in the Non-Rule Standard Permit Section (k)(3)(C) and within Table 6-1 below. As such, an impacts evaluation demonstrating compliance with the NO_2 NAAQS, and State Health Effects Review for benzene are included in this section. The hourly H_2S and SO_2 emissions are below the de minimis threshold; therefore, no further analysis is required; however, MarkWest evaluated H_2S and SO_2 impacts for completeness. For the NO_2 and SO_2 emissions, if the SIL is exceeded, the screening background concentration is added to the modeled impacts for comparison to the NAAQS in accordance with the site guidance. Since the site is located in Loving County, a NO_2 1-hour screening background concentration of 70 $\mu g/m^3$ was used per TCEQ guidance. A SO_2 1-hour screening background concentration of 50 $\mu g/m^3$ was used per TCEQ guidance. The Loving County screening background concentration of 20 $\mu g/m^3$ for the NO_2 annual averaging period and 8 $\mu g/m^3$ for the SO_2 annual averaging period is also taken from TCEQ guidance. The generic modeling tables specified in Barnett Shale Standard Permit Section (m) and SCREEN3 are used to demonstrate compliance with the required standards.

Table 6-1. De Minimis Thresholds for Impacts Evaluation

Air Contaminant	lb/hr
Benzene	0.039
Hydrogen sulfide	0.025
Sulfur dioxides	2
Nitrogen oxides	4

As evidenced within the analyses at the end of this section, the site-wide emissions are in compliance with the NAAQS for NO_2 and SO_2, State Property Line Standards, and the State Health Effects Review for benzene.

NON-RULE STANDARD PERMIT IMPACTS ASSESSMENT

	Hourly NO_X	Hourly SO_2	Hourly H_2S	Hourly Benzene
	E (lb/hr)	E (lb/hr)	E (lb/hr)	E (lb/hr)
Current Project Total	165.95	0.83	9.01E-03	2.16
De minimis Limits [1]	4.0	2.0	0.025	0.039
Impacts Review Required?	Yes	No	No	Yes

[1] De minimis limits per Non-Rule Standard Permit 6002(k)(3)(C).

IMPACTS ASSESSMENT - NO_2

NO_2 Impacts Evaluation - Annual

EPN	Which impacts table corresponds to this EPN? [2]	Distance to Property Line (ft)	Height of Release Point (ft)	G_{EPNx} [2] (μg/m³)/(lb/hr)	Annual Impacts Analysis [1]: NO_2 Annual Emissions [3] (tpy)	NO_2 Hourly Emissions [4] (lb/hr)	$E_{EPNx, annual}$ [5] (μg/m³)	NAAQS (μg/m³)	Screening Background Concentration [6] (μg/m³)	Total Concentration (μg/m³)	Is Modeled Concentration < NAAQS?
ENG-1 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	1.59	0.36	0.15	100	20	26.94	YES
ENG-2 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	1.59	0.36	0.15				
ENG-3 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	1.59	0.36	0.15				
ENG-4 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	1.59	0.36	0.15				
ENG-5 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	1.59	0.36	0.15				
ENG-6 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	1.59	0.36	0.15				
ENG-7 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	1.59	0.36	0.15				
CRANK / Crankcase	Table 2. Fugitives and Process Vents	250	10	426.0	0.12	0.03	0.95				
HTR-1 / Condensate Stabilizer Heater [7]	SCREEN3	200	20.3	10.9	2.93	0.67	0.58				
HTR-2 / Amine Regeneration Reboiler [7]	SCREEN3	200	20.3	14.3	2.42	0.55	0.63				
HTR-3 / Mol Sieve Regeneration [7]	Table 3. Flares and Thermal Destruction Devices	500	53.5	24.3	3.35	0.76	1.49				
HTR-4 / Hot Oil Heater [7]	SCREEN3	120	37.6	2.5	7.29	1.66	0.34				
HTR-5 / Glycol Reboiler [7]	Table 3. Flares and Thermal Destruction Devices	450	26.0	49.0	1.07	0.25	0.96				
STILLCOMB / Glycol Dehydration Unit Still Vent [7]	SCREEN3	50	25.3	0.9688	6.32	1.44	0.11				
VCU-1 / VCU Waste Gas Combustion Emissions [7]	SCREEN3	350	40	4.24	0.42	0.10	0.03				
FLR-1 MSS / Flare Pilot and MSS Gas Combustion Emissions [7]	SCREEN3	350	85	0.03	24.19	5.52	0.01				
FLR-1 TO DT / Flared TO Downtime Emissions [7]	SCREEN3	350	85	0.62	8.99	2.05	0.10				
TO-1 / Thermal Oxidizer to Control Amine Acid Gas [7]	SCREEN3	550	20	5.24	4.85	1.11	0.46				
TO-2 / Thermal Oxidizer to Control Inlet Amine Acid Gas [7]	SCREEN3	550	58	0.38	23.27	5.31	0.16				
GEN-1/ Emergency Generator (PBR 106.511)	Table 5F. Engines Greater Than 2,000 hp	50	8	7.00	0.71	0.16	0.091				
							$E_{total, annual}$ (μg/m³)				
							6.94				

[1] All site-wide sources are included in this assessment.
[2] GEPNx values obtained from Tables 2, 3, and 5F of the Non-Rule Standard Permit screening tables and SCREEN3.
[3] The NO_x-to-NO_2 ratio is applied for 4-stroke rich and lean burn engines per 6002(k)(4)(A), which is 0.2
[4] Modeled hourly emissions average the annual emissions over an entire year of operation. Modeled Hourly Emissions (lb/hr) = Annual Emissions Increase (tpy) / 8,760 (hrs/yr) x 2,000 (lb/ton) .
[5] The Modeled Annual Concentration for Each EPN (μg/m³) = Modeled Hourly Emission Increase (lb/hr) x Ground Level Concentration from the Table (μg/m³)/(lb/hr) x 0.08.
[6] Screening background for NO_2 annual is taken from TCEQ memorandum, "Screening Background Concentrations", from Dom Ruggeri, TCEQ, to TCEQ Air Dispersion Modeling Team (ADMT), September 4, 1998.
[7] The NO_x-to-NO_2 ratio of 1 is applied for all sources, except for 4-stroke rich and lean burn engines.

IMPACTS ASSESSMENT - NO_2

NO_2 Impacts Evaluation - Hourly

					Hourly Impact Analysis [1]					
EPN	Which impacts table corresponds to this EPN? [2]	Distance to Property Line (ft)	Height of Release Point (ft)	G_{EPNx} [2] (μg/m³)/(lb/hr)	NO_2 Hourly Emissions [3] (lb/hr)	$E_{EPNx, hourly}$ [4] (μg/m³)	NAAQS (μg/m³)	Screening Background Concentration [5] (μg/m³)	Total Concentration (μg/m³)	Is Total Modeled Concentration < NAAQS?
ENG-1 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	0.36	1.82	188	70	167.39	YES
ENG-2 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	0.36	1.82				
ENG-3 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	0.36	1.82				
ENG-4 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	0.36	1.82				
ENG-5 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	0.36	1.82				
ENG-6 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	0.36	1.82				
ENG-7 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	0.36	1.82				
CRANK / Crankcase	Table 2. Fugitives and Process Vents	250	10	426.0	0.03	11.83				
HTR-1 / Condensate Stabilizer Heater [6]	SCREEN3	200	20.33	10.9	0.67	7.28				
HTR-2 / Amine Regeneration Reboiler [6]	SCREEN3	200	20.33	14.3	0.55	7.90				
HTR-3 / Mol Sieve Regeneration [6]	Table 3. Flares and Thermal Destruction Devices	500	53.50	24.3	0.76	18.58				
HTR-4 / Hot Oil Heater [6]	SCREEN3	120	37.60	2.53	1.66	4.21				
HTR-5 / Glycol Reboiler [6]	Table 3. Flares and Thermal Destruction Devices	450	26	49.0	0.25	12.01				
STILLCOMB / Glycol Dehydration Unit Still Vent [6]	SCREEN3	50	25	0.9688	1.44	1.40				
VCU-1 / VCU Waste Gas Combustion Emissions [6]	SCREEN3	350	40	4.2	0.10	0.41				
FLR-1 MSS / Flare Pilot and MSS Gas Combustion Emissions [6,7]	SCREEN3	350	85	0.03	322.58	9.34				
FLR-1 TO DT / Flared TO Downtime Emissions [6]	Table 3: Flares and Thermal Destruction Devices	350	85	0.62	8.986	5.61				
TO-1 / Thermal Oxidizer to Control Amine Acid Gas [6]	SCREEN3	550	20	5.2	1.11	5.80				
TO-2 / Thermal Oxidizer to Control Inlet Amine Acid Gas [6]	SCREEN3	550	58	0.4	5.31	2.00				
GEN-1/ Emergency Generator (PBR 106.511) [7]	Table 5F. Engines Greater Than 2,000 hp	50	8	7.0	0.0406	0.284				
						$E_{total, hourly}$ (μg/m³)				
						97.39				

[1] All site-wide sources are included in this assessment.
[2] GEPNx values obtained from Tables 2, 3 and 5F of the Non-Rule Standard Permit screening tables and SCREEN3.
[3] The NO_x-to-NO_2 ratio is applied for 4-stroke rich and lean burn engines per 6002(k)(4)(A), which is 0.2
[4] The Modeled Hourly Concentration for Each EPN (μg/m³) = Modeled Hourly Emission Increase (lb/hr) x Ground Level Concentration from the Table (μg/m³)/(lb/hr).
[5] Screening background concentration for NO_2 1-hour is taken from the TCEQ "Interim 1-Hour NO_2 Screening Background Concentrations" dated July 22, 2010.
[6] The NO_x-to-NO_2 ratio of 1 is applied for all sources, except for 4-stroke rich and lean burn engines.
[7] GEN-1 is considered an intermittent source and runs a maximum of 100 hours per year. Therefore, the emission rate is annualized accordingly for NO_2 1-hour and SO_2 1-hour averaging periods.

MarkWest Tornado GP L.L.C. - Tornado Gas Plant

IMPACTS ASSESSMENT - SO_2

					Annual Impacts Analysis - Project Emissions [1]					Annual Impacts Analysis - Site-wide Emissions [5]						
EPN / Emission Source	Which impacts table corresponds to this EPN? [2]	Distance to Property Line (ft)	Height of Release Point (ft)	G_{EPNx} [2] ($\mu g/m^3$)/(lb/hr)	SO_2 Annual Project Emissions (tpy)	SO_2 Hourly Project Emissions [3] (lb/hr)	$E_{EPNx, annual}$ [4] ($\mu g/m^3$)	$SIL_{SO2, long term}$ ($\mu g/m^3$)	Is Project Modeled Concentration < 10% x SIL?	SO_2 Hourly Site-wide Emissions (lb/hr)	$E_{EPNx, annual}$ ($\mu g/m^3$)	Is Site-wide Modeled Concentration < SIL?	NAAQS ($\mu g/m^3$)	Screening Background Concentration [6] ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	Is Total Modeled Concentration < NAAQS?
ENG-1 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	0.070	0.016	6.44E-03			0.016	6.44E-03					
ENG-2 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	0.070	0.016	6.44E-03			0.016	6.44E-03					
ENG-3 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	0.070	0.016	6.44E-03			0.016	6.44E-03					
ENG-4 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	0.070	0.016	6.44E-03			0.016	6.44E-03					
ENG-5 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	0.070	0.016	6.44E-03			0.016	6.44E-03					
ENG-6 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	0.070	0.016	6.44E-03			0.016	6.44E-03					
ENG-7 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	0.070	0.016	6.44E-03			0.016	6.44E-03					
HTR-1 / Condensate Stabilizer Heater	SCREEN3	200	20.3	10.9	0.043	9.81E-03	8.55E-03			9.81E-03	8.55E-03					
HTR-2 / Amine Regeneration Reboiler	SCREEN3	200	20.3	14.3	0.035	8.10E-03	9.27E-03			8.10E-03	9.27E-03					
HTR-3 / Mol Sieve Regeneration	Table 3. Flares and Thermal Destruction Devices	500	53.5	24.3	0.020	4.59E-03	8.92E-03			4.59E-03	8.92E-03					
HTR-4 / Mol Sieve Regeneration	SCREEN3	120	37.6	2.5	0.119	0.03	5.51E-03	1	**YES**	0.03	5.51E-03	**NO**	80	8	11.28	**YES**
HTR-5 / Glycol Reboiler	Table 3. Flares and Thermal Destruction Devices	450	26.0	49.0	6.44E-03	1.47E-03	5.76E-03			1.47E-03	5.76E-03					
STILLCOMB / Glycol Dehydration Unit Still Vent	SCREEN3	50	25.3	0.9688	0.051	0.01	9.02E-04			0.01	9.02E-04					
VCU-1 / VCU Waste Gas Combustion Emissions	SCREEN3	350	40	4.2	5.75E-04	1.31E-04	4.46E-05			1.31E-04	4.46E-05					
FLR-1 MSS / Flare Pilot and MSS Gas Combustion Emissions	SCREEN3	350	85	0.03	0.12	0.028	6.56E-05			0.028	6.56E-05					
FLR-1 TO DT / Flared TO Downtime Emissions	SCREEN3	350	85	0.62	7.05	1.610	8.03E-02			1.610	8.03E-02					
TO-1 / Thermal Oxidizer to Control Amine Acid Gas	SCREEN3	550	20	5.24	30.73	7.016	2.94			7.016	2.94					
TO-2 / Thermal Oxidizer to Control Inlet Amine Acid Gas	SCREEN3	550	58	0.38	16.90	3.858	0.12			3.858	0.12					
GEN-1/ Emergency Generator (PBR 106.511)	Table 5F. Engines Greater Than 2,000 hp	50	8	7.00	0.45	0.10	5.80E-02			0.10	5.80E-02					
							$E_{total, annual}$ ($\mu g/m^3$)				$E_{total, annual}$ ($\mu g/m^3$)					
							8.04E-02				3.28					

[1] Project affected sources are included in this assessment.

[2] G_{EPNx} values were obtained from Tables 3 and 5F of the Non-Rule Standard Permit and SCREEN3 modeling.

[3] Modeled hourly emissions average the annual emissions over an entire year of operation. Modeled Hourly Emissions (lb/hr) = Annual Emissions Increase (tpy) / 8,760 (hrs/yr) x 2,000 (lb/ton)

[4] The Modeled Annual Concentration for Each EPN ($\mu g/m^3$) = Modeled Hourly Emission Increase (lb/hr) x Ground Level Concentration ($\mu g/m^3$)/(lb/hr) x 0.08

[5] All sitewide sources are included in this assessment.

[6] Screening background for SO_2 annual is taken from TCEQ memorandum, "Screening Background Concentrations", from Dom Ruggeri, TCEQ, to TCEQ Air Dispersion Modeling Team (ADMT), September 4, 1998.

IMPACTS ASSESSMENT - SO_2

SO_2 Impacts Evaluation - Hourly

EPN	Which impacts table corresponds to this EPN? [2]	Distance to Property Line (ft)	Height of Release Point (ft)	G_{EPNx} [2] ($\mu g/m^3$)/(lb/hr)	Hourly Impact Analysis - Project Emissions [1]: SO_2 Hourly Project Emissions (lb/hr)	$E_{EPNx, hourly}$ [3, 4] ($\mu g/m^3$)	$SIL_{SO2, short term}$ ($\mu g/m^3$)	Is Modeled Concentration < 10% x SIL?	Hourly Impact Analysis - Site-wide Emissions: SO_2 Hourly Site-wide Emissions (lb/hr)	$E_{EPNx, hourly}$ ($\mu g/m^3$)	Is Site-wide Modeled Concentration < SIL?	NAAQS ($\mu g/m^3$)	Screening Background Concentration [4] ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	Is Total Modeled Concentration < NAAQS? [5]
ENG-1 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	0.016	0.080	7.8	NO	0.016	0.080	NO	196	50	92.99	YES
ENG-2 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	0.016	0.080			0.016	0.080					
ENG-3 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	0.016	0.080			0.016	0.080					
ENG-4 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	0.016	0.080			0.016	0.080					
ENG-5 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	0.016	0.080			0.016	0.080					
ENG-6 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	0.016	0.080			0.016	0.080					
ENG-7 / Cat G3608 A4 Engine	Table 5F. Engines Greater Than 2,000 hp	250	20	5.0	0.016	0.080			0.016	0.080					
HTR-1 / Condensate Stabilizer Heater	SCREEN3	200	20	10.9	9.81E-03	0.11			9.81E-03	0.11					
HTR-2 / Amine Regeneration Reboiler	SCREEN3	200	20	14.3	8.10E-03	0.12			8.10E-03	0.12					
HTR-3 / Mol Sieve Regeneration	Table 3. Flares and Thermal Destruction Devices	500	54	24.3	4.59E-03	0.11			4.59E-03	0.11					
HTR-4 / Mol Sieve Regeneration	SCREEN3	120	38	2.5	0.027	0.07			0.03	0.07					
HTR-5 / Glycol Reboiler	Table 3. Flares and Thermal Destruction Devices	450	26	49.0	1.47E-03	0.07			1.47E-03	0.07					
STILLCOMB / Glycol Dehydration Unit Still Vent	SCREEN3	50	25	0.9688	0.01	0.01			0.01	0.01					
VCU-1 / VCU Waste Gas Combustion Emissions	SCREEN3	350	40	4.24	1.31E-04	5.57E-04			1.31E-04	5.57E-04					
FLR-1 MSS / Flare Pilot and MSS Gas Combustion Emissions [6]	SCREEN3	350	85	0.03	1.65	0.05			1.654	0.05					
FLR-1 TO DT / Flared TO Downtime Emissions [6]	SCREEN3	350	85	0.62	7.05	4.40			7.051	4.40					
TO-1 / Thermal Oxidizer to Control Amine Acid Gas	SCREEN3	550	20	5.2	7.016	36.77			7.016	36.77					
TO-2 / Thermal Oxidizer to Control Inlet Amine Acid Gas	SCREEN3	550	58	0.4	3.858	1.45			3.858	1.45					
GEN-1/ Emergency Generator (PBR 106.511) [6]	Table 5F. Engines Greater Than 2,000 hp	50	8	7.0	0.104	0.72			0.104	0.72					
						$E_{total, hourly}$ ($\mu g/m^3$) 4.45				$E_{total, hourly}$ ($\mu g/m^3$) 42.99					

[1] Project affected sources are included in this assessment.

[2] G_{EPNx} values were obtained from Tables 3 and 5F of the Non-Rule Standard Permit and SCREEN3 modeling.

[3] The Modeled Hourly Concentration for Each EPN ($\mu g/m^3$) = Modeled Hourly Emission Increase (lb/hr) x Ground Level Concentration ($\mu g/m^3$)/(lb/hr)

[4] Screening background for SO_2 1-hour is taken from the TCEQ "Interim 1-Hour SO_2 Screening Background Concentrations" dated December 20, 2010.

[5] Per the TCEQ's *Oil and Gas Standard Permit by Rule Refined- Screening Modeling Guidelines*, "short-term standards are usually the controlling concentrations; that is, if the standard is met for the shortest time period, standards for longer averaging periods will also be met." Therefore, if the predicted concentrations from the maximum 1-hour emissions for a NAAQS or applicable state standard are at or are lower than the concentrations from a longer averaging period, the demonstration is complete. Since the predicted 1-hour SO_2 concentration is less than 196 $\mu g/m^3$, the demonstration for all SO_2 NAAQS and state standards except the annual NAAQS is complete.

[6] GEN-1 is considered an intermittent source and runs a maximum of 100 hours per year. Therefore, the emission rate is annualized accordingly for NO_x 1-hour and SO_2 1-hour averaging periods.

IMPACTS ASSESSMENT - H_2S

						Hourly Impacts Analysis - Site-wide Emissions			
EPN	Description	Which impacts table corresponds to this EPN?	Shortest Distance to Property Line (ft)	Height of Release Point (ft)	G_{EPNx} [1] ($\mu g/m^3$)/(lb/hr)	Hourly Emissions (lb/hr)	$E_{EPNx, hourly}$ [2] ($\mu g/m^3$)	State Property Line Standard (1-hr H_2S) ($\mu g/m^3$)	Is Modeled Concentration < Standard?
ROD	Rod Packing	Table 2. Fugitives and Process Vents	50	3	4375.0	6.14E-06	2.69E-02	108	YES
HTR-1	Condensate Stabilizer Heater	SCREEN3	200	20.33	10.9	1.49E-04	1.62E-03		
HTR-2	Amine Regeneration Reboiler	SCREEN3	200	20.33	14.3	1.23E-04	1.76E-03		
HTR-3	Mol Sieve Regeneration	Table 3: Flares and Thermal Destruction Devices	500	53.5	24.3	6.98E-05	1.70E-03		
HTR-4	Hot Oil Heater	SCREEN3	120	37.60	2.5	4.14E-04	1.05E-03		
HTR-5	Glycol Reboiler	Table 3: Flares and Thermal Destruction Devices	450	26	49.0	2.24E-05	1.10E-03		
STILLCOMB	Glycol Dehydration Unit Still Vent	SCREEN3	50	25.25	0.9688	3.25E-04	3.15E-04		
AMINE-NGL	NGL Amine Treater	SCREEN3	200	20.33	14.3	2.71E-03	0.04		
AMINE-IN	Amine Unit Inlet Treater	SCREEN3	500	53.5	2.5	4.11E-04	0.00		
TK-1	Condensate Tank	Table 2. Fugitives and Process Vents	200	20	305.0	1.00E-16	3.06E-14		
TK-2	Condensate Tank	Table 2. Fugitives and Process Vents	250	20	299.5	1.00E-16	3.01E-14		
TK-3	Condensate Tank	Table 2. Fugitives and Process Vents	300	20	294.0	1.00E-16	2.95E-14		
TK-4	Produced Water Tank	Table 2. Fugitives and Process Vents	450	20	282.5	9.64E-17	2.72E-14		
TK-5	Produced Water Tank	Table 2. Fugitives and Process Vents	450	20	282.5	9.64E-17	2.72E-14		
VCU-1	VCU Waste Gas Combustion Emissions	SCREEN3	350	40	4.2	1.40E-06	5.92E-06		
FLR-1 MSS	Flare Pilot and MSS Gas Combustion Emissions	SCREEN3	350	85	0.03	0.02	5.20E-04		
FLR-1 TO DT	Flared TO Downtime Emissions	SCREEN3	350	85	0.62	0.08	0.05		
TO-1	Thermal Oxidizer to Control Amine Acid Gas	SCREEN3	550	20	5.2	0.04	0.22		
TO-2	Thermal Oxidizer to Control Inlet Amine Acid Gas	SCREEN3	550	58	0.4	0.023	0.01		
FUG	Site-wide Fugitives	Table 2. Fugitives and Process Vents	50	3	4375.0	1.41E-04	0.62		
							$E_{total, hourly}$ ($\mu g/m^3$) [3]		
							0.92		

[1] G_{EPNx} values from or interpolated from Tables 2 and 3 of the Non-Rule Standard Permit and SCREEN3.
[2] The Modeled Hourly Concentration for Each EPN (ug/m[3]) = Hourly Emissions (lb/hr) x Ground Level Concentration from the Table ($\mu g/m^3$)/(lb/hr)
[3] The Total Modeled Hourly Concentration for All EPNs (ug/m[3]) is the sum of all normal operations and MSS operations.

Benzene Project Emissions Impact Evaluation - Annual

EPN	Description	Modeling Method for Impacts Assessment [1]	Shortest Distance to Off-site Receptor (ft)	Height of Release Point (ft)	G_{EPNx} [1] $(\mu g/m^3)/(lb/hr)$	Hourly Emissions (lb/hr)	$E_{EPNx,\ annual}$ [2] $(\mu g/m^3)$	$ESL_{benzene,\ long\ term}$ $(\mu g/m^3)$	Is Project Modeled Concentration < 10% x ESL?
TEGDEHY	Glycol Dehydration Unit	Table 2. Fugitives and Process Vents	4608	10	27.1	0.13	0.27	4.5	YES
VCU-1	VCU Waste Gas Combustion Emissions	SCREEN3	4608	40	4.2420	7.93E-04	2.69E-04		
FUG	Site-wide Fugitives	Table 2. Fugitives and Process Vents	4608	3	24.4	2.62E-09	5.10E-09		
FLR-1 MSS	Flare Pilot and MSS Gas Cimbustion	SCREEN3	4608	85	0.02896	2.63	6.10E-03		
FLR-1 TO DT	TO Downtime Emissions Routed to Flare	SCREEN3	4608	85	0.62380	0.17	8.61E-03		
							$E_{total,\ annual}$ $(\mu g/m^3)$		
							0.288		

Benzene Project Emissions Impact Evaluation - Hourly

EPN	Description	Modeling Method for Impacts Assessment [1]	Shortest Distance to Off-site Receptor (ft)	Height of Release Point (ft) [2,3,4]	G_{EPNx} [1] $(\mu g/m^3)/(lb/hr)$	Hourly Emissions (lb/hr)	$E_{EPNx,\ hourly}$ [3] $(\mu g/m^3)$	$ESL_{benzene,\ short\ term}$ $(\mu g/m^3)$	Is Project Modeled Concentration < 10% x ESL?
TEGDEHY	Glycol Dehydration Unit	Table 2. Fugitives and Process Vents	4608	10	27.1	0.13	3.42	170	YES
VCU-1	VCU Waste Gas Combustion Emissions	SCREEN3	4608	40	4.2420	7.93E-04	3.37E-03		
FUG	Site-wide Fugitives	Table 2. Fugitives and Process Vents	4608	3	24.4	2.62E-09	6.37E-08		
FLR-1 MSS	Flare Pilot and MSS Gas Cimbustion	SCREEN3	4608	85	0.02896	2.63	0.08		
FLR-1 TO DT	TO Downtime Emissions Routed to Flare	SCREEN3	4608	85	0.62380	0.17	0.11		
							$E_{total,\ hourly}$ $(\mu g/m^3)$		
							3.60		

[1] G_{EPNx} interpolated from values obtained from Table 2 of the Oil and Gas Non-Rule Standard Permit and SCREEN3.
[2] The Modeled Annual Concentration for Each EPN $(\mu g/m^3)$ = Modeled Hourly Emission Increase (lb/hr) x Ground Level Concentration from the Table $(\mu g/m^3)/(lb/hr)$ x 0.08
[3] The Modeled Hourly Concentration for Each EPN $(\mu g/m^3)$ = Hourly Emissions (lb/hr) x Ground Level Concentration from the Table $(\mu g/m^3)/(lb/hr)$

IMPACTS ASSESSMENT - SCREEN3 Inputs and Results

Modeled Source Parameters for SCREEN3 Analysis

EPN / Emission Source	Stack Height		Stack Diameter		Stack Temperature		Stack Velocity		Distance to Property Line	
	(ft)	(m)	(ft)	(m)	(°F)	(K)	(ft/s)	(m/s)	(ft)	(m)
HTR-1 / Condensate Stabilizer Heater	20	6.20	2.17	0.660	450	505.37	38.7	11.8	200	60.96
HTR-2 / Amine Regeneration Reboiler	20	6.20	1.83	0.559	375	463.71	39.2	11.9	200	60.96
HTR-4 / Hot Oil Heater	38	11.46	3.50	1.067	468	515.37	41	12.5	120	36.58
STILLCOMB / Glycol Dehydration Unit Still Vent	25	7.70	4.00	1.219	1,832	1,273	66	20.00	50	15.24
VCU-1 / Waste Gas Combustion Emissions (Condensate Tanks, Loading)	40	12.19	5.00	1.524	250	394.26	20	6.1	350	106.68
FLR-1 MSS / Flare Pilot and MSS Gas Combustion Emissions	85	25.91	36.97	11.27	1,832	1,273	66	20.0	350	106.68
FLR-1 TO DT / TO Downtime Emissions routed to the flare	85	25.91	8.87	2.70	1,832	1,273	66	20.0	350	106.68
TO-1 / Thermal Oxidizer to Control Amine Acid Gas	20	6.10	1.41	0.43	1,500	1,089	107	32.6	550	167.64
TO-2 / Thermal Oxidizer to Control Inlet Amine Acid Gas	58	17.68	4.83	1.47	1,600	1,144	72	21.95	550	167.64

IMPACTS ASSESSMENT - SCREEN3 Inputs and Results

GLCMAX from Unit Emission Rate SCREEN3 Modeling

EPN / Emission Source	SCREEN3 Unit Emission Rate Concentration ($\mu g/m^3$)/(lb/hr)
HTR-1 / Condensate Stabilizer Heater	10.890
HTR-2 / Amine Regeneration Reboiler	14.300
HTR-4 / Hot Oil Heater	2.531
STILLCOMB / Glycol Dehydration Unit Still Vent	0.9688
VCU-1 / Waste Gas Combustion Emissions (Condensate Tanks, Loading)	4.242
FLR-1 MSS / Flare Pilot and MSS Gas Combustion Emissions	0.0290
FLR-1 TO DT / TO Downtime Emissions routed to the flare	0.6238
TO-1 / Thermal Oxidizer to Control Amine Acid Gas	5.241
TO-2 / Thermal Oxidizer to Control Inlet Amine Acid Gas	0.3764

Effective Diameter Calculation[1] - FLR-1 MSS

Effective flare tip diameter (m) = $[10^{-6} * q * (1-0.044*(MW^{1/2})]^{1/2}$

where q = lower heat release, cal/sec and MW is volume average molecular weight, g/gmol

Activity	Heat Release MMBtu/hr	Heat Release cal/s	MW	Effective Diameter (m)
FLR-1 MSS	2337.53	163,624,528.99	21.76	11.27
Minimum Effective Stack Diameter [2]				**11.27**

[1] Equation to calculate the effective flare diameter is obtained from TCEQ guidance on flare calculations, October 2006.

[2] Minimum effective stack diameter results in the highest modeled concentration; therefore, the smallest effective diameter is used in the modeling for conservatism.

Effective Diameter Calculation[1] - TO Downtime Emissions to Flare

Effective flare tip diameter (m) = $[10^{-6} * q * (1-0.044*(MW^{1/2})]^{1/2}$

where q = lower heat release, cal/sec and MW is volume average molecular weight, g/gmol

Activity	Heat Release MMBtu/hr	Heat Release cal/s	MW	Effective Diameter (m)
TO Downtime to Flare	140.183	9,812,621.80	28.29	2.703

[1] Equation to calculate the effective flare diameter is obtained from TCEQ guidance on flare calculations, October 2006.

7. BEST MANAGEMENT PRACTICES (BMP) AND BEST AVAILABLE CONTROL TECHNOLOGY (BACT) REQUIREMENTS

For any project and any associated emission control equipment registered under the NRSP, the following requirements shall be met, as applicable. A table summarizing the BACT requirements is included at the end of this section.

7.1 Program to Replace, Repair, and/or Maintain Facilities

(1) All facilities which have the potential to emit air contaminants must be maintained in good working order and operated properly during facility operations. Each operator shall establish and maintain a program to replace, repair, and/or maintain facilities to keep them in good working order. The minimum requirements of this program shall include:

(A) Compliance with manufacturer's specifications and recommended programs applicable to equipment performance and effect on emissions, or alternatively, an owner or operator developed maintenance plan for such equipment that is consistent with good air pollution control practices.

(B) Cleaning and routine inspection of all equipment; and

(C) Replacement and repair of equipment on schedules which prevent equipment failures and maintain performance.

MarkWest will comply with applicable requirements to maintain equipment in good working order and ensure the equipment is operated properly. MarkWest has established and will maintain a program to replace, repair, and/or maintain facilities to keep them in good working order. The program will comply with the requirements outlined above.

7.2 Distance Limitations

(2) Any OGS facility shall be operated at least 50 feet from any property line or receptor (whichever is closer to the facility). This distance limitation does not apply to the following:

(A) Any fugitive components that are used for isolation and or safety purposes may be located at one-half of the width of any applicable easement;

(B) Any facility at a location for which the distance requirements were satisfied at the time this standard permit is registered (provided that the authorization was maintained) regardless of whether a receptor is subsequently built or put to use 50 feet from any OGS facility; or

(C) Existing facilities which are located less than 50 feet from a property line or receptor when constructed and previously authorized. If modified or replaced, the operator shall consider, to the extent that good engineering practice will permit, moving these facilities to meet the 50 foot requirement. Replacement facilities must meet all other requirements of this standard permit.

All emission sources will be operated at least 50 feet from any property line or receptor (whichever is closer to the facility), except as allowed.

7.3 Engines and Turbines

(3) Engines and turbines shall meet the emission and performance standards listed in Table 6 in paragraph (m) and the following requirements:

As shown in the emission calculations, the engines demonstrate compliance with the requirements for 4 stroke lean burn engines in Table 6 (Engine and Turbine Emission and Operational Standards). No changes are proposed to the engines as part of this revision.

(A) Liquid fueled engines used for back-up power generation and periodic power needs at the OGS are authorized if the fuel has no more than 0.05% sulfur and the engine is operated less than 876 hours per rolling 12-month period.

MarkWest is not proposing to install any liquid fueled engines for back-up power generation or periodic power needs. There is one diesel emergency generator authorized under PBR 106.511. Therefore, these requirements do not apply.

(B) Engines and turbines used for electric generation more than 876 hours per rolling 12-month period are authorized if no reliable electric service is readily available. In all other circumstances, electric generators must meet the technical requirements of the Air Quality Standard Permit for Electric Generating Unit (EGU) (not including the EGU standard permit registration requirements) and the emissions shall be included in the registration under this standard permit;

There are no engines used for electric generation at the facility.

(C) All applicable requirements of 30 TAC Chapter 117; and

The Tornado Gas Plant is located in Loving County, which is not an affected county under 30 TAC Chapter 117; therefore, these requirements do not apply.

(D) All applicable requirements of 40 CFR Part 60 and 40 CFR Part 63.

Applicable requirements of Title 40 of the Code of Federal Regulations (40 CFR) Part 60 and 40 CFR Part 63 are discussed in Section 10 of this registration. MarkWest will comply with applicable requirements.

(E) Compression ignition engines that are rated less than 225 kW (300 hp) and emit less than or equal to the emission tier for an equivalent sized model year 2008 non-road compression ignition engine located at 40 CFR § 89.112, Table 1 are authorized.

MarkWest is not proposing to install any compression ignition engines rated at less than 300 hp; therefore, these requirements do not apply.

7.4 Open-Topped Tanks or Ponds

(4) Open-topped tanks or ponds containing VOCs or H_2S are allowed up to a PTE equal to 1 tpy of VOC and 0.1 tpy of H_2S.

The Tornado Gas Plant does not contain any of these sources; therefore, no BMP or BACT is required for these.

7.5 Process Equipment and Storage Facilities

(5) All process equipment and storage facilities individually must meet the requirements of BACT listed in Table 10 in paragraph (m). Any combination of process equipment and storage facilities with an uncontrolled PTE of equal to or greater than 25 tpy of VOC must also meet the requirements of Table 10, row titled "Combined Control Requirements". All of the following streams and facilities must be included for this site-wide assessment:

(A) For any gaseous vent stream with a concentration of 1% VOC must be considered for capture and control requirements;

(B) For any liquid stream with a potential to emit of equal to or greater than 1 tpy VOC for each vessel or storage facility.

MarkWest will continue to comply with applicable requirements in Table 10 for process equipment and storage facilities as described in the rule for combined control requirements for uncontrolled PTE equal to or greater than 25 tpy.

Uncontrolled emissions from the inlet amine unit treater are above 50 tpy; therefore, MarkWest will continue to control emissions from the inlet amine unit treater acid gas stream using a second TO with a 98.9% DRE and to control emissions from the inlet amine unit treater flash tank using the amine unit hot oil heater with 95% control. These control measures will continue to meet the BACT requirements as outlined in Table 10.

Uncontrolled emissions from the glycol dehydration unit are above 50 tpy; therefore, MarkWest will continue to control emissions from the glycol dehydration unit routing the flash gas to the fuel gas system for 95% control. The still vent emissions are controlled by a JATCO BTEX condenser for 80% control and then a combustor for 95% control. These control measures meet the BACT requirements as outlined in Table 10.

The TO-1 and TO-2 are fired by either sweet natural gas or fuel gas containing less than ten grains of total sulfur per 100 dry standard cubic feet (dscf).

The glycol dehydration reboiler has a heat input less than 10 MMBtu/hr. Therefore, no additional BACT is required by Table 10 for this unit. MarkWest will utilize good combustion practices and will burn only natural gas fuel in this heater. The hot oil heater has a heat input greater than 40 MMBtu/hr. The unit is designed and operated to meet 0.036 lb/MMBtu for NO_X and 0.074 lb/MMBtu for CO. Therefore, the reboiler and heater meet the BACT requirements as outlined in Table 10.

7.6 Fugitives

(6) The following shall apply to all fugitive components associated with the project:

(a) All seals and gaskets in VOC or H_2S service shall be installed, checked, and properly maintained to prevent leaking. All components shall be physically inspected quarterly for leaks.

(b) New and replaced fugitive components and instrumentation in gas or liquid service with the uncontrolled potential to emit equal to or greater than 10 tpy VOC or 1 tpy H_2S are subject to a leak detection and repair (LDAR) program as specified in Table 9 in paragraph (m). Additional requirements are applicable where uncontrolled potential to emit equal to or greater than 25 tpy VOC or 5 tpy H_2S as specified in Table 9. Planned MSS from fugitive components must also meet the requirements of Table 9.

(c) All components found to be leaking shall be repaired. Every reasonable effort shall be made to repair a leaking component. All leaks not repaired immediately shall be tagged or noted in a log. At manned sites, leaks shall be repaired no later than 30 days after the leak is found. At unmanned sites, leaks shall be repaired no later than 60 days after the leak is found. If the repair of a component would require a unit shutdown, which would create more emissions than the repair would eliminate, the repair may be delayed until the next shutdown.

(d) Tank hatches, not designed to be completely sealed, shall remain closed (but not completely sealed in order to maintain safe design functionality) except for sampling, gauging, loading, unloading, or planned maintenance activities.

(e) To the extent that good engineering practices will permit, new and reworked valves and piping connections shall be located in a place that is reasonably accessible for leak checking during plant operation and underground process pipelines shall contain no buried valves such that fugitive emission monitoring is rendered impractical.

Seals and gaskets in VOC or H_2S service are properly maintained and physically inspected quarterly for leaks. Uncontrolled emissions from site-wide fugitives exceed 25 tpy of VOC; therefore, the fugitive components are subject to a TCEQ LDAR program and additional requirements as specified under Table 9 of Fugitive Component LDAR BACT Table. MarkWest will continue to comply with applicable requirements in Table 9 for equipment leak fugitives, including the minimum design, monitoring, technique, or control for fugitive components with uncontrolled emissions greater than 25 tpy of VOC.

7.7 Tanks

(7) Tanks and vessels must utilize a paint color that minimizes the effects of solar heating (including, but not limited to, white or aluminum). To meet this requirement the solar absorptance should be 0.43 or less, as referenced in Table 7.1-6 in Compilation of Air Pollutant Emission Factors (AP-42). Paint shall be applied according to paint producers recommended application requirements if provided and in sufficient quantity as to be considered solar resistant. Paint shall be maintained in good condition and will not compromise tank integrity. Minimal amounts of rust may be present not to exceed 10% of the external surface area of the roof or walls of the tank and in no way may compromise tank integrity. Additionally, up to 10% of the external surface area of the roof or walls of the tank or vessel may be painted with other colors to allow for identification and/or aesthetics. For tanks and vessels purposefully darkened to

create the process reaction and help condense liquids from being entrained in the vapor or are in an area whereby a local, state, federal law, ordinance, or private contract predating this standard permit's effective date establishes in writing tank and vessel colors other than white, these requirements do not apply.

MarkWest will continue to comply with all applicable requirements for painting the storage tanks. Paint shall be maintained in good condition.

7.8 Estimation Methods

(8) All emission estimation methods including but not limited to computer programs such as GRI-GLYCalc, AmineCalc, E&P Tanks, and Tanks 4.0, must be used with monitoring data generated in accordance with Table 8 in subsection (m) of this section where monitoring is required. All emission estimation methods must also be used in a way that is consistent with protocols established by the commission or promulgated in federal regulations (NSPS, NESHAPS). Where control of emissions is relied upon to meet subsection (k) of this section, control monitoring is required.

Emissions estimation methods using computer programs are used in coordination with monitoring data generated according to Table 8 requirements where monitoring is required. The emissions estimation methodologies and calculations have been used in a way that is consistent with protocols established by TCEQ or by federal regulations. MarkWest will continue to comply with the control monitoring requirements, as needed, for any sources in which control is required to meet the impacts evaluations (e.g., flare, TO, VCU).

7.9 Process Reboilers, Heaters, and Furnaces as Control Devices

(9) Process reboilers, heaters, and furnaces that are also used for control of waste gas streams may claim 50 to 99% destruction efficiency for VOCs and H_2S depending on the design and level of monitoring applied. The 90% destruction may be claimed where the waste gas is delivered to the flame zone or combustion fire box with basic monitoring as specified in paragraph (j). Any value greater than 90% and up to 99% destruction efficiency may be claimed where enhanced monitoring and/or testing are applied as specified in paragraph (j). If the waste gas is premixed with the primary fuel gas and used as the primary fuel in the device through the primary fuel burners, 99% destruction may be claimed with basic monitoring as specified in paragraph (j). In systems where the combustion device is designed to cycle on and off to maintain the designed heating parameters, and may not fully utilize the waste gas stream, records of run time and enhanced monitoring is required to claim any run time beyond 50%.

The Tornado Gas Plant will continue to use the glycol dehydration reboiler as a control device for the glycol dehydration unit flash gas and the hot oil heater as a control device for the inlet amine unit treater flash tank. MarkWest will continue to comply with the requirements of this subpart.

7.10 VAPOR RECOVERY UNITS

(10) Vapor recovery Systems (VRSs) may claim up to 100% control. The control efficiency is based on whether it is a mechanical VRU (mVRU) or a liquid VRU (lVRU). The VRUs must meet the appropriate design, monitoring and record-keeping in Table 7 and Table 8 in paragraph (m).

MarkWest is not proposing to use any of these devices as a control; therefore, this subsection does not apply.

7.11 Flares as Control Devices

(11) Flares used for control of emissions from production, planned MSS, emergency, or upset events may claim design destruction efficiency of 98% for VOCs and H_2S and 99% for VOCs containing no more than three carbon atoms that contain no elements other than carbon and hydrogen. All flares must be designed and operated in accordance with the following:

- *(a) Meet specifications for minimum heating values of waste gas, maximum tip velocity, and pilot flame monitoring found in 40 CFR §60.18;*
- *(b) If necessary to ensure adequate combustion, sufficient gas shall be added to make the gases combustible;*
- *(c) An infrared monitor is considered equivalent to a thermocouple for flame monitoring purposes;*
- *(d) An automatic ignition system may be used in lieu of a continuous pilot;*
- *(e) Flares must be lit at all times when gas streams are present;*
- *(f) Fuel for all flares shall be sweet gas or liquid petroleum gas except where only field gas is available and it is not sweetened at the site; and*
- *(g) Flares shall be designed for and operated with no visible emissions, except for periods not to exceed at total of 5 minutes during any 2 consecutive hours. Acid gas flares which must comply with opacity limits and records in accordance with 30 TAC §111.111(a)(4), Requirements for Specified Sources, regarding gas flares, are exempt from this visible emission limitation.*
- *(h) Flares may be designed with steam or air assist to help reduce visible emissions from the flare but must meet the appropriate requirements in 40 CFR 60.18.*
- *(i) At no time shall minimum heating values fall below the associated minimum heating value in 60.18*

MarkWest uses a flare with a DRE of 98% for VOCs (excluding propane) and H_2S and 99% for methane, ethane, and propane. The flare is used to control MSS activities in addition to the NGL amine unit and inlet amine unit treater acid gas streams during TO downtime. MarkWest will continue to comply with applicable monitoring and design requirements in Table 8 in addition to the requirements in this subsection. The flare is designed to meet the minimum heating value and maximum tip velocity requirements in 40 CFR §60.18.

7.12 Thermal Oxidation and Vapor Combustion Devices

(12) Thermal oxidation and vapor combustion control devices may claim design destruction efficiency from 90 to 99.9% for VOCs and H2S depending on the design and the level of monitoring and testing applied. A device designed for the variability of the waste gas streams it controls with basic monitoring

to indicate oxidation or combustion is occurring when waste gas is directed to the device may claim 90% destruction efficiency. Devices with intermediate monitoring, designed for the variability of the waste gas streams they control, with a fire box or fire tube designed to maintain a temperature above 1,400 degrees Fahrenheit (F) for 0.5 seconds, residence time; or designed to meet the parameters of a flare with minimum heating values of waste gas, maximum tip velocity, and pilot flame monitoring as found in 40 CFR § 60.18, but within a full or partial enclosure may claim a design destruction efficiency of 90 to 98%. Devices with enhanced monitoring and ports and platforms to allow stack testing may claim a 99% efficiency where the devices are designed for the variability of the waste gas streams they control, with a fire box or fire tube designed to maintain a temperature above 1,400 degrees F for 0.5 seconds, residence time. The devices that can claim 99% destruction efficiency may claim 99.9% destruction efficiency if stack testing is conducted and confirms the efficiency and the enhanced monitoring is adjusted to ensure the continued efficiency. Temperature and residence time requirements may be modified if stack testing is conducted to confirm efficiencies.

The Tornado Gas Plant is using two thermal oxidizers; one to control emissions from the NGL amine unit acid gas and a second to control emissions from the inlet amine unit treater acid gas. MarkWest is representing 98.9% DRE for the TO based on vendor specifications. The Tornado Gas Plant uses a combustor for control of the glycol dehydration unit still vent stream (EPN STILLCOMB) with a DRE of 95% based on vendor specifications. MarkWest will continue to comply with the applicable monitoring and design requirements for the control devices in Table 8 for the TO-1, TO-2, STILLCOMB, and VCU.

NRSP BACT ASSESSMENT

Non-rule Standard Permit Requirements		
General/Facility-wide		
Equipment and Uncontrolled Emissions	**BACT Requirement**	**Applicability**
Construction	Pre-construction Notification must be submitted to the TCEQ and the registration must be submitted within 90 days of the start of operation.	All facilities registered under the Non-rule Standard Permit must comply with these restrictions.
Combined Control Requirements ≥ 25 tpy VOC	All continuous and periodic vents on process vessels and equipment with potential emissions containing ≥ 1% VOC at any time must be captured and directed to a control device listed in the Control Device BACT Table with a minimum design control efficiency of at least 95%, if the sum of the uncontrolled PTE of the vents at the site will equal or exceed 25 tons of VOC per year. A site total potential to emit of 1 tpy of VOC from vent gas streams may be exempted from this control requirement.	All continuous and periodic vents at the facility subject to these requirements will be captured and controlled by the flare, thermal oxidizer or vapor combustion unit.
BACT for Fugitives (Table 9)		
Uncontrolled Emissions ≥ 25 tpy	LDAR program with leak definition of 500 ppmvd	Uncontrolled fugitive emissions for FUG are greater than 25 tpy. The results of the VOC leak detection and repair requirements must be recorded and made available upon request. Quarterly inspections with a leak definition of 500 ppmvd will be used.
BACT for Tanks (Table 10)		
Equipment and Uncontrolled Emissions	**BACT Requirement**	**Applicability**
Uncontrolled Emissions < 1 tpy	No controls required.	The uncontrolled emissions from the produced water tanks are less than 1 tpy; therefore no controls are required.
BACT for Flares		
Equipment and Uncontrolled Emissions	**BACT Requirement**	**Applicability**
All Flares	(A) Meet specifications for minimum heating values of waste gas, maximum tip velocity, and pilot flame monitoring found in 40 CFR §60.18; (B) If necessary to ensure adequate combustion, sufficient gas shall be added to make the gases combustible; (C) An infrared monitor is considered equivalent to a thermocouple for flame monitoring purposes; (D) An automatic ignition system may be used in lieu of a continuous pilot; (E) Flares must be lit at all times when gas streams are present; (F) Fuel for all flares shall be sweet gas or liquid petroleum gas except where only field gas is available and it is not sweetened at the site; and (G) Flares shall be designed for and operated with no visible emissions, except for periods not to exceed at total of 5 minutes during any two consecutive hours. Acid gas flares which must comply with opacity limits and records in accordance with 30 TAC §111.111(a)(4), Requirements for Specified Sources, regarding gas flares, are exempt from this visible emission limitation. (H) Flares may be designed with steam or air assist to help reduce visible emissions from the flare but must meet the appropriate requirements in 40 CFR 60.18. (I) At no time shall minimum heating values fall below the associated minimum heating value in 60.18.	The flare at the site will meet all applicable requirements of 40 CFR §60.18 and will comply with all other applicable BACT requirements.
BACT for Loading (Table 10)		
Equipment and Uncontrolled Emissions	**BACT Requirement**	**Applicability**
Uncontrolled Emissions < 5 tpy	Submerged filling or vapor balancing is recommended but not required.	The uncontrolled emissions resulting from loading of produced water tanks are less than 5 tpy.

8. SPECIFIC STANDARD PERMIT REQUIREMENTS

According to the NRSP (6002-Non-Rule, effective November 8, 2012), the following specific requirements apply:

Table 8.1. Specific Standard Permit Requirements

Citation	Requirement	Compliance Explanation
6002(a)	**Applicability**. This standard permit applies to all stationary facilities, or groups of facilities, at a site which handle gases and liquids associated with the production, conditioning, processing, and pipeline transfer of fluids or gases found in geologic formations on or beneath the earth's surface including, but not limited to, crude oil, natural gas, condensate, and produced water with the following conditions. […]	The Tornado Gas Plant qualifies for use of the NRSP, as the site is a natural gas processing plant that removes CO_2 and H_2S from inlet gas through amine treatment, removes water content using molecular sieve dehydrator beds, and separates natural gas liquids (NGLs) from the natural gas through a cryogenic process. There are no operationally dependent facilities authorized under a 116.111 case-by-case construction permit or a Permit by Rule.
6002(b)	**Definitions and Scope.**	MarkWest will use the outlined definitions, as applicable, for compliance determination. This registration includes the facilities outlined in the scope of the Standard Permit.
6002(c)	**Authorized Facilities, Changes and Activities**.	The Tornado Gas Plant will be a minor source with respect to the Prevention of Significant Deterioration (PSD) program. The Tornado Gas Plant is located in Loving County; therefore, the site is not subject to the Nonattainment New Source Review (NNSR) program. The facility will comply with all state and federal regulations as outlined in Sections 10 and 11 of this registration.

Table 8.1. Specific Standard Permit Requirements

Citation	Requirement	Compliance Explanation
6002(d)	**Facilities and Exclusions**	This revision registration application will address all facilities listed in the Standard Permit Registration. The Tornado Gas Plant will not include any facilities not authorized by the NRSP, except for an emergency engine authorized under PBR 106.511.
6002(e)	**Best Management Practices (BMP) and Best Available Control Technology (BACT) Requirements**. For any project, and any associated emission control equipment registered under this standard permit this paragraph shall be met as applicable. These requirements are not applicable to existing, unchanging facilities until any renewal submitted after December 31, 2015.	BMP and BACT requirements are addressed for the Tornado Gas Plant in Section 7 of this revision registration.
6002(f)	**Registration, Revision, and Renewal Requirements**	MarkWest submitted the pre-construction notification (STDPMT Permit No. 153270, Project No. 328758) for this project on May 12, 2021via STEERS. This application serves as the registration required for the Standard Permit.
6002(g)	Any claim under this standard permit must comply with all applicable requirements of 30 TAC §116.610; §116.611, Registration to Use a Standard Permit; §116.614, Standard Permit Fees; and §116.615, General Conditions. This standard permit supersedes: the notification requirements of 30 TAC §116.615, General Conditions; and the emission limitations of 30 TAC §116.610(a)(1), Applicability.	The general Standard Permit requirements are addressed in Section 9 of this revision registration.
6002(h)	**Emission Limitations**. Total maximum estimated registered or certified emissions shall meet the most stringent of the following. All emissions estimates must be based on representative worst-case operations and planned MSS activities.	The total maximum emissions will meet the requirements of the Standard Permit, as illustrated in Sections 4 and 5 of this registration.
6002(i)	**Planned Maintenance, Start-ups and Shutdowns (MSS).** For any facility, group of facilities or site using this standard permit or previous versions of this standard permit, the following shall apply: […]	This revision registration authorizes MSS activities associated with the sources at the Tornado Gas Plant.

Table 8.1. Specific Standard Permit Requirements

Citation	Requirement	Compliance Explanation
6002(j)	**Records, Sampling and Monitoring**. The following records shall be maintained at a site in written or electronic form and be readily available to the agency or local air pollution control program with jurisdiction upon request. […]	MarkWest will maintain all records as required by the Standard Permit.
6002(k)	**Emission Limits Based on Impacts Evaluation**.	The Impacts Evaluation is discussed in detail in Section 6 of this registration.
6002(l)	**Existing, Unchanged Facilities and Projects Before Effective Date.** The requirements in 30 TAC §116.620 are applicable to existing unchanged facilities and new or changing facilities as specified in paragraph (a)(1) of this standard permit.	The Tornado Gas Plant is located in Loving County, which is not a Barnett Shale County. However, MarkWest is voluntarily using the Non-Rule Standard Permit to register changes to this facility. Therefore, the Tornado Gas Plant complies with the rules set forth in this standard permit instead of 30 TAC §116.620.
6002(m)	The following Tables shall be used as required by this standard permit. […]	The Standard Permit tables are used in the assessment of the applicable requirements for the Standard Permit. MarkWest will comply with the requirements set forth in the tables, as applicable.

9. GENERAL STANDARD PERMIT REQUIREMENTS

According to the NRSP, Section (g), the facility must comply with all applicable requirements of 30 TAC §116.610, Applicability; §116.611, Registration to Use a Standard Permit; §116.614, Standard Permit Fees; and §116.615, General Conditions. The NRSP supersedes the notification requirements of 30 TAC §116.615, General Conditions and the emission limitations of 30 TAC §116.610(a)(1).

9.1 APPLICABILITY (30 TAC §116.610) EFFECTIVE April 17, 2014

(a) Under the Texas Clean Air Act, §382.051, a project that meets the requirements for a standard permit listed in this subchapter or issued by the commission is hereby entitled to the standard permit, provided the following conditions listed in this section are met. For the purposes of this subchapter, project means the construction or modification of a facility or a group of facilities submitted under the same registration.

(1) Any project that results in a net increase in emissions of air contaminants from the project other than water, nitrogen, ethane, hydrogen, oxygen, or greenhouse gases (GHGs) as defined in §101.1 of this title (relating to Definitions), or those for which a national ambient air quality standard has been established must meet the emission limitations of §106.261 of this title (relating to Facilities (Emission Limitations)), unless otherwise specified by a particular standard permit.

The NRSP supersedes the emission limitations of this citation per Section (g).

(2) Construction or operation of the project must be commenced prior to the effective date of a revision to this subchapter under which the project would no longer meet the requirements for a standard permit.

The project will meet the requirements of the current version of the NRSP at the time construction and operation commences.

(3) The proposed project must comply with the applicable provisions of the Federal Clean Air Act (FCAA), §111 (concerning New Source Performance Standards) as listed under 40 Code of Federal Regulations (CFR) Part 60, promulgated by the United States Environmental Protection Agency (EPA).

The Tornado Gas Plant will comply with applicable New Source Performance Standards (NSPS) as noted in Section 10 of this registration.

(4) The proposed project must comply with the applicable provisions of FCAA, §112 (concerning Hazardous Air Pollutants) as listed under 40 CFR Part 61, promulgated by the EPA.

There are no National Emission Standards for Hazardous Air Pollutants (NESHAP) standards in 40 CFR Part 61 applicable to the sources at the Tornado Gas Plant, as noted in Section 10 of this registration.

(5) The proposed project must comply with the applicable maximum achievable control technology standards as listed under 40 CFR Part 63, promulgated by the EPA under FCAA, §112 or as listed under Chapter 113, Subchapter C of this title (relating to National Emissions Standards for Hazardous Air Pollutants for Source Categories (FCAA, §112, 40 CFR Part 63)).

The Tornado Gas Plant will comply with all applicable NESHAP standards in 40 CFR Part 63, as noted in Section 10 of this registration.

(6) If subject to Chapter 101, Subchapter H, Division 3 of this title (relating to Mass Emissions Cap and Trade Program) the proposed facility, group of facilities, or account must obtain allocations to operate.

The Tornado Gas Plant is located in Loving County, which is not part of the Houston-Galveston-Brazoria ozone nonattainment area. Therefore, the Mass Emissions Cap and Trade (MECT) program requirements do not apply.

(b) Any project that constitutes a new major stationary source or major modification as defined in §116.12 of this title (relating to Nonattainment and Prevention of Significant Deterioration Review Definitions) is subject to the requirements of §116.110 of this title (relating to Applicability) rather than this subchapter.

The Tornado Gas Plant is located in Loving County, which is currently designated as an attainment or unclassified area for all criteria air pollutants; therefore, NNSR permitting requirements do not apply to the proposed project. The proposed project does not constitute a new major stationary source under the Prevention of Significant Deterioration Program, as defined in §116.12. Therefore, this project is not subject to the requirements of 30 TAC §116.110(b), and the Non-Rule Standard Permit can be claimed.

(c) Persons may not circumvent by artificial limitations the requirements of §116.110 of this title.

This registration is submitted to demonstrate compliance with the Standard Permit regulations.

(d) Any project involving a proposed affected source (as defined in §116.15(1) of this title (relating to Section 112(g) Definitions)) shall comply with all applicable requirements under Subchapter E of this chapter (relating to Hazardous Air Pollutants: Regulations Governing Constructed or Reconstructed Major Sources (FCAA, §112(g), 40 CFR Part 63)). Affected sources subject to Subchapter E of this chapter may use a standard permit under this subchapter only if the terms and conditions of the specific standard permit meet the requirements of Subchapter E of this chapter.

The proposed project does not involve an affected source as defined in 30 TAC §116.15(1). Therefore, this paragraph does not apply.

9.2 REGISTRATION TO USE A STANDARD PERMIT (30 TAC §116.611) EFFECTIVE April 17, 2014

(a) *If required, registration to use a standard permit shall be sent by certified mail, return receipt requested, or hand delivered to the executive director, the appropriate commission regional office, and any local air pollution program with jurisdiction, before a standard permit can be used. The registration must be submitted on the required form and must document compliance with the requirements of this section, including, but not limited to:*

(1) *the basis of emission estimates;*
(2) *quantification of all emission increases and decreases associated with the project being registered;*
(3) *sufficient information as may be necessary to demonstrate that the project will comply with §116.610(b) of this title (relating to Applicability);*
(4) *information that describes efforts to be taken to minimize any collateral emissions increases that will result from the project;*
(5) *a description of the project and related process; and*
(6) *a description of any equipment being installed.*

This registration includes all required items and is being submitted to TCEQ.

(b) *Construction may begin any time after receipt of written notification from the executive director that there are no objections or 45 days after receipt by the executive director of the registration, whichever occurs first, except where a different time period is specified for a particular standard permit or the source obtains a prevention of significant deterioration permit for greenhouse gases as provided in §116.164(a) of this title (relating to Prevention of Significant Deterioration Applicability for Greenhouse Gases Sources).*

The NRSP specifies a different time period for start of construction than 45 days after receipt by the executive director or receipt of written notification from the executive director. Per 6002(f)(4), MarkWest must submit a preconstruction notification through STEERS and a fee of $50 prior to start of construction or implementation for any project which meets the Standard Permit. MarkWest submitted the pre-construction notification for this project to the TCEQ via STEERS (STDPMT Permit No. 153270, Project No. 328758) on May 12, 2021. According to the NRSP, construction may begin any time after the pre-construction notification is submitted.

(c) *In order to avoid applicability of Chapter 122 of this title (relating to Federal Operating Permits), a certified registration shall be submitted. The certified registration must state the maximum allowable emission rates and must include documentation of the basis of emission estimates and a written statement by the registrant certifying that the maximum emission rates listed on the registration reflect the reasonably anticipated maximums for operation of the facility. The certified registration shall be amended if the basis of the emission estimates changes or the maximum emission rates listed on the registration no longer reflect the reasonably anticipated maximums for operation of the facility. The certified registration shall be submitted to the executive director; to the appropriate commission regional office; and to all local air pollution control agencies having jurisdiction over the* *site. Certified registrations must also be maintained in accordance with the requirements of §116.115 of this title (relating to General and Special Conditions).*

(1) *Certified registrations established prior to December 11, 2002, shall be submitted on or before February 3, 2003.*
(2) *Certified registrations established on or after December 11, 2002, shall be submitted no later than the date of operation.*

According to the applicability requirements in 30 TAC Chapter 122.120(a)(1), any site that meets the major source definition in §122.10 is subject to the requirements of Chapter 122 related to operating permits. 30 TAC Chapter 122.10(13) defines a major source as having the potential to emit (PTE) greater than any of the following limits:

- **25 tpy of combined HAPs**
- **10 tpy of any single HAP**
- **100 tpy of any air pollutant**

The Tornado Gas Plant is a major source of non-GHG pollutants since the emission thresholds listed above are exceeded for VOC, NO_X, and CO. Standard Permits are inherently federally enforceable; therefore, this registration serves as a certified registration stating the maximum allowable emission estimates listed in this registration reflect the reasonably anticipated maximums for operation of the facility. The registration will be revised if any changes to the maximum emission rates are made. The revision registration is being sent to TCEQ Austin and the appropriate TCEQ Regional Office. There is no local air pollution control agency within Loving County. This registration application will be maintained in accordance with the applicable general and special conditions within 116.115.

(3) *Certified registrations established for greenhouse gases (as defined in §101.1 of this title (relating to Definitions)) on or after the effective date of EPA's final action approving amendments to §122.122 of this title (relating to Potential to Emit) into the State Implementation Plan shall be submitted*
    a. *for existing sites that emit or have the potential to emit greenhouse gases, no later than 12 months after the effective date of EPA's final action approving amendments to §122.122 of this title as a revision to the Federal Operating Permits Program; or*
    b. *for new sites that emit or have the potential to emit greenhouse gases, no later than the date of operation.*

MarkWest will not be certifying greenhouse gas emissions at the Tornado Gas Plant with this registration.

9.3 STANDARD PERMIT FEES (30 TAC §116.614) EFFECTIVE OCTOBER 20, 2002

Any person who registers to use a standard permit or an amended standard permit, or to renew a registration to use a standard permit shall remit, at the time of registration, a flat fee of $900 for each standard permit being registered, unless otherwise specified in a particular standard permit. No fee is required if a registration is automatically renewed by the commission. All standard permit fees will be remitted in the form of a check, certified check, electronic funds transfer, or money order made payable to the Texas Commission on Environmental Quality (TCEQ) and delivered with the permit registration to the TCEQ, P.O. Box 13088, MC 214, Austin, Texas 78711-3087. No fees will be refunded.

MarkWest has paid the $50 pre-construction notification fee and $850 registration fee, as required in the NRSP.[2]

9.4 GENERAL CONDITIONS (30 TAC §116.615) EFFECTIVE MARCH 15, 2007

The following general conditions are applicable to holders of standard permits, but will not necessarily be specifically stated within the standard permit document.

(1) Protection of public health and welfare. The emissions from the facility, including dockside vessel emissions, must comply with all applicable rules and regulations of the commission adopted under Texas Health and Safety Code, Chapter 382, and with the intent of the Texas Clean Air Act (TCAA), including protection of health and property of the public.

This Standard Permit Registration documents that the Tornado Gas Plant will comply with the rules and regulations of the TCEQ and the intent of the Texas Clean Air Act (TCAA), including protection of health and property of the public.

(2) Standard permit representations. All representations with regard to construction plans, operating procedures, and maximum emission rates in any registration for a standard permit become conditions upon which the facility or changes thereto, must be constructed and operated. It is unlawful for any person to vary from such representations if the change will affect that person's right to claim a standard permit under this section. Any change in condition such that a person is no longer eligible to claim a standard permit under this section requires proper authorization under §116.110 of this title (relating to Applicability). If the facility remains eligible for a standard permit, the owner or operator of the facility shall notify the executive director of any change in conditions which will result in a change in the method of control of emissions, a change in the character of the emissions, or an increase in the discharge of the various emissions as compared to the representations in the original registration or any previous notification of a change in representations. Notice of changes in representations must be received by the executive director no later than 30 days after the change.

[2] Per Non-Rule Standard Permit, Section 6002(f)(5)(C).

MarkWest understands that Standard Permit representations become conditions upon which the facility must be operated. Any changes to the representations in this registration will be communicated to the TCEQ, as required in 30 TAC §116.615(2).

(3) *Standard permit in lieu of permit amendment. All changes authorized by standard permit to a facility previously permitted under §116.110 of this title shall be administratively incorporated into that facility's permit at such time as the permit is amended or renewed.*

This Standard Permit registration is not being submitted in lieu of a permit amendment; therefore, this section does not apply.

(4) *Construction progress. Start of construction, construction interruptions exceeding 45 days, and completion of construction shall be reported to the appropriate regional office not later than 15 working days after occurrence of the event, except where a different time period is specified for a particular standard permit.*

The requirements in the NRSP supersede these notification requirements per Section (g).

(5) *Start-up notification.*
- (a) *The appropriate air program regional office of the commission and any other air pollution control agency having jurisdiction shall be notified prior to the commencement of operations of the facilities authorized by a standard permit in such a manner that a representative of the executive director may be present.*
- (b) *For phased construction, which may involve a series of units commencing operations at different times, the owner or operator of the facility shall provide separate notification for the commencement of operations for each unit.*
- (c) *Prior to beginning operations of the facilities authorized by the permit, the permit holder shall identify to the Office of Permitting, Remediation, and Registration, the source or sources of allowances to be utilized for compliance with Chapter 101, Subchapter H, Division 3 of this title (relating to Mass Emissions Cap and Trade Program).*
- (d) *A particular standard permit may modify start-up notification requirements.*

The requirements in the NRSP supersede these notification requirements per Section (g).

(6) *Sampling requirements. If sampling of stacks or process vents is required, the standard permit holder shall contact the commission's appropriate regional office and any other air pollution control agency having jurisdiction prior to sampling to obtain the proper data forms and procedures. All sampling and testing procedures must be approved by the executive director and coordinated with the regional representatives of the commission. The standard permit holder is also responsible for providing sampling facilities and conducting the sampling operations or contracting with an independent sampling consultant.*

If stack sampling is required by the Executive Director, MarkWest will comply with these stack sampling requirements.

(7) *Equivalency of methods. The standard permit holder shall demonstrate or otherwise justify the equivalency of emission control methods, sampling or other emission testing methods, and monitoring methods proposed as alternatives to methods indicated in the conditions of the standard permit. Alternative methods must be applied for in writing and must be reviewed and approved by the executive director prior to their use in fulfilling any requirements of the standard permit.*

MarkWest is not requesting any alternatives to emissions control methods, sampling or other emission testing methods, or monitoring methods proposed as alternative methods in the conditions of the Standard Permit. MarkWest understands that if changes are proposed, a demonstration of equivalency of methods will be required.

(8) *Recordkeeping. A copy of the standard permit along with information and data sufficient to demonstrate applicability of and compliance with the standard permit shall be maintained in a file at the plant site and made available at the request of representatives of the executive director, the United States Environmental Protection Agency, or any air pollution control agency having jurisdiction. For facilities that normally operate unattended, this information shall be maintained at the nearest staffed location within Texas specified by the standard permit holder in the standard permit registration. This information must include, but is not limited to, production records and operating hours. Additional recordkeeping requirements may be specified in the conditions of the standard permit. Information and data sufficient to demonstrate applicability of and compliance with the standard permit must be retained for at least two years following the date that the information or data is obtained. The copy of the standard permit must be maintained as a permanent record.*

MarkWest will maintain records as required by the Standard Permit and make them available to regulatory personnel upon request.

(9) *Maintenance of emission control. The facilities covered by the standard permit may not be operated unless all air pollution emission capture and abatement equipment is maintained in good working order and operating properly during normal facility operations. Notification for emissions events and scheduled maintenance shall be made in accordance with §101.201 and §101.211 of this title (relating to Emissions Event Reporting and Recordkeeping Requirements; and Scheduled Maintenance, Startup, and Shutdown Reporting and Recordkeeping Requirements).*

MarkWest will maintain the air pollution capture and abatement equipment for the facilities covered by this Standard Permit in good working order and will operate the air pollution capture and abatement equipment properly during normal facility operations. Notifications under 30 TAC §101.201 and §101.211 will be made, as necessary.

(10) *Compliance with rules. Registration of a standard permit by a standard permit applicant constitutes an acknowledgment and agreement that the holder will comply with all rules, regulations, and orders of the commission issued in conformity with the TCAA and the conditions precedent to the claiming of the standard permit. If more than one state or federal rule or regulation or permit condition are applicable, the most stringent limit or condition shall govern. Acceptance includes consent to the entrance of*

commission employees and designated representatives of any air pollution control agency having jurisdiction into the permitted premises at reasonable times to investigate conditions relating to the emission or concentration of air contaminants, including compliance with the standard permit.

MarkWest will comply with all applicable rules, regulations, and orders of the TCEQ and U.S. EPA as appropriate. Regulatory personnel will be allowed to enter the site at reasonable times, as necessary.

(11) Distance limitations, setbacks, and buffer zones. Notwithstanding any requirement in any standard permit, if a standard permit for a facility requires a distance, setback, or buffer from other property or structures as a condition of the permit, the determination of whether the distance, setback, or buffer is satisfied shall be made on the basis of conditions existing at the earlier of:

(a) the date new construction, expansion, or modification of a facility begins; or

(b) the date any application or notice of intent is first filed with the commission to obtain approval for the construction or operation of the facility.

Any distance limitations, setbacks, and buffer zones will be determined as required by this section.

10. REGULATORY REVIEW

10.1 State Requirements Review

- 30 TAC Chapter 111:
  - Emission sources at the Tornado Gas Plant are subject to the regulations listed in 30 TAC §111.111(a) and §111.151. MarkWest will operate and maintain emissions sources so as not to exceed the applicable visible and particulate matter emissions limits.
- 30 TAC Chapter 112:
  - Emission sources will comply with the applicable requirements of Chapter 112, regarding the control of sulfur compounds. Subchapters C and D do not apply to the Tornado Gas Plant because the site does not directly emit sulfuric acid or total reduced sulfur. Subchapter A applies to emissions of sulfur dioxide (SO_2), and Subchapter B applies to emissions of H_2S. MarkWest will comply with the applicable requirements of these two sections.
- 30 TAC Chapter 115:
  - The Tornado Gas Plant is located in Loving County, which is currently not an affected county under this Chapter. Therefore, Chapter 115 requirements do not apply.
- 30 TAC Chapter 117 :
  - The Tornado Gas Plant is located in Loving County, which is currently not an affected county under Chapter 117. Therefore, Chapter 117 requirements do not apply.

10.2 Federal Requirements Review

This section addresses the applicability of 40 CFR Parts 60, 61, and 63 for the proposed sources at the Tornado Gas Plant. Only potentially applicable federal regulations for the proposed sources are discussed below.

10.2.1 40 CFR Part 60 – New Source Performance Standards (NSPS)

- 40 CFR Part 60 Subpart A: *General Provisions*
  - Any source subject to a source-specific NSPS is also subject to the general provisions of NSPS Subpart A. Unless specifically excluded by the source-specific NSPS, Subpart A generally requires initial construction notification, initial startup notification, performance tests, performance test date initial notification, general monitoring requirements, general recordkeeping requirements, and semiannual monitoring and/or excess emission reports. Because MarkWest is subject to a source-specific NSPS, the Tornado Gas Plant is also subject to NSPS Subpart A and will continue to comply with the applicable requirements. In addition, the flare is designed to meet the minimum heating value and maximum tip velocity requirements in 40 CFR §60.18.

- 40 CFR Part 60 Subpart Dc: Small Industrial-Commercial-Institutional Steam Generating Units
  - This subpart applies to steam generating units for which construction, modification, or reconstruction is commenced after June 9, 1989 and that have a maximum design heat input capacity of greater than or equal to 10 MMBtu/hr and less than or equal to 100 MMBtu/hr. There are no changes to the heaters as part of this NRSP revision. The condensate stabilizer heater (EPN HTR-1), amine regenerator reboiler (EPN HTR-2), and the hot oil heater (EPN HTR-4) will continue to comply with Subpart Dc.

- 40 CFR Part 60 NSPS Subpart LLL: Standards of Performance for SO_2 Emissions from Onshore Natural Gas Processing for which Construction, Reconstruction, or Modification Commenced After January 20, 1984, and on or Before August 23, 2011
  - This subpart does not apply to the Tornado Gas Plant since the proposed operations will commence construction after August 23, 2011.

- 40 CFR 60 NSPS Subpart IIII: Stationary Compression Ignition Internal Combustion Engines
  - This subpart applies to compression ignition engines. This registration does not contain any compression ignition engines; therefore, this subpart does not apply.

- 40 CFR 60 NSPS Subpart JJJJ: Stationary Spark Ignition Internal Combustion Engines
  - There are no proposed engines as part of this revision registration. However, existing lean burn engines were constructed (i.e. ordered) after June 12, 2006 and manufactured after July 1, 2007; therefore, these engines will continue to comply with the requirements of NSPS JJJJ.

- 40 CFR Part 60 NSPS Subpart OOOO: Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution for which Construction, Modification, or Reconstruction Commenced after August 23, 2011 and before September 18, 2015
  - This subpart does not apply to the Tornado Gas Plant since the operations commenced construction after September 18, 2015.

- 40 CFR Part 60 NSPS Subpart OOOOa: Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification, or Reconstruction Commenced after September 18, 2015
  - This subpart applies to Crude Oil and Natural Gas Facilities for which construction, modification, or reconstruction commenced after September 18, 2015. NSPS Subpart OOOOa regulates emissions and work practice standards for onshore affected facilities, such as compressors, storage tanks, pneumatic devices and pumps, and fugitive sources.
  - The compressors were constructed after September 18, 2015, therefore these sources are subject to NSPS OOOOa requirements. MarkWest will continue to comply with all applicable requirements. The rod packing will be replaced every 26,000 hours or every 36 months, whichever occurs first.
  - The condensate storage tanks are controlled and with control each emit less than 6 tpy; therefore, these tanks are not subject to NSPS OOOOa requirements.
  - The pneumatic pumps are located at a natural gas processing plant, and therefore are subject to NSPS OOOOa requirements. MarkWest will continue to comply with all applicable requirements.
  - The pneumatic devices are air-driven (not natural gas), and therefore, are not subject to NSPS OOOOa requirements.
  - The site was constructed after the effective date of this subpart and therefore is subject to NSPS OOOOa for fugitive emissions. MarkWest will continue to comply with the monitoring and reporting requirements for the fugitive emissions.
  - The amine sweetening units were constructed after September 18, 2015, therefore these sources are subject to NSPS OOOOa requirements. MarkWest will continue to comply with all applicable requirements.

10.2.2 40 CFR Part 61 – National Emission Standards for Hazardous Air Pollutants (NESHAP)

- 40 CFR Part 61 Subpart A: *General Provisions*

- This subpart applies to any site that has applicable Subpart in Part 61. Because MarkWest is not subject to any NESHAP subparts in Part 61, this subpart is not applicable to the Tornado Gas Plant.

10.2.3 40 CFR Part 63 – National Emission Standards for Hazardous Air Pollutants (MACT)

- 40 CFR Part 63 Subpart A: *General Provisions*
  - This subpart applies to any site that has an applicable MACT Subpart. Since MarkWest is subject to at least one MACT Subpart, MarkWest will comply with the general requirements in Subpart A.

- 40 CFR Part 63 Subpart HH: Oil and Natural Gas Production Facilities
  - This subpart applies to emission points at oil and natural gas production facilities that are major sources or area sources of HAPs and that process, upgrade, or store either hydrocarbon liquids or natural gas prior to the point of custody transfer. As an area source and a facility that processes natural gas, the Tornado Gas Plant is potentially subject to the requirements of MACT Subpart HH. MACT Subpart HH requirements for area sources apply to glycol dehydration units. The controlled dehydrator benzene emissions are less than one (1) tpy; therefore, the dehydrator is subject only to limited recordkeeping requirements under MACT Subpart HH per §63.774(d)(1). MarkWest will continue to comply with the applicable requirements of MACT HH.

- 40 CFR Part 63 Subpart ZZZZ: Stationary Reciprocating Internal Combustion Engines (RICE)
  - The engines were constructed after June 12, 2006 and are at an area source of HAPs; therefore, the engines will continue to comply with MACT ZZZZ by complying with NSPS JJJJ.

11. GAS AND LIQUID ANALYSES

The representative analyses used for this project are representative of the design criteria of the gas plant.

Extended Gas Analysis Report

10329G	050-0049	Tornado Inlet
Sample Point Code	Sample Point Name	Sample Point Location

Laboratory Services	2020032829	1632	T Wheeler - Spot
Source Laboratory	Lab File No	Container Identity	Sampler
USA	USA	USA	Default
District	Area Name	Field Name	Facility Name
Jun 22, 2020 10:00	Jun 22, 2020 10:00	Jun 24, 2020 08:54	Jun 24, 2020
Date Sampled	Date Effective	Date Received	Date Reported

80.00	159,330.00	TG	846 @ 87
Ambient Temp (°F)	Flow Rate (Mcf)	Analyst	Press PSI @ Temp °F Source Conditions

Mark West	NG
Operator	Lab Source Description

Component	Normalized Mol %	Un-Normalized Mol %	GPM
Nitrogen (N2)	1.0580	0.999514	
Carbon Dioxide (CO2)	0.3530	0.333825	
Hydrogen Sulfide (H2S)	0.0000	0	
Methane (C1)	78.9760	74.586292	
Ethane (C2)	11.2450	10.619516	3.0070
Propane (C3)	4.9080	4.635499	1.3520
IsoButane (IC4)	0.6750	0.637059	0.2210
n-Butane (NC4)	1.4690	1.387664	0.4630
IsoPentane (IC5)	0.3550	0.335033	0.1300
n-Pentane (NC5)	0.3790	0.35755	0.1370
Hexanes (C6's)	0.5820	0.581	0.2400
TOTAL	100.0000	94.4730	5.5500

Method(s): Gas C6+ - GPA 2261, Extended Gas - GPA 2286, Calculations - GPA 2172

Analyzer Information

Device Type:	Gas Chromatograph	Device Make:	Agilent
Device Model:	7890B	Last Cal Date:	May 1, 2020

Gross Heating Values (Real, BTU/ft³)

14.696 PSI @ 60.00 °F	14.73 PSI @ 60.00 °F	
Dry	Dry	Saturated
1,248.1	1,255.4	1,234.0000

Calculated Total Sample Properties

GPA2145-16 *Calculated at Contract Conditions

Relative Density Real	Relative Density Ideal
0.7263	0.7241

Molecular Weight
20.9720

C6+ Group Properties

Assumed Composition

C6 - 52.905% C7 - 33.014% C8 - 14.081%

Field H2S
0 PPM

PROTREND STATUS:
Passed By Validator on Jun 25, 2020

DATA SOURCE:
Imported

PASSED BY VALIDATOR REASON:
Close enough to be considered reasonable.

VALIDATOR:
Dustin Armstrong

VALIDATOR COMMENTS:
OK

Sample Point Code - Name @ Location

10329G - 050-0049 - Tornado Inlet

Operator

Mark West

Component	Normalized Mol %	Un-Normalized Mol %	GPM
Nitrogen (N2)	1.0580	0.999514	
Carbon Dioxide (CO2)	0.3530	0.333825	
Hydrogen Sulfide (H2S)	0.0000	0	
Methane (C1)	78.9760	74.5863	
Ethane (C2)	11.2450	10.6195	3.0070
Propane (C3)	4.9080	4.6355	1.3520
IsoButane (IC4)	0.6750	0.637059	0.2210
n-Butane (NC4)	1.4690	1.38766	0.4630
IsoPentane (IC5)	0.3550	0.335033	0.1300
n-Pentane (NC5)	0.3790	0.35755	0.1370
Hexanes (C6's)	0.3090	0.308	0.1260
Heptanes (C7's)	0.1780	0.178	0.0710
Octanes (C8's)	0.0560	0.056	0.0270
Nonanes (C9's)	0.0050	0.005	0.0040
Decanes (C10's)	0.0000	0	0.0000
Undecanes (C11's)	0.0000	0	0.0000
Dodecanes (C12's)	0.0040	0.004	0.0030

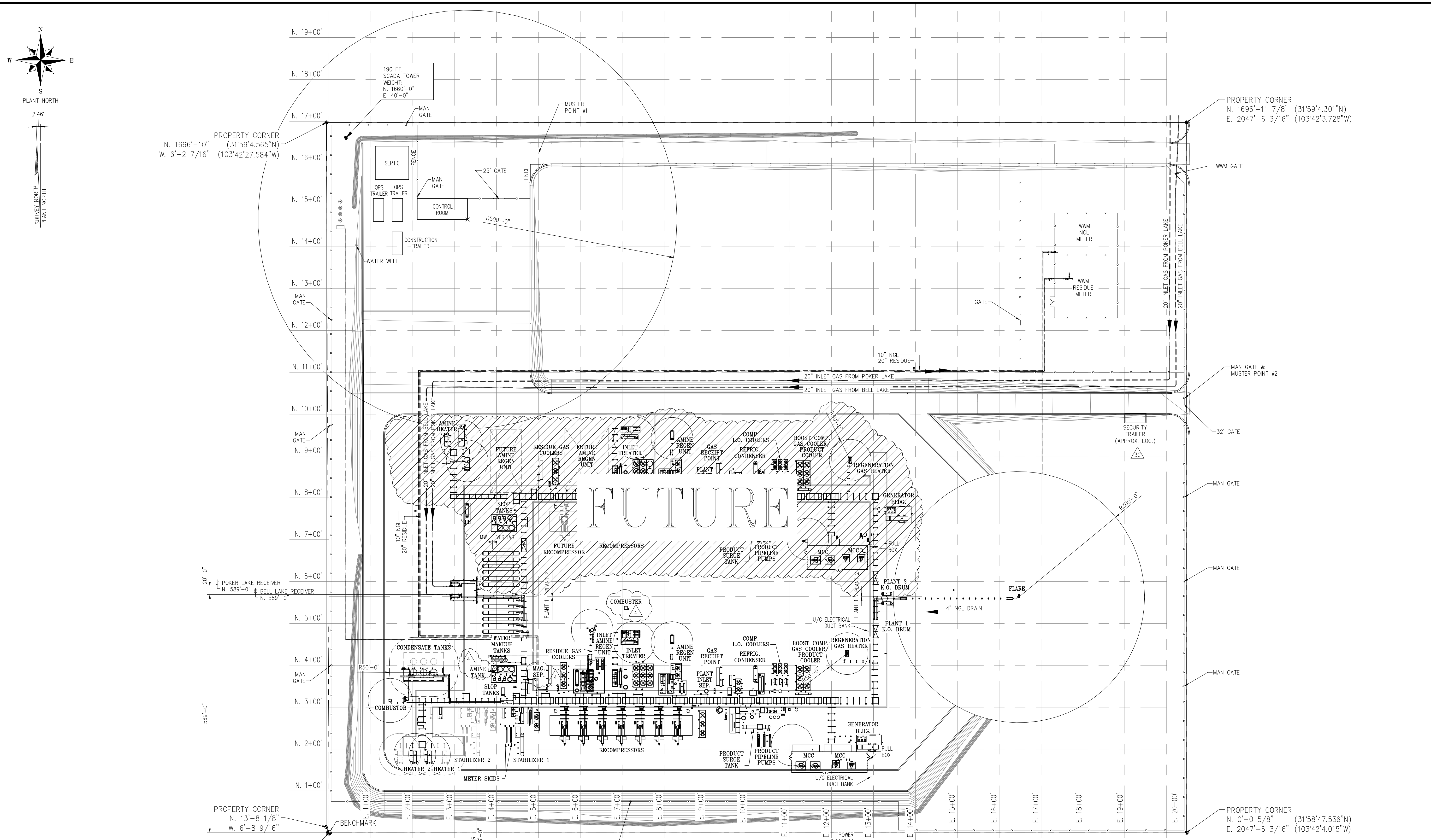
BTEX

Component	Normalized Mol %	Un-Normalized Mol %	GPM
Benzene	0.0140	0.014	0.0040
Toluene	0.0110	0.011	0.0040
EthylBenzene	0.0010	0.001	0.0000
M+P Xylene	0.0030	0.003	0.0010
O Xylene	0.0010	0.001	0.0000

Tank Inlet Analysis		
Component	**lbmol/hr**	**Mol %**
Nitrogen	0.00	0.00%
Carbon Dioxide	0.00	0.00%
Methane	0.00	0.00%
Ethane	0.00	0.00%
Propane	0.00	0.00%
i-Butane	0.00	0.00%
n-Butane	0.08	0.045%
i-Pentane	28.77	16.18%
n-Pentane	37.25	20.94%
n-Hexane	45.12	25.37%
n-Heptane	43.28	24.33%
n-Octane	23.36	13.13%
Hydrogen Sulfide	-	0.0001%
Total	***177.86***	***100.00%***

APPENDIX A. PLOT PLAN

Figures A-1 provides a plot plan of the Tornado Gas Plant.



NOTE:
1. COORDINATES PROVIDED ARE IN THE PLANT COORDINATE SYSTEM BASED ON BENCHMARK & GRID.

NO.	REVISION-DESCRIPTION	DATE	DRAWN	CHK'D	ENG. APP'D	PROCESS APP'D	DIRECTOR APP'D
3E	ISSUE FOR REVIEW ADDED EAST AND WEST OPTION FOR AMINE TANK	9/11/20	JSS	RGM			
3D	ISSUE FOR REVIEW ADDED WATER TANKS	05/12/20	DLB				
3C	REVISED PER VERITAS PLOT PLAN REV-C ISSUE FOR REVIEW	3/10/20	RGM	MR			
3	ISSUE FOR INFORMATION – UPDATED FENCING AND GATES PER CONSTRUCTION REDLINES	09/27/19	DLB				
4	REVISED FOR MAG SEP., AMINE TANK & COMBUSTER ISSUE FOR INFORMATION	12/2/20	RGM	RGM			

REFERENCE

MARKWEST
MarkWest Energy Partners, L.P.

OVERALL PLOT PLAN
TORNADO GAS PLANT
PHASE 1 & 2
LOVING CO. TORNADO TEXAS

A.F.E.			
DRAWN:	DB	DATE:	01/25/17
CHECK:	RGM	DATE:	9/5/18
ENG. APP.:		DATE:	
PROCESS APP.:		DATE:	
DIRECTOR APP.:		DATE:	
SCALE:	1"=100'-0"	CAD. FILE:	TO-1000
DRAWING NO.	TO-PM-1000	REV.	4