CHESAPEAKE OPERATING, LLC

Smith Creek 8-32-70 B Pad

CHAPTER 6, SECTION 2 CONSTRUCTION PERMIT APPLICATION

SUBMITTED TO WDEQ AIR QUALITY DIVISION
MAY 2015

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INTRODUCTION

Narrative Description

Chesapeake Operating, L.L.C. (Chesapeake) submits the enclosed Chapter 6, Section 2 NSR permit application at the Smith Creek 8-32-70 B Pad, an oil and gas production facility proposed to be located in Converse County. The Smith Creek 8-32-70 B Pad will consist of the following three Sussex wells:

- Smith Creek 8-32-70 B SX 5H API #4900929843
- Smith Creek 8-32-70 B SX 7H API #4900929200
- Smith Creek 8-32-70 B SX 9H API #4900929091

With this application Chesapeake requests authorization to construct and operate the following equipment at the Smith Creek 8-32-70 B Pad oil and gas production facility:

- One (1) vapor recovery tower (VRT);
- Eight (8) 400 barrel oil storage tanks (OTKs);
- Four (4) 400 barrel produced water storage tanks (WTKs);
- Three (3) heater treaters (HTs);
- Two (2) combustors (CMBs);
- Two (2) flares (FLs);
- Truck Loadout of Condensate and Produced Water (TLs);
- Fugitive Emissions (FUG);
- One (1) Electric vapor recovery unit (VRU); and
- One (1) Air assisted flare (AAF-1).

The equipment listed above will be allocated/shared between the three Sussex wells.

Process Description

The description of the facility process is as follows: Oil, gas and water from the well enter the facility through a two-phase inlet separator where the gas in separated from the liquid. The liquid is routed to a heater treater, where it is heated and separated into oil, gas and water. Water from the heater treater is drained off and stored in atmospheric tanks prior to disposal. Emissions from the oil tanks, water tanks, and truck loading operations are controlled by a combustor. Under normal operating conditions, gas from the inlet separators and heater treaters is sold via pipeline rather than flared, except during limited times such as maintenance, or when downstream sales line pressure exceeds sales line pressure at the facility. During those times, gas from the well will be flared. Oil from the heater treater passes to a low pressure tower where gas and oil are further separated. Gas from the low pressure tower is compressed with an electric driven vapor recovery unit into the sales gas line. During limited times such as maintenance, or when downstream sales line pressure exceeds sales line pressure at the facility, low pressure tower flash gas is routed to a combustion device.

A process flow diagram reflecting the proposed facility operations is shown in Figure 1. A proposed layout of the facility equipment is shown in Figure 2. Figure 3 and 4 contain maps of the surrounding areas.

Regulatory Applicability

Regulatory applicability for the sources impacted by this permit modification application is discussed below.

NSPS Subpart Kb applies to volatile organic liquid storage vessels constructed, reconstructed, or modified after July 23, 1984 with a capacity of 19,813 gallons (gal) or more. The eight (8) oil tanks (OTK-1 – OTK-8) and four (4) water tanks (WTK-1 – WTK-4) on-site were constructed after 1984 and have capacity less than 19,813 gal. Hence, the storage vessels at the Smith Creek 8-32-70 B Pad oil and gas production facility are not subject to this subpart. Additionally, the VOC emissions associated with these tanks are routed to combustors (CMB-1 – CMB-2) with 98% efficiency.

NSPS Subpart OOOO applies to new onshore natural gas production, transmission and distribution affected facilities constructed after August 23, 2011. Per 40 CFR § 60.5365 (e), a storage vessel is an affected facility if it is located in the oil and natural gas production segment, natural gas processing segment or natural gas transmission and storage segment, and has potential to emit (PTE) 6 tpy or more VOC emissions. Since, each storage vessel in operation at this facility has a PTE of less than 6 tpy, it is exempt from requirements under Subpart OOOO.

Per 40 CFR § 63.760, NESHAP Subpart HH applies to emission points at oil and natural gas production facilities that are HAP major or HAP area sources and that process, upgrade, or store either hydrocarbon liquids or natural gas prior to the point of custody transfer. Subpart HH applies to glycol dehydration units, storage vessels with the potential for flashing, and fugitive equipment at major sources of HAP emissions and glycol dehydration units at area sources of HAP emissions. This tank battery is an E&P facility at an area source of HAP (prior to the point of custody transfer), and therefore the only potentially affected sources are TEG dehydrators. This facility does not have a TEG dehydrator unit and therefore, Subpart HH does not apply to this facility.

The Smith Creek 8-32-70 B Pad oil and gas production facility will be a minor source of criteria pollutants (NO_X, SO_2, VOC, CO, PM, PM_{10}, $PM_{2.5}$) and HAPs with respect to Title V permitting (i.e., emissions < 100 tpy for criteria pollutants and <25 tpy for HAPs). Therefore, the facility is not subject to Title V Operating Permit requirements.

The Smith Creek 8-32-70 B Pad oil and gas production facility will be a minor source of criteria pollutants (NO_X, SO_2, VOC, CO, PM, PM_{10}, $PM_{2.5}$) with respect to PSD permitting (i.e., emissions < 250 tpy). Therefore, the facility is not subject to PSD review.

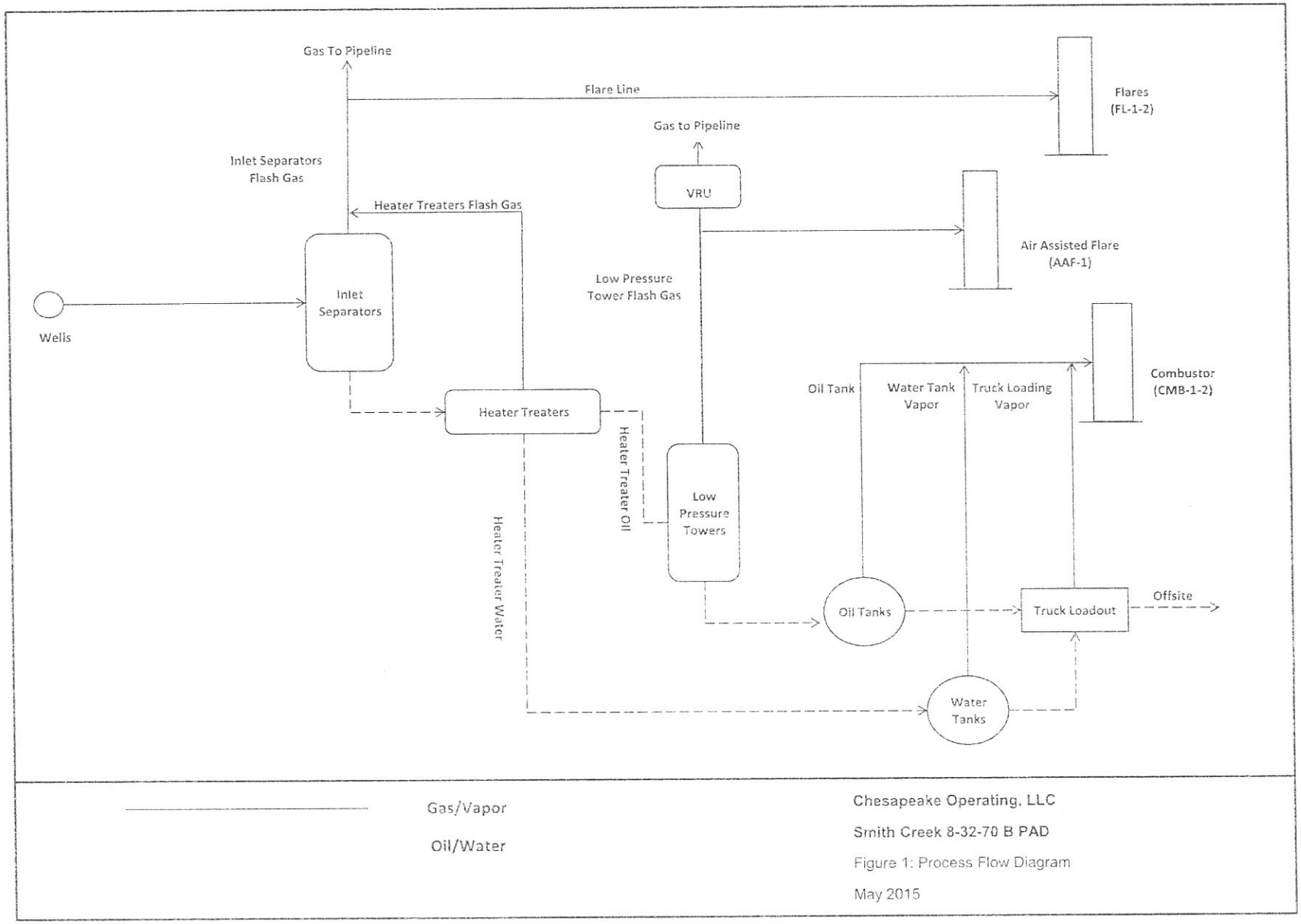
APPENDIX A – TABLES AND DIAGRAMS

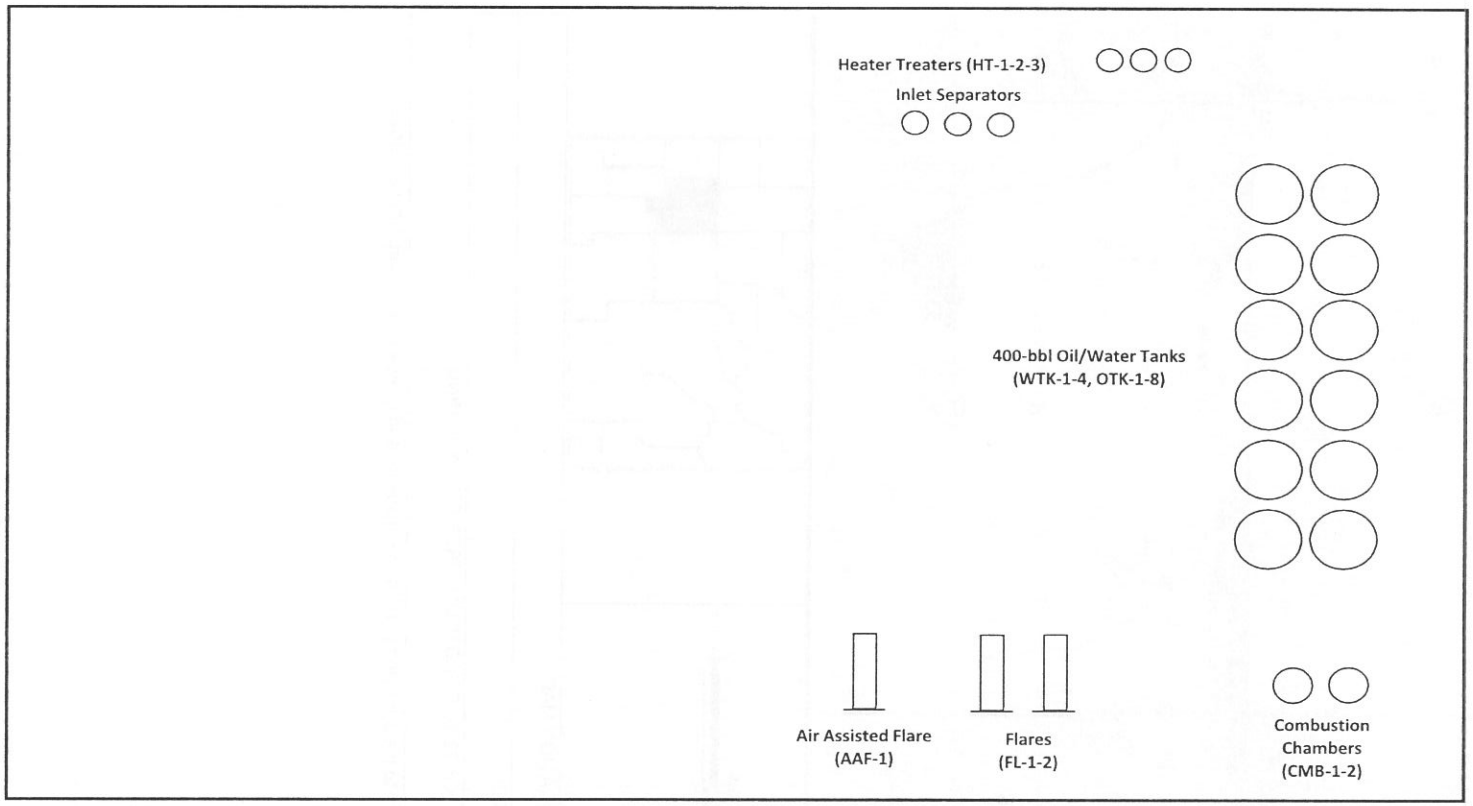
Figure 1, Process Flow Diagram

Figure 2, Site Drawing

Figure 3, Facility Area Map

Figure 4, Facility Co-location Map


Gas To Pipeline
Flare Line
Flares
(FL-1-2)
Gas to Pipeline
Inlet Separators
Flash Gas
VRU
Heater Treaters Flash Gas
Air Assisted Flare
(AAF-1)
Low Pressure
Tower Flash Gas
Inlet
Separators
Wells
Combustor
(CMB-1-2)
Oil Tank
Water Tank
Vapor
Truck Loading
Vapor
Heater Treaters
Heater Treater Oil
Low
Pressure
Towers
Heater Treater Water
Oil Tanks
Truck Loadout
Offsite
Water
Tanks
Gas/Vapor
Oil/Water
Chesapeake Operating, LLC
Smith Creek 8-32-70 B PAD
Figure 1: Process Flow Diagram
May 2015



Drawing is intended to show relative locations of similar site. Not to scale. Wellheads are located on an adjacent pad.

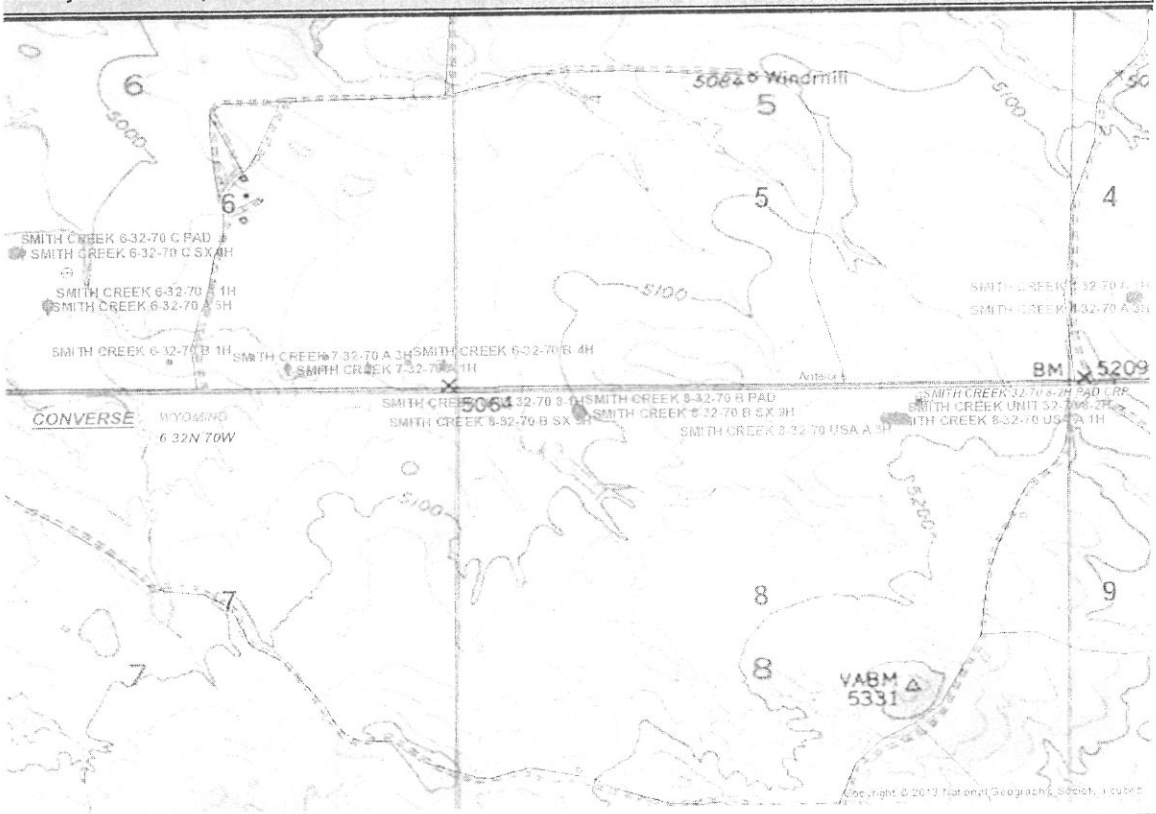
Chesapeake Operating, LLC

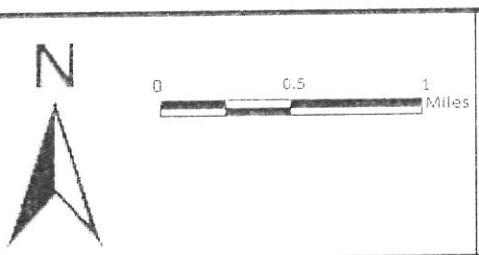
Smith Creek 8-32-70 B PAD

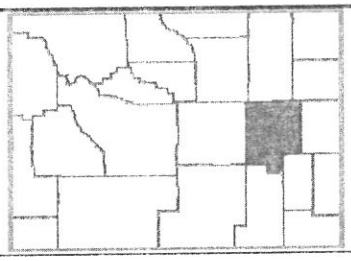
Figure 2: Site Drawing

May 2015

Facility Location Map with Current Site in the Center.







Chesapeake ENERGY	FACILITY LOCATION MAP
	CHESAPEAKE
	SMITH CREEK 8-32-70 B PAD, CONVERSE CO., WYOMING 8/32N/70W

Email the Excel version of this document to the approved permitting consultant and Chesapeake's corporate air group.

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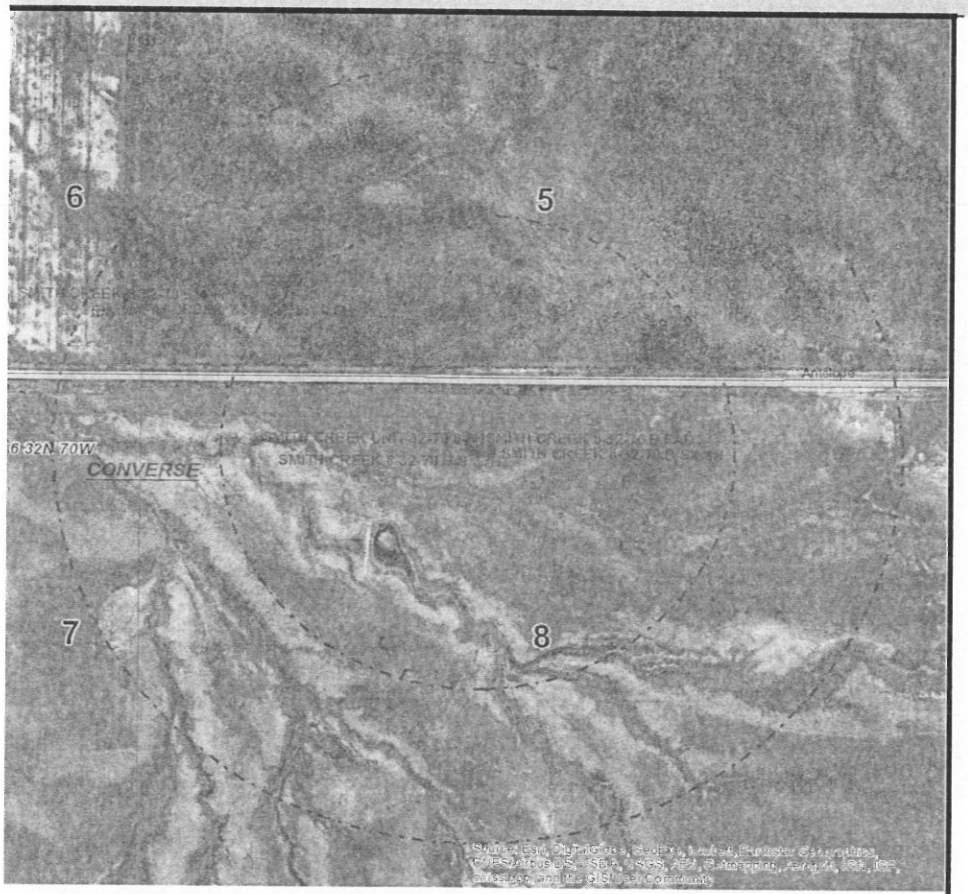
Co-Location Map with Current Site in the Center.



Chesapeake Sites within 800 feet: 0

Chesapeake Adjacent Sites between 800 feet and .25 miles: 0

Chesapeake ENERGY

SMITH CREEK 8-32-70 B PAD / 910195
Lat/Long: 42.76591 / -105.28269

0 250 500 1,000 Feet

N

CHK OP Wells
- COMPRESSOR STATION
- DRY
- FACILITY
- GAS
- OIL

CHK NONOP Wells
- COMPRESSOR STATION
- DRY
- FACILITY
- GAS
- OIL

Meter Location
- Treatment Plant
- Salt Water Disposal Plant
- Tank
- Water

Pipeline
- Active
- Water Pipe
- COI Active
- Leased

APPENDIX B – EMISSION CALCULATIONS

FACILITYWIDE EMISSION CALCULATIONS - SUMMARY

Wyoming Site: Smith Creek 8-32-70 B Pad

Summary of Criteria Air Pollutant Emissions

Equipment proposed by Chapter 6, Section 2 Construction Permit Application

Equipment	Unit ID	NO_X		CO		VOC		SO_2		PM	
		lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
Two (2) Combustion Chambers (Pilot Gas + Burner + Tanks +TL Combustion)	CMB-1 - CMB-2	0.88	3.86	0.22	0.96	4.02	17.60	<0.01	0.02	0.05	0.21
One (1) Air Assisted Flare	AAF-1	1.70	0.75	0.43	0.19	95.56	41.85	<0.01	<0.01	0.09	0.04
Three (3) 0.50-MMBtu/hr Heater Treater Burners	HT-1 - HT-3	0.15	0.64	0.12	0.54	<0.01	0.04	<0.01	<0.01	0.01	0.05
Eight (8) 400-bbl Oil Tanks - Controlled by Combustion Chamber	OTK-1 - OTK-8	-	-	-	-	1.77	7.76	-	-	-	-
Four (4) 400-bbl Produced Water Tank - Controlled by Combustion Chamber	WTK-1 - WTK-4	-	-	-	-	0.02	0.09	-	-	-	-
Truck Loading - Condensate	TL-1	-	-	-	-	1.49	6.52	-	-	-	-
Truck Loading - PW	TL-2	-	-	-	-	0.04	0.16	-	-	-	-
Two (2) Standard Flares	FL-1 - FL-2	1.85	8.09	0.46	2.02	3.23	14.16	-	-	-	-
Fugitive Emissions	FUG	-	-	-	-	1.60	7.03	-	-	-	-
Total		**4.58**	**13.34**	**1.23**	**3.71**	**107.74**	**95.21**	**0.01**	**0.02**	**0.15**	**0.29**

FACILITYWIDE EMISSION CALCULATIONS - SUMMARY

Wyoming Site: Smith Creek 8-32-70 B Pad

Summary of Hazardous Air Pollutant Hourly Emissions

Equipment proposed by Chapter 6, Section 2 Construction Permit Application

Equipment	Unit ID	Estimated Emissions (lb/hr)									
		Acetaldehyde	Acrolein	Benzene	Ethyl-benzene	Formaldehyde	Methanol	n-Hexane	Toluene	Xylenes	Other HAPs	Total HAPs
Two (2) Combustion Chambers (Pilot Gas + Burner + Tanks +TL Combustion)	CMB-1 - CMB-2	-	-	<0.01	0.01	<0.01	-	0.09	0.04	0.05	<0.01	0.20
One (1) Air Assisted Flare	AAF-1	-	-	<0.01	-	<0.01	-	0.02	<0.01	-	<0.01	0.02
Three (3) 0.50-MMBtu/hr Heater Treater Burners	HT-1 - HT-3	-	-	<0.01	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01
Eight (8) 400-bbl Oil Tanks - Controlled by Combustion Chamber	OTK-1 - OTK-8	-	-	<0.01	<0.01	-	-	0.04	0.02	0.02	-	0.08
Four (4) 400-bbl Produced Water Tank - Controlled by Combustion Chamber	WTK-1 - WTK-4	-	-	<0.01	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01
Truck Loading - Condensate	TL-1	-	-	<0.01	<0.01	-	-	0.03	0.01	0.02	-	0.07
Truck Loading - PW	TL-2	-	-	<0.01	<0.01	-	-	<0.01	<0.01	0.00	-	<0.01
Two (2) Standard Flares	FL-1 - FL-2	-	-	<0.01	0.00	-	-	0.06	<0.01	<0.01	-	0.07
Fugitive Emissions	FUG	-	-	<0.01	<0.01	-	-	0.03	0.01	0.01		0.07
Total		-	-	**0.02**	**0.02**	**<0.01**	-	**0.27**	**0.09**	**0.12**	**<0.01**	**0.52**

FACILITYWIDE EMISSION CALCULATIONS - SUMMARY

Wyoming Site: Smith Creek 8-32-70 B Pad

Summary of Hazardous Air Pollutant Annual Emissions

Equipment proposed by Chapter 6, Section 2 Construction Permit Application

Equipment	Unit ID	Estimated Emissions (tons/yr)										
		Acetaldehyde	Acrolein	Benzene	Ethyl-benzene	Formaldehyde	Methanol	n-Hexane	Toluene	Xylenes	Other HAPs	Total HAPs
Two (2) Combustion Chambers (Pilot Gas + Burner + Tanks +TL Combustion)	CMB-1 - CMB-2	-	-	0.04	0.04	<0.01	-	0.40	0.17	0.24	<0.01	0.89
One (1) Air Assisted Flare	AAF-1	-	-	<0.01	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01
Three (3) 0.50-MMBtu/hr Heater Treater Burners	HT-1 - HT-3	-	-	<0.01	-	<0.01	-	0.01	<0.01	-	<0.01	0.01
Eight (8) 400-bbl Oil Tanks - Controlled by Combustion Chamber	OTK-1 - OTK-8	-	-	0.02	0.02	-	-	0.15	0.07	0.11	-	0.37
Four (4) 400-bbl Produced Water Tank - Controlled by Combustion Chamber	WTK-1 - WTK-4	-	-	<0.01	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01
Truck Loading - Condensate	TL-1	-	-	0.01	0.02	-	-	0.13	0.06	0.09	-	0.31
Truck Loading - PW	TL-2	-	-	<0.01	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01
Two (2) Standard Flares	FL-1 - FL-2	-	-	0.02	0.00	-	-	0.24	0.03	0.01	-	0.30
Fugitive Emissions	FUG	-	-	0.02	0.01	-	-	0.15	0.05	0.07	-	0.29
Total		**-**	**-**	**0.11**	**0.09**	**<0.01**	**-**	**1.10**	**0.39**	**0.52**	**<0.01**	**2.20**

OIL TANK EMISSION CALCULATIONS - CRITERIA AIR POLLUTANTS

Unit ID =	OTK-1 - OTK-8 (Each)	OTK-1 - OTK-8 (Total)
Number of Tanks =	8	-
Capacity (bbl) =	400	-
Capacity (gal) =	16,800	-
Throughput (bbl/yr)[1] =	627,800	5,022,400.00
Throughput (gal/yr)[1] =	26,367,600	210,940,800
Throughput (bbl/d)[1] =	1,720	13,760
Tanks 4.0.9d Working Losses (lb/yr)[2] =	37,647.13	-
Tanks 4.0.9d Breathing Losses (lb/yr)[2] =	2,327.27	-
Tanks 4.0.9d Total Losses (lb/yr)[2] =	39,974.40	
Flash Emission Factor (lb VOC/bbl)[3] =	0.09081	-
Capture Efficiency =	98.00%	98.00%
Control Type =	Combustion Chamber	Combustion Chamber
Control Efficiency =	98.00%	98.00%

Uncontrolled VOC Emissions

Emissions	OTK-1 - OTK-8 (Each) Avg. lb/hr[5]	OTK-1 - OTK-8 (Each) tons/yr[6]	OTK-1 - OTK-8 (Total) Avg. lb/hr[7]	OTK-1 - OTK-8 (Total) tons/yr[8]
Working	4.30	18.82	34.38	150.59
Breathing	0.27	1.16	2.13	9.31
Flashing	6.51	28.50	52.06	228.03
Total	11.07	48.49	88.57	387.93

Proposed Uncaptured VOC Emissions[9] - Emissions that are not Captured by the Combustors (Represented under Oil Tanks in the Summary Tables)

Emissions	OTK-1 - OTK-8 (Each) Avg. lb/hr[10]	OTK-1 - OTK-8 (Each) tons/yr[11]	OTK-1 - OTK-8 (Total) Avg. lb/hr[12]	OTK-1 - OTK-8 (Total) tons/yr[13]
Working	0.09	0.38	0.69	3.01
Breathing	0.01	0.02	0.04	0.19
Flashing	0.13	0.57	1.04	4.56
Total	0.22	0.97	1.77	7.76

Proposed Controlled VOC Emissions[14] - Captured and Controlled by Combustors (Represented under Combustors in the Summary Tables)

Emissions	OTK-1 - OTK-8 (Each) Avg. lb/hr[15]	OTK-1 - OTK-8 (Each) tons/yr[16]	OTK-1 - OTK-8 (Total) Avg. lb/hr[17]	OTK-1 - OTK-8 (Total) tons/yr[18]
Working	0.0842	0.37	0.67	2.95
Breathing	0.01	0.02	0.04	0.18
Flashing	0.13	0.56	1.02	4.47
Total	0.22	0.95	1.74	7.60

[1] Individual tank throughputs shown for worst-case breathing emissions estimate only and not intended as a per tank limit.

[2] Working and breathing losses for all tanks modeled as Gasoline RVP 11 for conservative emissions estimate. Flashing emission factor calculated with Promax process simulations. Process simulation results and EPA Tanks 4.09d emissions reports attached. Tank vapor destroyed by combustion chamber with manufactured-estimated 98% control efficiency.

[3] Calculated by Promax process simulation (report attached).

[4] Control efficiency of the combustor is 98 %.

[5] Due to variable short-term emission rates, average lb/hr based on annual emissions shown for reference only.

Uncontrolled Hourly Emissions, Each (lb/hr) = Tanks 4.0.9d Working Losses (lb/yr) / 8,760 (hrs/yr) and Tanks 4.0.9d Breathing Losses (lb/yr) / 8,760 (hrs/yr) and Flash Emission Factor (lb VOC/bbl) x Throughput (bbl/yr) / 8,760 (hrs/yr)

Uncontrolled Working Hourly Emissions, Each (lb/hr) = 37,647.13 lb/yr / 8,760 hr = 4.30 lb/hr

[6] Uncontrolled Hourly Emissions, Total (lb/hr) = Uncontrolled Hourly Emissions, Each (lb/hr) * Total Number of Tanks

Uncontrolled Hourly Emissions, Total (lb/hr) = 4.30 lb/hr * 08 Tanks = 34.38 lb/hr

[7] Uncontrolled Annual Emissions, Each (tpy) = Uncontrolled Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

Uncontrolled Annual Emissions, Each (tpy) = 4.30 lb/hr * 8,760 hr/yr * 1 ton/2,000 lb = 18.82 ton/yr

[8] Uncontrolled Annual Emissions, Total (tpy) = Uncontrolled Annual Emissions, Each (tpy) * Total Number of Tanks

Uncontrolled Annual Working Emissions, Total (tpy) = 18.82 ton/yr * 08 Tanks = 150.59 ton/yr

[9] Uncaptured Hourly / Annual Emissions (lb/hr or tpy) = Uncontrolled Emissions (lb/hr or tpy) * (1 - Capture Efficiency (%))

[10] Proposed Uncaptured Hourly Emissions (lb/hr) = Uncontrolled Emissions (lb/hr) * (1 - Capture efficiency (%))

Proposed Uncaptured Working Hourly Emissions (lb/hr) = 4.30 lb/hr * 1 - 98% = 0.09 lb/hr

[11] Proposed Uncaptured Hourly Emissions, Total (lb/hr) = Proposed Uncaptured Hourly Emissions, Each (lb/hr) * Total Number of Tanks

Proposed Uncaptured Working Hourly Emissions, Total (lb/hr) = 0.09 lb/hr * 08 Tanks = 0.69 lb/hr

[12] Proposed Uncaptured Annual Emissions, Each (tpy) = Uncaptured Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

Proposed Uncaptured Working Annual Emissions, Each (tpy) = 0.09 lb/hr * 8,760 hr/yr * 1 ton/2,000 lb = 0.38 ton/yr

[13] Proposed Uncaptured Annual Emissions, Total (tpy) = Uncaptured Annual Emissions, Each (tpy) * Total Number of Tanks

Uncaptured Annual Working Emissions, Total (tpy) = 0.38 ton/yr * 08 Tanks = 3.01 ton/yr

OIL TANK EMISSION CALCULATIONS - CRITERIA AIR POLLUTANTS

[14] Controlled VOC emissions are captured vapors from the tanks which are routed and combusted by the Combustors and shown and accounted for under the combustors in the summary tables.
Captured Emissions = Uncontrolled Emissions - Uncaptured Emissions.

[15] Proposed Controlled Hourly Emissions (lb/hr) =

Captured Emissions (Uncontrolled Emissions - Uncaptured Emissions) (lb/hr) * (1- Control efficiency (%))

Proposed Controlled Working Hourly Emissions (lb/hr) = [4.30 lb - 0.09 lb] / hr | 1 - 98% = 0.08 lb / hr

[16] Proposed Controlled Hourly Emissions, Total (lb/hr) =

Proposed Controlled Hourly Emissions, Each (lb/hr) * Total Number of Tanks

Proposed Controlled Working Hourly Emissions, Total (lb/hr) = 0.08 lb / hr | 08 Tanks = 0.67 lb / hr

[17] Proposed Controlled Annual Emissions, Each (tpy) =

Controlled Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

Proposed Controlled Working Annual Emissions, Each (tpy) = 0.08 lb / hr | 8,760 hr / yr | 1 ton / 2,000 lb = 0.37 ton / yr

[18] Proposed Controlled Annual Emissions, Total (tpy) =

Controlled Annual Emissions, Each (tpy) * Total Number of Tanks

Controlled Working Annual Working Emissions, Total (tpy) = 0.37 ton / yr | 08 Tanks = 2.95 ton / yr

OIL TANK EMISSION CALCULATIONS - HAZARDOUS AIR POLLUTANTS

Unit ID =	OTK-1 - OTK-8 (Each)	OTK-1 - OTK-8 (Total)
Number of Tanks =	8	-
Capacity (bbl) =	400	-
Capacity (gal) =	16,800	-
Throughput (bbl/yr) =	627,800	5,022,400
Throughput (gal/yr) =	26,367,600	210,940,800
Throughput (bbl/d) =	1,720	13,760
Capture Efficiency =	98.00%	98.00%
Control Type =	Combustion Chamber	Combustion Chamber
Control Efficiency =	98.00%	98.00%

Uncontrolled Hazardous Air Pollutant Emissions

Pollutant	OTK-1 - OTK-8 (Each) Avg. lb/hr [2]	OTK-1 - OTK-8 (Each) tons/yr [3]	OTK-1 - OTK-8 (Total) Avg. lb/hr [4]	OTK-1 - OTK-8 (Total) tons/yr [5]
Total VOC [1]	11.07	48.49	88.57	387.93
n-Hexane	0.22	0.96	1.76	7.69
Benzene	0.03	0.11	0.20	0.88
Toluene	0.11	0.47	0.85	3.74
Ethylbenzene	0.03	0.12	0.21	0.93
Xylenes	0.15	0.66	1.21	5.29
Other HAPs	0.00	0.00	0.00	0.00
Total HAPs	0.53	2.32	4.23	18.53

Proposed Uncaptured VOC Emissions[6] - Not captured by the combustors (Represented under Oil Tanks in the summary tables)

Pollutant	OTK-1 - OTK-8 (Each) Avg. lb/hr [7]	OTK-1 - OTK-8 (Each) tons/yr [8]	OTK-1 - OTK-8 (Total) Avg. lb/hr [9]	OTK-1 - OTK-8 (Total) tons/yr [10]
Total VOC	0.22	0.97	1.77	7.76
n-Hexane	<0.01	0.02	0.04	0.15
Benzene	<0.01	<0.01	<0.01	0.02
Toluene	<0.01	<0.01	0.02	0.07
Ethylbenzene	<0.01	<0.01	<0.01	0.02
Xylenes	<0.01	0.01	0.02	0.11
Other HAPs	0.00	0.00	0.00	0.00
Total HAPs	0.01	0.05	0.08	0.37

Proposed Controlled Hazardous Air Pollutant Emissions [11] - Controlled by Combustor (Represented under Combustor in the summary tables)

Pollutant	OTK-1 - OTK-8 (Each) Avg. lb/hr [12]	OTK-1 - OTK-8 (Each) tons/yr [13]	OTK-1 - OTK-8 (Total) Avg. lb/hr [14]	OTK-1 - OTK-8 (Total) tons/yr [15]
Total VOC	0.22	0.95	1.74	7.60
n-Hexane	<0.01	0.02	0.03	0.15
Benzene	<0.01	<0.01	<0.01	0.02
Toluene	<0.01	<0.01	0.02	0.07
Ethylbenzene	<0.01	<0.01	<0.01	0.02
Xylenes	<0.01	0.01	0.02	0.10
Other HAPs	0.00	0.00	0.00	0.00
Total HAPs	0.01	0.05	0.08	0.36

Estimated Hazardous Air Pollutant Composition (wt%) [16]

Pollutant	Wt%
n-Hexane	1.983%
Benzene	0.226%
Toluene	0.965%
Ethylbenzene	0.239%
Xylenes	1.364%
Other HAPs	0.000%
Total HAPs	4.78%

[1] VOC emissions calculated in the Criteria Air Pollutant calculations.

[2] Due to variable short-term emission rates, average lb/hr based on annual emissions shown for reference only.

Uncontrolled Hourly Emissions, Each (lb/hr) = Tanks Uncontrolled VOC, Each (lb/yr) * HAP Composition wt%

Uncontrolled n-Hexane Hourly Emissions, Each (lb/hr) = 11.07 lb/hr | 1.98% = 0.22 lb/hr

[3] Uncontrolled n-Hexane Hourly Emissions, Total (lb/hr) = Uncontrolled Hourly Emissions, Each (lb/hr) * Total Number of Tanks

Uncontrolled n-Hexane Hourly Emissions, Total (lb/hr) = 0.22 lb/hr | 08 Tanks = 1.76 lb/hr

[4] Uncontrolled Annual Emissions, Each (tpy) = Uncontrolled Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

Uncontrolled n-Hexane Annual Emissions, Each (tpy) = 0.22 lb/hr | 8,760 hr/yr | 1 ton/2,000 lb = 0.96 ton/yr

[5] Uncontrolled Annual Emissions, Total (tpy) = Uncontrolled Annual Emissions, Each (tpy) * Total Number of Tanks

Uncontrolled n-Hexane Annual Emissions, Total (tpy) = 0.96 ton/yr | 08 Tanks = 7.69 ton/yr

[6] Uncaptured Hourly/ Annual Emissions (lb/hr or tpy) are represented at emissions at the tank level.

[7] Proposed Uncaptured Hourly Emissions (lb/hr) = Uncontrolled Emissions (lb/hr) * (1- Capture efficiency (%))

Proposed Uncaptured n-Hexane Working Hourly Emissions (lb/hr) = 0.22 lb/hr | 1 - 98% = <0.01 lb/hr

[8] Proposed Uncaptured Hourly Emissions, Total (lb/hr) = Proposed Uncaptured Hourly Emissions, Each (lb/hr) * Total Number of Tanks

Proposed Uncaptured n-Hexane Hourly Emissions, Total (lb/hr) = <0.01 lb/hr | 08 Tanks = 0.04 lb/hr

[9] Proposed Uncaptured Annual Emissions, Each (tpy) = Uncaptured Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

Proposed Uncaptured Annual n-Hexane Emissions, Each (tpy) = <0.01 lb/hr | 8,760 hr/yr | 1 ton/2,000 lb = 0.02 ton/yr

[10] Proposed Uncaptured Annual Emissions, Total (tpy) = Uncaptured Annual Emissions, Each (tpy) * Total Number of Tanks

Proposed Uncaptured n-Hexane Hourly Emissions, Total (tpy) = 0.02 ton/yr | 08 Tanks = 0.15 ton/yr

OIL TANK EMISSION CALCULATIONS - HAZARDOUS AIR POLLUTANTS

[11] Controlled HAP emissions are captured vapors from the tanks which are routed and combusted by the Combustors and shown and accounted for under the combustors in the summary tables. Captured Emissions = Uncontrolled Emissions - Uncaptured Emissions.

[12] Proposed Controlled Hourly Emissions, Each (lb/hr) = Captured Emissions (Uncontrolled Emissions - Uncaptured Emissions) (lb/hr) * (1- Control efficiency (%))

Proposed Controlled n-Hexane Hourly Emissions, Each (lb/hr) = [0.22 lb/hr - <0.01 lb/hr] | 1 - 98% = <0.01 lb/hr

[13] Proposed Controlled Hourly Emissions, Total (lb/hr) = Proposed Controlled Hourly Emissions, Each (lb/hr) * Total Number of Tanks

Proposed Controlled n-Hexane Hourly Emissions, Total (lb/hr) = <0.01 lb/hr | 08 Tanks = 0.03 lb/hr

[14] Proposed Controlled Annual Emissions, Each (tpy) = Controlled Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

Proposed Controlled n-Hexane Annual Emissions, Each (tpy) = <0.01 lb/hr | 8,760 hr/yr | 1 ton/2,000 lb = 0.02 ton/yr

[15] Proposed Controlled Annual Emissions, Total (tpy) = Controlled Annual Emissions, Each (tpy) * Total Number of Tanks

Proposed Controlled n-Hexane Annual Emissions, Total (tpy) = 0.02 ton/yr | 08 Tanks = 0.15 ton/yr

[16] Representative separator oil analysis attached. HAP weight % calculated as % of total VOCs in sample. All HAP assumed to volatilize from liquids for most conservative estimate.

FIXED ROOF OIL TANKS - EMISSION CALCULATIONS

Fixed-Roof Tank Emissions
Based on AP-42, February 1996, Section 7.1.3.1.

Enter or select all information in **bold** lines. All other values are automatically calculated or are defaults. *Italics* indicate descriptions that are not used in the calculations. Defaults shown in blue text may be overwritten on a case-by-case basis.

Variable	Instructions/Defaults	Value
Tank Identification		*Smith Creek 8-32-70 B Pad (PN 910195) OTK1-OTK-8 (Each)*
Actual Location		*Converse County*
Location for Calculation Purposes	Select nearest city with defined meteorological data	Casper, Wyoming
Type of Substance	Select Organic Liquid, Petroleum Distillate, or Crude Oil	Petroleum Distillate
Contents of Tank	Select from list (add new compounds in 'VOLs' tab):	Gasoline (RVP 11)
Tank/Roof Type	Select Cone, Dome, or Horizontal Tank	Cone
Underground?	Select Aboveground or Underground	Aboveground
Diameter, ft		12
Shell Height or Length, ft		20
Nominal Capacity, gal		16,075
Throughput, gallons/yr		26,367,600
Tank Paint Color	Select from list (Default = White)	Gray/Light
Tank Paint Condition	Select from list (Default = Good)	Good
Effective Diameter, ft		12.0
Geometric Capacity, gal		16,920
Maximum Liquid Height, ft		20.0
Average Liquid Height, ft	Default = Maximum Liquid Height / 2	10.00
Cone Tank Roof Slope, ft/ft	Default = 0.0625; N/A for Horizontal tanks	0.0625
Dome Tank Roof Radius, ft	Default = Effective Diameter	N/A
Dome Tank Roof Height, ft		N/A
Roof Outage, ft		0.125
Vapor Space Outage, ft		10.13
Vapor Space Volume, ft^3		1145
Average Daily Minimum Ambient Temperature, F		31.60
Average Daily Maximum Ambient Temperature, F		58.51
Daily Total Solar Insolation Factor, Btu/ft^2/day		1394
Daily Average Ambient Temperature, F		45.1
Tank Paint Solar Absorbance, dimensionless		0.540
Daily Vapor Temperature Range, R		40.5
Daily Average Liquid Surf. Temperature, F		52.3
Daily Minimum Liquid Surf. Temperature, F		42.1
Daily Maximum Liquid Surf. Temperature, F		62.4
Liquid Bulk Temperature		47.3
Vapor Molecular Weight, lb/lbmol		65.0
Antoine's Coefficient A		N/A
Antoine's Coefficient B		N/A
Antoine's Coefficient C		N/A
Type of Substance (for use in calculations)		Gas
Vapor Pressure at Daily Av. Liquid Surf. Temp., psia		4.962
Vapor Pressure at Daily Min. Liquid Surf. Temp., psia		4.049
Vapor Pressure at Daily Max. Liquid Surf. Temp., psia		6.034
Vapor Pressure Calculation Method		AP-42 Figure 7.1-14b: RVP=11 ASTM Slope=3
Vapor Density, lb/ft^3		0.058714
Daily Vapor Pressure range, psi		1.985
Breather Vent Pressure Setting, psig	Default = 0.03	0.0300
Breather Vent Vacuum Setting, psig	Default = -0.03	-0.0300
Breather Vent Pressure Setting Range, psi		0.0600
Ambient Pressure, psia		12.1
Vapor Space Expansion Factor		0.3474
Vented Vapor Saturation Factor		0.273
Annual Turnovers		1558.32
Turnover Factor		0.19
Working Loss Product Factor		1.00
Standing Storage Loss, lb/yr		**2327**
Working Loss, lb/yr		**37647**
Total Losses, lb/yr		**39974**

WATER TANK EMISSION CALCULATIONS - CRITERIA AIR POLLUTANTS

Unit ID =	WTK-1 - WTK-4 (Each)	WTK-1 - WTK-4 (Total)
Number of Tanks =	4	-
Capacity (bbl) =	400	-
Capacity (gal) =	16,800	-
Throughput (bbl/yr)[1] =	136,875	547,500
Throughput (gal/yr)[1] =	5,748,750	22,995,000
Throughput (bbl/d)[1] =	375	1,500
Tanks 4.0.9d Working Losses (lb/yr)[2] =	11,256.32	-
Tanks 4.0.9d Breathing Losses (lb/yr)[2] =	2,327.27	-
Tanks 4.0.9d Total Losses (lb/yr)[2] =	13,583.59	
1% Tanks 4.0.9d Working Losses (lb/yr)[2] =	112.56	
1% Tanks 4.0.9d Breathing Losses (lb/yr)[2] =	23.27	
Flash Emission Factor (lb VOC/bbl)[3] =	0.01613	-
Capture Efficiency =	98.00%	98.00%
Control Type =	Combustion Chamber	Combustion Chamber
Control Efficiency [4] =	98.00%	98.00%

Uncontrolled VOC Emissions

Emissions	WTK-1 - WTK-4 (Each) Avg. lb/hr [5]	WTK-1 - WTK-4 (Each) tons/yr [6]	WTK-1 - WTK-4 (Total) Avg. lb/hr [7]	WTK-1 - WTK-4 (Total) tons/yr [8]
Working	0.01	0.06	0.05	0.23
Breathing	<0.01	0.01	0.01	0.05
Flashing	0.25	1.10	1.01	4.41
Total	0.27	1.17	1.07	4.69

Proposed Uncaptured VOC Emissions[9] - Not captured by the combustors (Represented under PW Tanks in the summary tables)

Emissions	WTK-1 - WTK-4 (Each) Avg. lb/hr [10]	WTK-1 - WTK-4 (Each) tons/yr [11]	WTK-1 - WTK-4 (Total) Avg. lb/hr [12]	WTK-1 - WTK-4 (Total) tons/yr [13]
Working	<0.01	<0.01	<0.01	<0.01
Breathing	<0.01	<0.01	<0.01	<0.01
Flashing	<0.01	0.02	0.02	0.09
Total	0.01	0.02	0.02	0.09

Proposed Controlled VOC Emissions[14] - Controlled by Combustor (Represented under Combustor in the summary tables)

Emissions	WTK-1 - WTK-4 (Each) Avg. lb/hr [15]	WTK-1 - WTK-4 (Each) tons/yr [16]	WTK-1 - WTK-4 (Total) Avg. lb/hr [17]	WTK-1 - WTK-4 (Total) tons/yr [18]
Working	<0.01	<0.01	<0.01	<0.01
Breathing	<0.01	<0.01	<0.01	<0.01
Flashing	<0.01	0.02	0.02	0.09
Total	0.01	0.02	0.02	0.09

[1] Individual tank throughputs shown for worst-case breathing emissions estimate only and not intended as a per tank limit.

[2] Working and breathing losses for produced water modeled assuming all water is crude (Gasoline RVP 11 for conservative emissions estimate) and 1% of the calculated emissions are emitted. Flashing emission factor calculated with Promax process simulations. Process simulation results and EPA Tanks 4.09d emissions reports attached. Tank vapor destroyed by combustion chamber with manufactured-estimated 98% control efficiency.

[3] Calculated by Promax process simulation (report attached).

[4] Control efficiency of the combustor is 98 %.

[5] Due to variable short-term emission rates, average lb/hr based on annual emissions shown for reference only.

Uncontrolled Hourly Emissions, Each (lb/hr) = Tanks 4.0.9d Working Losses (lb/yr) / 8,760 (hrs/yr) and Tanks 4.0.9d Breathing Losses (lb/yr) / 8,760 (hrs/yr) and Flash Emission Factor (lb VOC/bbl) x Throughput (bbl/yr) / 8,760 (hrs/yr)

Uncontrolled Working Hourly Emissions, Each (lb/hr) = 112.56 lb/yr | 1 yr/8,760 hr = 0.01 lb/hr

[6] Uncontrolled Hourly Emissions, Total (lb/hr) = Uncontrolled Hourly Emissions, Each (lb/hr) * Total Number of Tanks

Uncontrolled Hourly Emissions, Total (lb/hr) = 0.01 lb/hr | 4 Tanks = 0.05 lb/hr

[7] Uncontrolled Annual Emissions, Each (tpy) = Uncontrolled Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

Uncontrolled Annual Emissions, Each (tpy) = 0.01 lb/hr | 8,760 hr/yr | 1 ton/2,000 lb = 0.06 ton/yr

[8] Uncontrolled Annual Emissions, Total (tpy) = Uncontrolled Annual Emissions, Each (tpy) * Total Number of Tanks

Uncontrolled Annual Working Emissions, Total (tpy) = 0.06 ton/yr | 4 Tanks = 0.23 ton/yr

[9] Uncaptured Hourly/ Annual Emissions (lb/hr or tpy) = Uncontrolled Emissions (lb/hr or tpy) * (1- Capture Efficiency (%))

[10] Proposed Uncaptured Hourly Emissions (lb/hr) = Uncontrolled Emissions (lb/hr) * (1- Capture efficiency (%))

Proposed Uncaptured Working Hourly Emissions (lb/hr) = 0.01 lb/hr | 1 - 98% = <0.01 lb/hr

[11] Proposed Uncaptured Hourly Emissions, Total (lb/hr) = Proposed Uncaptured Hourly Emissions, Each (lb/hr) * Total Number of Tanks

Proposed Uncaptured Working Hourly Emissions, Total (lb/hr) = <0.01 lb/hr | 4 Tanks = <0.01 lb/hr

[12] Proposed Uncaptured Annual Emissions, Each (tpy) = Uncaptured Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

Proposed Uncaptured Working Annual Emissions, Each (tpy) = <0.01 lb/hr | 8,760 hr/yr | 1 ton/2,000 lb = <0.01 ton/yr

[13] Proposed Uncaptured Annual Emissions, Total (tpy) = Uncaptured Annual Emissions, Each (tpy) * Total Number of Tanks

Uncaptured Annual Working Emissions, Total (tpy) = <0.01 ton/yr | 4 Tanks = <0.01 ton/yr

WATER TANK EMISSION CALCULATIONS - CRITERIA AIR POLLUTANTS

[14] Controlled VOC emissions are captured vapors from the tanks which are routed and combusted by the Combustors and shown and accounted for under the combustors in the summary tables.
Captured Emissions = Uncontrolled Emissions - Uncaptured Emissions.

[15] Proposed Controlled Hourly Emissions (lb/hr) =

Captured Emissions (Uncontrolled Emissions - Uncaptured Emissions) (lb/hr) * (1- Control efficiency (%))

Proposed Controlled Working Hourly Emissions (lb/hr) = [0.01 lb - <0.01 lb] / hr × 1 - 98% = <0.01 lb / hr

[16] Proposed Controlled Hourly Emissions, Total (lb/hr) =

Proposed Controlled Hourly Emissions, Each (lb/hr) * Total Number of Tanks

Proposed Controlled Working Hourly Emissions, Total (lb/hr) = <0.01 lb / hr × 4 Tanks = <0.01 lb / hr

[17] Proposed Controlled Annual Emissions, Each (tpy) =

Controlled Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

Proposed Controlled Working Annual Emissions, Each (tpy) = <0.01 lb / hr × 8,760 hr / yr × 1 ton / 2,000 lb = <0.01 ton / yr

[18] Proposed Controlled Annual Emissions, Total (tpy) =

Controlled Annual Emissions, Each (tpy) * Total Number of Tanks

Controlled Working Annual Working Emissions, Total (tpy) = <0.01 ton / yr × 4 Tanks = <0.01 ton / yr

WATER TANK EMISSION CALCULATIONS - HAZARDOUS AIR POLLUTANTS

Unit ID =	WTK-1 - WTK-4 (Each)	WTK-1 - WTK-4 (Total)
Number of Tanks =	4	-
Capacity (bbl) =	400	-
Capacity (gal) =	16,800	-
Throughput (bbl/yr) =	136,875	547,500
Throughput (gal/yr) =	5,748,750	22,995,000
Throughput (bbl/d) =	375	1,500
Capture Efficiency =	98.00%	98.00%
Control Type =	Combustion Chamber	Combustion Chamber
Control Efficiency =	98.00%	98.00%
Overall Reduction Efficiency =	96.0400%	

Uncontrolled Hazardous Air Pollutant Emissions

Pollutant	WTK-1 - WTK-4 (Each) Avg. lb/hr [2]	WTK-1 - WTK-4 (Each) tons/yr [3]	WTK-1 - WTK-4 (Total) Avg. lb/hr [4]	WTK-1 - WTK-4 (Total) tons/yr [5]
Total VOC [1]	0.27	1.17	1.07	4.69
n-Hexane	<0.01	0.02	0.02	0.09
Benzene	<0.01	<0.01	<0.01	0.01
Toluene	<0.01	0.01	0.01	0.05
Ethylbenzene	<0.01	<0.01	<0.01	0.01
Xylenes	<0.01	0.02	0.01	0.06
Other HAPs	0.00	0.00	0.00	0.00
Total HAPs	0.01	0.06	0.05	0.22

Proposed Uncaptured HAP Emissions[6] - Not captured by the combustors (Represented under PW Tanks in the summary tables)

Pollutant	WTK-1 - WTK-4 (Each) Avg. lb/hr [7]	WTK-1 - WTK-4 (Each) tons/yr [8]	WTK-1 - WTK-4 (Total) Avg. lb/hr [9]	WTK-1 - WTK-4 (Total) tons/yr [10]
Total VOC [1]	0.01	0.02	0.02	0.09
n-Hexane	<0.01	<0.01	<0.01	<0.01
Benzene	<0.01	<0.01	<0.01	<0.01
Toluene	<0.01	<0.01	<0.01	<0.01
Ethylbenzene	<0.01	<0.01	<0.01	<0.01
Xylenes	<0.01	<0.01	<0.01	<0.01
Other HAPs	0.00	0.00	0.00	0.00
Total HAPs	<0.01	<0.01	<0.01	<0.01

Proposed Controlled Hazardous Air Pollutant (HAP) Emissions[11] - Controlled by Combustor (Represented under Combustor in the summary tables)

Pollutant	WTK-1 - WTK-4 (Each) Avg. lb/hr [12]	WTK-1 - WTK-4 (Each) tons/yr [13]	WTK-1 - WTK-4 (Total) Avg. lb/hr [14]	WTK-1 - WTK-4 (Total) tons/yr [15]
Total VOC [1]	0.01	0.02	0.02	0.09
n-Hexane	<0.01	<0.01	<0.01	<0.01
Benzene	<0.01	<0.01	<0.01	<0.01
Toluene	<0.01	<0.01	<0.01	<0.01
Ethylbenzene	<0.01	<0.01	<0.01	<0.01
Xylenes	<0.01	<0.01	<0.01	<0.01
Other HAPs	0.00	0.00	0.00	0.00
Total HAPs	<0.01	<0.01	<0.01	<0.01

Estimated Hazardous Air Pollutant Composition (wt%) [16]

Pollutant	Wt%
n-Hexane	1.983%
Benzene	0.226%
Toluene	0.965%
Ethylbenzene	0.239%
Xylenes	1.364%
Other HAPs	0.000%
Total HAPs	4.78%

[1] VOC emission calculated in the Criteria Air Pollutant calculations.

[2] Due to variable short-term emission rates, average lb/hr based on annual emissions shown for reference only.

Uncontrolled Hourly Emissions, Each (lb/hr) = Tanks Uncontrolled VOC, Each (lb/yr) * HAP Composition wt%

Uncontrolled n-Hexane Hourly Emissions, Each (lb/hr) = 0.27 lb/hr | 1.98% = <0.01 lb/hr

[3] Uncontrolled n-Hexane Hourly Emissions, Total (lb/hr) = Uncontrolled Hourly Emissions, Each (lb/hr) * Total Number of Tanks

Uncontrolled n-Hexane Hourly Emissions, Total (lb/hr) = 0.01 lb/hr | 4 Tanks = 0.02 lb/hr

[7] Uncontrolled Annual Emissions, Each (tpy) = Uncontrolled Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

Uncontrolled n-Hexane Annual Emissions, Each (tpy) = 0.01 lb/hr | 8,760 hr/yr | 1 ton/2,000 lb = 0.02 ton/yr

[8] Uncontrolled Annual Emissions, Total (tpy) = Uncontrolled Annual Emissions, Each (tpy) * Total Number of Tanks

Uncontrolled n-Hexane Annual Emissions, Total (tpy) = 0.02 ton/yr | 4 Tanks = 0.09 ton/yr

[6] Uncaptured Hourly/ Annual Emissions (lb/hr or tpy) are represented at emissions at the tank level.

[7] Proposed Uncaptured Hourly Emissions (lb/hr) = Uncontrolled Emissions (lb/hr) * (1 - Capture efficiency (%))

Proposed Uncaptured n-Hexane Working Hourly Emissions (lb/hr) = <0.01 lb/hr | 1 - 98% = <0.01 lb/hr

[8] Proposed Uncaptured Hourly Emissions, Total (lb/hr) = Proposed Uncaptured Hourly Emissions, Each (lb/hr) * Total Number of Tanks

Proposed Uncaptured n-Hexane Hourly Emissions, Total (lb/hr) = <0.01 lb/hr | 4 Tanks = <0.01 lb/hr

[9] Proposed Uncaptured Annual Emissions, Each (tpy) = Uncaptured Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

Proposed Uncaptured Annual n-Hexane Emissions, Each (tpy) = <0.01 lb/hr | 8,760 hr/yr | 1 ton/2,000 lb = <0.01 ton/yr

[10] Proposed Uncaptured Annual Emissions, Total (tpy) = Uncaptured Annual Emissions, Each (tpy) * Total Number of Tanks

Proposed Uncaptured n-Hexane Hourly Emissions, Total (tpy) = <0.01 ton/yr | 04 Tanks = <0.01 ton/yr

WATER TANK EMISSION CALCULATIONS - HAZARDOUS AIR POLLUTANTS

[11] Controlled HAP emissions are captured vapors from the tanks which are combusted by the Combustors and shown under the combustors in the summary tables.
Captured Emissions = Uncontrolled Emissions - Uncaptured Emissions.

[12] Proposed Controlled Hourly Emissions, Each (lb/hr) =
Proposed Controlled n-Hexane Hourly Emissions, Each (lb/hr) = Captured Emissions (Uncontrolled Emissions - Uncaptured Emissions) (lb/hr) * (1 - Control efficiency (%))

[0.01 lb - <0.01 lb] / hr	1 - 98%	=	<0.01 lb / hr

[13] Proposed Controlled Hourly Emissions, Total (lb/hr) =
Proposed Controlled n-Hexane Hourly Emissions, Total (lb/hr) = Proposed Controlled Hourly Emissions, Each (lb/hr) * Total Number of Tanks

<0.01 lb / hr	4 Tanks	=	<0.01 lb / hr

[14] Proposed Controlled Annual Emissions, Each (tpy) =
Proposed Controlled n-Hexane Annual Emissions, Each (tpy) = Controlled Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

<0.01 lb / hr	8,760 hr / yr	1 ton / 2,000 lb	=	<0.01 ton / yr

[15] Proposed Controlled Annual Emissions, Total (tpy) =
Proposed Controlled n-Hexane Annual Emissions, Total (tpy) = Controlled Annual Emissions, Each (tpy) * Total Number of Tanks

<0.01 ton / yr	4 Tanks	=	<0.01 ton / yr

[16] Representative separator oil analysis attached. HAP weight % calculated as % of total VOCs in sample. All HAP assumed to volatilize from liquids for most conservative estimate.

FIXED ROOF WATER TANKS - EMISSION CALCULATIONS

Fixed-Roof Tank Emissions
Based on AP-42, February 1996, Section 7.1.3.1.

Enter or select all information in **bold** lines. All other values are automatically calculated or are defaults. *Italics* indicate descriptions that are not used in the calculations. Defaults shown in blue text may be overwritten on a case-by-case basis.

Variable	Instructions/Defaults	Value
Tank Identification		*Smith Creek 8-32-70 B Pad (PN 910195) WTK-1- WTK-4 (Each)*
Actual Location		*Converse County*
Location for Calculation Purposes	**Select nearest city with defined meteorological data**	**Casper, Wyoming**
Type of Substance	**Select Organic Liquid, Petroleum Distillate, or Crude Oil**	**Petroleum Distillate**
Contents of Tank	**Select from list (add new compounds in 'VOLs' tab):**	**Gasoline (RVP 11)**
Tank/Roof Type	**Select Cone, Dome, or Horizontal Tank**	**Cone**
Underground?	**Select Aboveground or Underground**	**Aboveground**
Diameter, ft		**12**
Shell Height or Length, ft		**20**
Nominal Capacity, gal		**16,075**
Throughput, gallons/yr		**5,748,750**
Tank Paint Color	**Select from list (Default = White)**	**Gray/Light**
Tank Paint Condition	**Select from list (Default = Good)**	**Good**
Effective Diameter, ft		12.0
Geometric Capacity, gal		16,920
Maximum Liquid Height, ft		20.0
Average Liquid Height, ft	Default = Maximum Liquid Height / 2	10.00
Cone Tank Roof Slope, ft/ft	Default = 0.0625; N/A for Horizontal tanks	0.0625
Dome Tank Roof Radius, ft	Default = Effective Diameter	N/A
Dome Tank Roof Height, ft		N/A
Roof Outage, ft		0.125
Vapor Space Outage, ft		10.13
Vapor Space Volume, ft^3		1145
Average Daily Minimum Ambient Temperature, F		31.60
Average Daily Maximum Ambient Temperature, F		58.51
Daily Total Solar Insolation Factor, Btu/ft^2/day		1394
Daily Average Ambient Temperature, F		45.1
Tank Paint Solar Absorbance, dimensionless		0.540
Daily Vapor Temperature Range, R		40.5
Daily Average Liquid Surf. Temperature, F		52.3
Daily Minimum Liquid Surf. Temperature, F		42.1
Daily Maximum Liquid Surf. Temperature, F		62.4
Liquid Bulk Temperature		47.3
Vapor Molecular Weight, lb/lbmol		65.0
Antoine's Coefficient A		N/A
Antoine's Coefficient B		N/A
Antoine's Coefficient C		N/A
Type of Substance (for use in calculations)		Gas
Vapor Pressure at Daily Av. Liquid Surf. Temp., psia		4.962
Vapor Pressure at Daily Min. Liquid Surf. Temp., psia		4.049
Vapor Pressure at Daily Max. Liquid Surf. Temp., psia		6.034
Vapor Pressure Calculation Method		AP-42 Figure 7.1-14b: RVP=11 ASTM Slope=3
Vapor Density, lb/ft^3		0.058714
Daily Vapor Pressure range, psi		1.985
Breather Vent Pressure Setting, psig	Default = 0.03	0.0300
Breather Vent Vacuum Setting, psig	Default = -0.03	-0.0300
Breather Vent Pressure Setting Range, psi		0.0600
Ambient Pressure, psia		12.1
Vapor Space Expansion Factor		0.3474
Vented Vapor Saturation Factor		0.273
Annual Turnovers		339.75
Turnover Factor		0.25
Working Loss Product Factor		1.00
Standing Storage Loss, lb/yr		**2327**
Working Loss, lb/yr		**11256**
Total Losses, lb/yr		**13584**

TRUCK LOADING OF CONDENSATE CALCULATIONS - CRITERIA AND HAZARDOUS AIR POLLUTANTS

Unit ID =	**TL-1**		
Fill Method =	Submerged		
Type of Service =	Dedicated		
Mode of Operation =	Normal		
Saturation Factor =	0.6		
Emission Factor (lb/1000 gal)[1] =	4.75		
Oil Throughput for Truck-Loadout (bbl/day) =	13,760		
Throughput (gal/hr) =	24,080		
Annual Throughput (gal/yr) =	210,940,800		
Throughput (1000 gal) =	210,941		
Control Type =	Submerged Loading		
Vapor Capture Efficiency =	98.70%		
Captured Vapor Routed to =	Combustor		
Combustion Chamber Efficiency [2] =	98.00%		
True Vapor pressure of liquid loaded (average psia), P [1] =		4.962	psia
Molecular weight of vapor, M [1] =		65	lb/lb-mol
Average Temperature of bulk liquid loaded, T [1]=		47.294	F
Average Temperature of bulk liquid loaded, T=		507.294	R

Uncontrolled Hazardous Air Pollutant Emissions [3]

Pollutant	TL-1 lb/hr [4]	TL-1 tons/yr [5]
Total VOC	114.46	501.31
n-Hexane	2.27	9.94
Benzene	0.26	1.13
Toluene	1.10	4.84
Ethylbenzene	0.27	1.20
Xylenes	1.56	6.84
Other HAPs	0.00	0.00
Total HAPs	5.47	23.95

Proposed Uncaptured VOC Emissions - Not captured by the combustors (Represented under Truck Loading - Condensate in the summary tables)

Pollutant	TL-1 lb/hr [6]	TL-1 tons/yr [7]
Total VOC	1.49	6.52
n-Hexane	0.03	0.13
Benzene	<0.01	0.01
Toluene	0.01	0.06
Ethylbenzene	<0.01	0.02
Xylenes	0.02	0.09
Other HAPs	0.00	0.00
Total HAPs [11]	0.07	0.31

Proposed Controlled Hazardous Air Pollutant Emissions [8] - Controlled by Combustor (Represented under Combustor in the summary tables)

Pollutant	TL-1 lb/hr [9]	TL-1 tons/yr [10]
Total VOC	2.26	9.90
n-Hexane	0.04	0.20
Benzene	<0.01	0.02
Toluene	0.02	0.10
Ethylbenzene	<0.01	0.02
Xylenes	0.03	0.13
Other HAPs	0.00	0.00
Total HAPs [11]	0.11	0.47

Estimated Hazardous Air Pollutant Composition (wt%) [12]

Pollutant	Wt%
n-Hexane	1.98%
Benzene	0.23%
Toluene	0.97%
Ethylbenzene	0.24%
Xylenes	1.36%
Other HAPs	0.00%
Total HAPs	4.78%

[1] AP-42 5.2-4 Eq.1: Loading Loss (lb/1000gal) = 12.46*S*P*M/T. Properties based on EPA TANKS 4.0.9d.

Loss Equation and Variables are from AP-42, Section 5.2, Transportation and Marketing of Petroleum Liquids (June 2008).

True vapor pressure, molecular weight of tank vapors from AP-42, Section 7.1, Table 7.1-2, Organic Liquid Storage Tanks (November 2006).

[2] Control efficiency of the combustor is 98 %.

[3] Due to variable short-term emission rates, average lb/hr based on annual emissions shown for reference only.

[4] Uncontrolled Hourly VOC Emissions, (lb/hr) = Maximum Loading Rate (gal/hr) * Emission Factor (lb/1000 gal) / 1000

$$\frac{4.75\ \text{lb}}{1000\ \text{gal}} \times \frac{24{,}080\ \text{gal}}{\text{hr}} \times \frac{1}{1000} = \frac{114.46\ \text{lb}}{\text{hr}}$$

[5] Uncontrolled Annual VOC Emissions, (tpy) = Throughput (gal/hr) * Emission Factor (lb/1000 gal) / 2000

$$\frac{4.75\ \text{lb}}{1000\ \text{gal}} \times \frac{210{,}941\ \text{gal}}{\text{yr}} \times \frac{\text{ton}}{2000\ \text{lb}} = \frac{501.31\ \text{ton}}{\text{yr}}$$

[6] Proposed Uncaptured Hourly VOC Emissions (lb/hr) = Uncontrolled Emissions (lb/hr) * (1- Capture efficiency (%))

$$\frac{114.46\ \text{lb}}{\text{hr}} \times 1 - 98.70\% = \frac{1.49\ \text{lb}}{\text{hr}}$$

[7] Proposed Uncaptured Annual VOC Emissions, (tpy) = Uncontrolled Annual VOC Emissions (tpy) * (1- Capture efficiency (%))

$$\frac{501.31\ \text{ton}}{\text{yr}} \times 1 - 98.70\% = \frac{6.52\ \text{ton}}{\text{yr}}$$

[8] Controlled VOC emissions are captured vapors from the truckloading of condensate which are combusted by the Combustors and shown under the combustors in the summary table. Captured Emissions = Uncontrolled Emissions - Uncaptured Emissions.

[9] Proposed Controlled Hourly VOC Emissions (lb/hr) = Captured VOC Emissions (Uncontrolled Emissions - Uncaptured Emissions) (lb/hr) * (1 - control efficiency)

$$\frac{[114.46\ \text{lb} - 1.49\ \text{lb}]}{\text{hr}} \times 1 - 98.00\% = \frac{2.26\ \text{lb}}{\text{hr}}$$

[10] Proposed Controlled Annual VOC Emissions, (tpy) = Captured Annual VOC Emissions (Uncontrolled Emissions - Uncaptured Emissions) (tpy) * (1 - control efficiency)

$$\frac{[501.31\ \text{ton} - 6.52\ \text{ton}]}{\text{yr}} \times 1 - 98.00\% = \frac{9.90\ \text{ton}}{\text{yr}}$$

[11] HAP Emissions = VOC Emissions * HAP Composition wt%

[12] Representative separator oil analysis attached. HAP weight % calculated as % of total VOCs in sample. All HAP assumed to volatilize from Equids for most conservative estimate.

TRUCK LOADING OF PW CALCULATIONS - CRITERIA AND HAZARDOUS AIR POLLUTANTS

Unit ID =	**TL-2**
Fill Method =	Submerged
Type of Service =	Dedicated
Mode of Operation =	Normal
Saturation Factor =	0.6
Emission Factor (lb/1000 gal)[1] =	4.75
PW Throughput for Truck-Loadout (bbl/day) =	1,500
Throughput (gal/hr) =	2,625
Total Annual Throughput for PW Truck-Loadout (gal/yr) =	22,995,000
Total Annual Throughput for PW Truck-Loadout (as Condensate) (gal/yr)[1] =	229,950
Throughput (1000 gal) =	22,995
Control Type =	Submerged Loading
Vapor Capture Efficiency =	70.00%
Captured Vapor Routed to =	Combustor
Combustion Chamber Efficiency[2] =	98.00%

Note: Throughput (gal/hr) for PW loading was estimated assuming that 1% of all loading PW throughput will be equal to the emissions profile of condensate loading.

True Vapor pressure of liquid loaded (average psia), P[1] =	4.962	psia
Molecular weight of vapor, M[1] =	65	lb/lb-mol
Average Temperature of bulk liquid loaded, T[1]=	47.294	F
Average Temperature of bulk liquid loaded, Tr=	507.294	R

Uncontrolled Hazardous Air Pollutant Emissions[3]

Pollutant	TL-2 lb/hr[4]	TL-2 tons/yr[5]
Total VOC	0.12	0.55
n-Hexane	<0.01	0.01
Benzene	<0.01	<0.01
Toluene	<0.01	<0.01
Ethylbenzene	<0.01	<0.01
Xylenes	<0.01	<0.01
Other HAPs	0.00	0.00
Total HAPs	<0.01	0.03

Proposed Uncaptured VOC Emissions - Not captured by the combustors (Represented under Truck Loading - PW in the summary tables)

Pollutant	TL-2 lb/hr[6]	TL-2 tons/yr[7]
Total VOC	0.04	0.16
n-Hexane	<0.01	<0.01
Benzene	<0.01	<0.01
Toluene	<0.01	<0.01
Ethylbenzene	<0.01	<0.01
Xylenes	<0.01	<0.01
Other HAPs	0.00	0.00
Total HAPs[11]	<0.01	0.01

Proposed Controlled Hazardous Air Pollutant Emissions[8] - Controlled by Combustor (Represented under Combustor in the summary tables)

Pollutant	TL-2 lb/hr[9]	TL-2 tons/yr[10]
Total VOC	<0.01	<0.01
n-Hexane	<0.01	<0.01
Benzene	<0.01	<0.01
Toluene	<0.01	<0.01
Ethylbenzene	<0.01	<0.01
Xylenes	<0.01	<0.01
Other HAPs	0.00	0.00
Total HAPs[11]	<0.01	<0.01

Estimated Hazardous Air Pollutant Composition (wt%)[12]

Pollutant	Wt%
n-Hexane	1.98%
Benzene	0.23%
Toluene	0.97%
Ethylbenzene	0.24%
Xylenes	1.36%
Other HAPs	0.00%
Total HAPs	4.78%

[1] AP-42 5.2-4 Eq.1: Loading Loss (lb/1000gal) = 12.46*S*P*M/T. Properties based on EPA TANKS 4.0.9d. Throughput (gal/yr) for PW loading was estimated assuming that 1% of all loading PW throughput will be equal to the emissions profile of condensate loading.

Loss Equation and Variables are from AP-42, Section 5.2, Transportation and Marketing of Petroleum Liquids (June 2008).

True vapor pressure, molecular weight of tank vapors from AP-42, Section 7.1, Table 7.1-2, Organic Liquid Storage Tanks (November 2006).

[2] Control efficiency of the combustor is 98 %.

[3] Due to variable short-term emission rates, average lb/hr based on annual emissions shown for reference only. Note that only 1% of the produced water can be considered as condensate. Therefore the emissions obtained are multiplied by 1% to estimate emissions from produced water loading.

[4] Uncontrolled Hourly VOC Emissions, (lb/hr) = Maximum Loading Rate (gal/hr) * Emission Factor (lb/1000 gal) / 1000

$$\frac{4.75\ \text{lb}}{1000\ \text{gal}} \times \frac{2{,}625\ \text{gal}}{\text{hr}} \times \frac{1}{1000} = \frac{0.12\ \text{lb}}{\text{hr}}$$

[5] Uncontrolled Annual VOC Emissions, (tpy) = Throughput (gal/hr) * Emission Factor (lb/1000 gal) / 2000

$$\frac{4.75\ \text{lb}}{1000\ \text{gal}} \times \frac{22{,}995\ \text{gal}}{\text{yr}} \times \frac{\text{ton}}{2000\ \text{lb}} = \frac{0.55\ \text{ton}}{\text{yr}}$$

[6] Proposed Uncaptured Hourly VOC Emissions (lb/hr) = Uncontrolled Emissions (lb/hr) * (1- Capture efficiency (%))

$$\frac{0.12\ \text{lb}}{\text{hr}} \times 1 - 70.00\% = \frac{0.04\ \text{lb}}{\text{hr}}$$

[7] Proposed Uncaptured Annual VOC Emissions, (tpy) = Uncontrolled Annual VOC Emissions (tpy) * (1- Capture efficiency (%))

$$\frac{0.55\ \text{ton}}{\text{yr}} \times 1 - 70.00\% = \frac{0.16\ \text{ton}}{\text{yr}}$$

[8] Controlled VOC emissions are captured vapors from the truck loading of produced water which are combusted by the Combustors and shown under the combustors in the summary tables. Captured Emissions = Uncontrolled Emissions - Uncaptured Emissions.

[9] Proposed Controlled Hourly VOC Emissions (lb/hr) = Captured VOC Emissions (Uncontrolled Emissions - Uncaptured Emissions) (lb/hr) * (1 - control efficiency)

$$\frac{|0.12\ \text{lb} - 0.04\ \text{lb}|}{\text{hr}} \times 1 - 98.00\% = \frac{<0.01\ \text{lb}}{\text{hr}}$$

[10] Proposed Controlled Annual VOC Emissions, (tpy) = Captured VOC Emissions (Uncontrolled Emissions - Uncaptured Emissions) (tpy) * (1 - control efficiency)

$$\frac{|0.55\ \text{ton} - 0.16\ \text{ton}|}{\text{yr}} \times 1 - 98.00\% = \frac{0.01\ \text{ton}}{\text{yr}}$$

[11] HAP Emissions = VOC Emissions * HAP Composition wt%

[12] Representative separator oil analysis attached. HAP weight % calculated as % of total VOCs in sample. All HAP assumed to volatilize from liquids for most conservative estimate.

HEATER TREATER EMISSIONS CALCULATIONS - CRITERIA AIR POLLUTANTS

Unit ID =	HT-1 - HT-3 (Each)	HT-1 - HT-3 (Total)
Description	Heater Treater	-
Number of Heater Treaters =	3	-
Combustor Type =	AP-42 converted to HHV	
Control Efficiency =	0%	
Max Burner Design Capacity (MMBtu/hr) =	0.5	-
Fuel HHV (Btu/scf) [1] =	1,359	-
Annual Fuel Use (MMscf/yr) [2] =	3.22	9.67
Annual Operating Hours =	8,760	-

Criteria Air Pollutant Emissions

Unit ID: Pollutant	HT-1 - HT-3 (Each) lb/hr [4]	HT-1 - HT-3 (Each) tons/yr [5]	HT-1 - HT-3 (Total) lb/hr [6]	HT-1 - HT-3 (Total) tons/yr [6]
NO_X	0.05	0.21	0.15	0.64
CO	0.04	0.18	0.12	0.54
VOC	<0.01	0.01	<0.01	0.04
SO_2	<0.01	<0.01	<0.01	<0.01
$PM_{FIL/2.5}$ [3]	<0.01	0.01	<0.01	0.04
PM_{COND} [3]	<0.01	<0.01	<0.01	0.01
PM_{TOT} [3]	<0.01	0.02	0.01	0.05

AP-42 Emission Factor for Units < 100 MMBtu/hr, (lb/MMscf) [7]

Pollutant	Uncontrolled 1,4-1,-2 (7/98)	AP-42 Controlled to HHV 1,4-1, -2 (7/98)
NO_X	100.00	133.22
CO	84.00	111.90
VOC	5.50	7.33
SO_2	0.60	0.80
$PM_{FIL/2.5}$	5.70	7.59
PM_{COND}	1.90	2.53
PM_{TOT}	7.60	10.12

[1] Calculated by Promax process simulation (report attached).

[2] Heater Treater Emissions are based on the heat input rating of the heater treaters. Annual Fuel Usage rate as follows:

Annual Fuel Use (MMscf/yr)= $\frac{500{,}000\ \text{Btu}}{\text{hr}} \times \frac{\text{scf}}{1{,}359\ \text{Btu}} \times \frac{8{,}760\ \text{hr}}{\text{yr}} \times \frac{\text{MMscf}}{1{,}000{,}000\ \text{scf}} \times 3\ \text{(No of Heaters)} = \frac{9.67\ \text{MMscf}}{\text{yr}}$

[3] All PM (total, condensable and filterable) is assumed to be < 1 micrometer in diameter. Total PM is the sum of filterable PM and condensable PM

[4] Emissions (lb/hr) = Emission Factor (lb/MMscf) x Annual Fuel Usage (MMscf/yr) / 8760 hr/yr.

Example Hourly NO_X Emission, Each lb/hr = $\frac{133.22\ \text{lb}}{\text{MMscf}} \times \frac{3.22\ \text{MMscf}}{\text{yr}} \times \frac{\text{yr}}{8{,}760\ \text{hr}} = \frac{0.05\ \text{lb}}{\text{hr}}$

[5] Emissions (tpy) = Emissions (lb/hr) x Hours of Operation per year (8760 hr/yr)/ 2,000 lb/ton

Example Annual NO_X Emissions, Each tpy = $\frac{0.05\ \text{lb}}{\text{hr}} \times \frac{8{,}760\ \text{hr}}{\text{yr}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} = \frac{0.21\ \text{ton}}{\text{yr}}$

[6] Total Emissions = Emissions per Heater Treater x Number of Heater Treaters

Example Hourly NO_X Emissions, Total lb/hr = $\frac{0.05\ \text{lb}}{\text{hr}} \times 3\ \text{Heaters} = \frac{0.15\ \text{lb}}{\text{hr}}$

Example Annual NO_X Emissions, Total tpy = $\frac{0.21\ \text{ton}}{\text{yr}} \times 3\ \text{Heaters} = \frac{0.64\ \text{ton}}{\text{yr}}$

[7] Emission factors shown above based on an average higher heating value (HHV) of 1,020 Btu/scf. Emission factors may be converted to other heating values by multiplying the given emission factor by the ratio of the specified heating value to the average heating value.

Example NO_X Emission Factor, lb/scf = $\frac{100\ \text{lb}}{\text{MMscf}} \times \frac{1{,}359\ \text{Btu}}{\text{scf}} \times \frac{\text{scf}}{1{,}020\ \text{Btu}} = \frac{133.22\ \text{lb}}{\text{MMscf}}$

HEATER TREATER EMISSIONS CALCULATIONS - HAZARDOUS AIR POLLUTANTS

Unit ID =	HT-1 - HT-3 (Each)	HT-1 - HT-3 (Total)
Description =	Heater Treater	-
Number of Heater-Treaters =	3	-
Combustor Type =	AP-42 converted to HHV	
Max Burner Design Capacity (MMBtu/hr) =	0.5	-
Fuel HHV (Btu/scf) =	1,359	
Annual Fuel Use (MMscf/yr) [2] =	3.22	9.67
Annual Operating Hours =	8,760	-

HAP Emissions

Pollutant	HT-1 - HT-3 (Each) lb/hr [3]	HT-1 - HT-3 (Each) tons/yr [4]	HT-1 - HT-3 (Total) lb/hr [5]	HT-1 - HT-3 (Total) tons/yr [5]
n-Hexane	<0.01	<0.01	<0.01	0.01
Formaldehyde	<0.01	<0.01	<0.01	<0.01
Benzene	<0.01	<0.01	<0.01	<0.01
Toluene	<0.01	<0.01	<0.01	<0.01
Other HAPs	<0.01	<0.01	<0.01	<0.01
Total HAPs	<0.01	<0.01	<0.01	0.01

AP-42 Emission Factor, (lb/MMscf) [1]

Pollutant	Uncontrolled 1,4-3 (7/98)	AP-42 Controlled to HHV 1,4-3 (7/98)
n-Hexane	1.80E+00	2.40E+00
Formaldehyde	7.50E-02	9.99E-02
Benzene	2.10E-03	2.80E-03
Toluene	3.40E-03	4.53E-03
Other HAPs	1.90E-03	2.53E-03

[1] Emission factors shown above based on an average higher heating value (HHV) of 1,020 Btu/scf. Emission factors may be converted to other heating values by multiplying the given emission factor by the ratio of the specified heating value to the average heating value.

[2] Annual fuel use is calculated on Heater Treater Criteria Page.

[3] Emissions (lb/hr) = Emission Factor (lb/MMscf) x Annual Fuel Usage (MMscf/yr) / 8760 hr/yr.

Example Hourly n-Hexane Emissions, Each lb/hr = $\frac{2.40 \text{ lb}}{\text{MMscf}} \times \frac{3.22 \text{ MMscf}}{\text{yr}} \times \frac{\text{yr}}{8{,}760 \text{ hr}} = \frac{<0.01 \text{ lb}}{\text{hr}}$

[4] Emissions (tpy) = Emissions (lb/hr) x Hours of Operation per year (8760 hr/yr)/ 2,000 lb/ton

Example Annual n-Hexane Emissions, Each tpy = $\frac{<0.01 \text{ lb}}{\text{hr}} \times \frac{8{,}760 \text{ hr}}{\text{yr}} \times \frac{\text{ton}}{2{,}000 \text{ lb}} = \frac{<0.01 \text{ ton}}{\text{yr}}$

[5] Total Emissions = Emissions per Heater Treater * Number of Heater Treaters

Example Hourly n-Hexane Emissions, Total lb/hr = $\frac{<0.01 \text{ lb}}{\text{hr}} \times 3 \text{ Heaters} = \frac{<0.01 \text{ lb}}{\text{hr}}$

Example Annual n-Hexane Emissions, Total tpy = $\frac{<0.01 \text{ ton}}{\text{yr}} \times 3 \text{ Heaters} = \frac{0.01 \text{ ton}}{\text{yr}}$

COMBUSTION CHAMBER CALCULATIONS - CRITERIA AIR POLLUTANTS

Unit ID =	CMB-1 - CMB-2 (Each)	CMB-1 - CMB-2 (Total)
Combustion Type =	AP-42 Converted to HHV	-
Number of Combustors =	2	-
Max Burner Design Capacity (MMBtu/hr) =	12	-
Burner Fuel Use (MMscf/yr)[3] =	15.71	31.43
Pilot Gas Flow Rate (Mscf/d) =	0.75	1.50
Pilot Fuel Use (MMscf/yr) =	0.27	0.55
Annual Fuel Use (MMscf/yr) =	15.99	-
Fuel HHV (Btu/scf)[4] =	1,722	-
Annual Operating Hours =	8,760	-

Criteria Air Pollutant Emissions [5]

Unit ID: Pollutant	CMB-1 - CMB-2 (Each)		CMB-1 - CMB-2 (Total)	
	lb/hr [5,6]	tons/yr [7]	lb/hr [8]	tons/yr [8]
NO_X	0.44	1.93	0.88	3.86
CO	0.11	0.48	0.22	0.96
SO_2	<0.01	<0.01	<0.01	0.02
$PM_{10/2.5}$ [1]	0.02	0.08	0.04	0.15
PM_{COND} [1]	<0.01	0.03	0.01	0.05
PM_{TOT} [1]	0.02	0.10	0.05	0.21

Emission Factors

Pollutant	Units	Uncontrolled [2]	Converted to HHV [2]
NO_X	lb/MMBtu	0.14	0.14
CO	lb/MMBtu	0.04	0.04
SO_2	lb/MMscf	0.60	1.01
$PM_{10/2.5}$	lb/MMscf	5.70	9.62
PM_{COND}	lb/MMscf	1.90	3.21
PM_{TOT}	lb/MMscf	7.60	12.83

[1] All PM (total, condensable and filterable) is assumed to be < 1 micrometer in diameter. Total PM is the sum of filterable PM and condensable PM

[2] NO_X and CO emission factors taken from Oil and Gas Production Facilities Chapter 6, Section 2 Permitting Guidance. All other emission factors shown above are taken from AP-42 Section 1.4, Tables 1.4-1 and 1.4-2 (7/98) and are based on an average higher heating value (HHV) of 1,020 Btu/scf. AP-42 emission factors in lb/MMscf may be converted to other heating values by multiplying the given emission factor by the ratio of the specified heating value to the average heating value.

Example SO_2 Emission Factor, lb/MMscf = $\frac{0.60\ \text{lb}}{\text{MMscf}} \times \frac{1{,}722\ \text{Btu}}{\text{scf}} \times \frac{\text{scf}}{1{,}020\ \text{Btu}} = \frac{1.01\ \text{lb}}{\text{MMscf}}$

[3] Combustion annual burner fuel (total) use is calculated on Combustion Firing Rate estimation page.

[4] Calculated by Promax process simulation (report attached).

[5] NO_X and CO emissions (lb/hr) = Emission Factor (lb/MMBtu) x Annual Fuel Usage (MMscf/yr) x Fuel HHV (Btu/scf) / 8760 hr/yr.

Example Hourly NO_X Emission, Each lb/hr = $\frac{0.14\ \text{lb}}{\text{MMBtu}} \times \frac{15.99\ \text{MMscf}}{\text{yr}} \times \frac{1{,}722\ \text{Btu}}{\text{scf}} \times \frac{\text{yr}}{8{,}760\ \text{hr}} = \frac{0.44\ \text{lb}}{\text{hr}}$

[6] SO_2 and $PM_{10}/PM_{2.5}/PM_{COND}/PM_{TOT}$ Emissions (lb/hr) = Emission Factor (lb/MMscf) x Annual Fuel Usage (MMscf/yr) / 8760 hr/yr.

Example Hourly SO_2 Emission, Each lb/hr = $\frac{1.01\ \text{lb}}{\text{MMscf}} \times \frac{15.99\ \text{MMscf}}{\text{yr}} \times \frac{\text{yr}}{8{,}760\ \text{hr}} = \frac{<0.01}{\text{hr}}$

[7] Emissions (tpy) = Emissions (lb/hr) x Hours of Operation per year (8760 hr/yr)/ 2,000 lb/ton

Example Annual NO_X Emissions, Each tpy = $\frac{0.44\ \text{lb}}{\text{hr}} \times \frac{8{,}760\ \text{hr}}{\text{yr}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} = \frac{1.93\ \text{ton}}{\text{yr}}$

[8] Total Emissions = Emissions per Combustor x Number of Combustors

Example Hourly NO_X Emissions, Total lb/hr = $\frac{0.44\ \text{lb}}{\text{hr}} \times 2\ \text{Combustors} = \frac{0.88\ \text{lb}}{\text{hr}}$

Example Annual NO_X Emissions, Total tpy = $\frac{1.93\ \text{ton}}{\text{hr}} \times 2\ \text{Combustors} = \frac{3.86\ \text{ton}}{\text{yr}}$

COMBUSTION CHAMBER CALCULATIONS - VOCs

Combustor Controlled Emissions - VOC

Unit ID =	CMB-1-CMB-2
Number of Combustors =	2
Control Efficiency =	98.00%

The combustor controls the Oil Tanks (OTK-1 - OTK-8), Produced Water Tanks (WTK-1 - WTK-4), Truck-loadout of condensate(TL-1) and Truck-loadout of produced water (TL-2). The summary of these emissions are given in the table below:

	All the Combustors		Per Combustor	
Description	**Hourly (lb/hr)**	**Annual (tpy)**	**Hourly (lb/hr)**	**Annual (tpy)**
Oil Tanks	1.74	7.60	0.87	3.80
PW Tanks	0.02	0.09	0.01	0.05
Truck Loading - Cond	2.26	9.90	1.13	4.95
Truck Loading - PW	<0.01	<0.01	<0.01	<0.01
Total	**4.02**	**17.60**	**2.01**	**8.80**

Note 1: The above emissions have been calculated under the individual emission units (Oil Tanks, PW Tanks, Truck Loadout - Condensate and Truck Loading - PW) and are shown here for representative purposes only.
Note 2: The captured, controlled emissions from all the above sources have been assigned under the combustors in the summary tables and the uncaptured, non-combusted emissions have been assigned under the respective emission sources in the summary tables. Refer to the individual emission source for a more detailed version of the calculations.

COMBUSTION CHAMBER CALCULATIONS - HAZARDOUS AIR POLLUTANTS

Unit ID =	CMB-1 - CMB-2 (Each)	CMB-1 - CMB-2 (Total)
Combustion Type =	AP-42 Converted to HHV	-
Number of Combustors =	2	-
Max Burner Design Capacity (MMBtu/hr) =	12	-
Burner Fuel Use (MMscf/yr)[2] =	15.71	31.43
Pilot Gas Flow Rate (Mscf/d) =	0.75	1.50
Pilot Fuel Use (MMscf/yr) =	1.00	2.00
Annual Fuel Use (MMscf/yr) =	16.71	-
Fuel HHV (Btu/scf) =	1,722	-
Annual Operating Hours =	8,760	-

Criteria Air Pollutant Emissions

Unit ID: Pollutant	CMB-1 - CMB-2 (Each)		CMB-1 - CMB-2 (Total)	
	lb/hr[3]	tons/yr[4]	lb/hr[5]	tons/yr[5]
n-Hexane	<0.01	0.03	0.01	0.05
Formaldehyde	<0.01	<0.01	<0.01	<0.01
Benzene	<0.01	<0.01	<0.01	<0.01
Toluene	<0.01	<0.01	<0.01	<0.01
Other HAPs	<0.01	<0.01	<0.01	<0.01
Total HAPs	<0.01	0.03	0.01	0.05

AP-42 Emission Factor, (lb/MMscf) [1]

Pollutant	Uncontrolled 1,4-3 (7/98)	AP-42 Converted to HHV 1,4-3 (7/98)
n-Hexane	1.80E+00	3.04E+00
Formaldehyde	7.50E-02	1.27E-01
Benzene	2.10E-03	3.55E-03
Toluene	3.40E-03	5.74E-03
Other HAPs	1.90E-03	3.21E-03

[1] Emission factors shown above based on an average higher heating value (HHV) of 1,020 Btu/scf. Emission factors may be converted to other heating values by multiplying the given emission factor by the ratio of the specified heating value to the average heating value.

[2] Combustion annual burner fuel use is calculated on Combustion Firing Rate estimation page.

[3] Emissions (lb/hr) = Emission Factor (lb/MMscf) x Annual Fuel Usage (MMscf/yr) / 8760 hr/yr.

Example Hourly n-Hexane Emissions, Each lb/hr = $\frac{3.04\ \text{lb}}{\text{MMscf}} \times \frac{16.71\ \text{MMscf}}{\text{yr}} \times \frac{\text{yr}}{8{,}760\ \text{hr}} = \frac{0.01\ \text{lb}}{\text{hr}}$

[4] Emissions (tpy) = Emissions (lb/hr) x Hours of Operation per year (8760 hr/yr)/ 2,000 lb/ton

Example Annual n-Hexane Emissions, Each tpy = $\frac{0.01\ \text{lb}}{\text{hr}} \times \frac{8{,}760\ \text{hr}}{\text{yr}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} = \frac{0.05\ \text{ton}}{\text{yr}}$

[5] Total Emissions = Emissions per Combustor * Number of Combustors

Example Hourly n-Hexane Emissions, Total lb/hr = $\frac{0.01\ \text{lb}}{\text{hr}} \times 2\ \text{Combustors} = \frac{0.01\ \text{lb}}{\text{hr}}$

Example Annual n-Hexane Emissions, Total tpy = $\frac{0.03\ \text{ton}}{\text{hr}} \times 2\ \text{Combustors} = \frac{0.05\ \text{ton}}{\text{yr}}$

COMBUSTION FIRING RATE CALCULATIONS

Grand Total Energy Content Routed to Combustor		
OT/WT Flash	1.41	MMBtu/hr
TL - Cond	2.23	MMBtu/hr
TL-PW	0.86	MMBtu/hr
OT Working & Working	0.86	MMBtu/hr
WT Working & Breathing	0.00210	MMBtu/hr
Total	4.51	MMBtu/hr
Safety Factor	50.00%	
Grand Total Energy Routed to Combustor	6.79	MMBtu/hr

Grand Total Gas Volume Routed to Combustor		
OT/WT Flash	5,949,083	scf/yr
TL - Cond	11,365,686	scf/yr
TL - PW	22,744	scf/yr
OT Working & Working	3,599,452	scf/yr
WT Working & Breathing	15,829	scf/yr
Total	20,952,794	scf/yr
Safety Factor	50.00%	
Grand Total Volume Routed to Combustor	31,429,191	scf/yr

Flash Emissions Routed to Combustor		
Barrel Oil Per Day Produced [1]	13760	bopd
Barrel Water Per Day Produced [1]	1500	bwpd
Oil Tanks Flash Gas Rate [2]	0.001094386	Mscf/bbl oil
Oil Tanks Flash Gas Energy Content [2]	2,146	Btu/scf
Oil Tanks Flash Gas Volume [3]	15.06	Mscf/day
Oil Tanks Energy Stream [4]	32.31	MMBtu/day
Water Tanks Flash Gas Rate [1]	0.000826735	Mscf/bbl water
Water Tanks Flash Gas Energy Content [1]	1,162	Btu/scf
Water Tanks Flash gas Volume [5]	1.24	Mscf/day
Water Tanks Energy Stream [6]	1.44	MMBtu/day
Total Energy Content to Combustor (OT + WT) from Flash [7]	1.41	MMBtu/hr

[1] Obtained from Oil Tank and Water Tank calculations.
[2] From oil and water tank flash gas stream in Promax simulation.

[3] Oil Tank Flash Gas Volume, Mscf/day= 2: 13,760 bopd × 0.001094386 Mscf/bbl oil × 15.06 Mscf/day

[4] Oil Tank Energy Stream, MMBtu/day= 2,146 Btu/scf × 15.06 Mscf/day × MMBtu/1000 Btu × 32.31 MMBtu/day

[5] Water Tank Flash Gas Volume, Mscf/day = 1,500 bopd × 0.000826735 Mscf/bbl oil × 1.24 Mscf/day

[6] Water Tank Energy Stream, MMBtu/day= 1,162 Btu/scf × 1.24 Mscf/day × MMBtu/1000 Btu × 1.44 MMBtu/day

[7] Total Energy Content (OT+WT) to Combustor, MMBtu/hr = [32.31 MMBtu/day + 1.44 MMBtu/day] × 1 day/24 hrs = 1.41 MMBtu/hr

Truck Loading - Condensate - Emissions Routed to Combustor		
Oil Throughput (daily)	13760	bopd
Oil Throughput (annual)	5,022,400	bopy
Oil Throughput (annual 1000s gal)	210.941	
Emission Factor	4.75	lb VOC/1000 gal
Uncontrolled VOC Emissions (per AP-42)	501.31	tpy VOC
Mass % C1 & C2 (Oil Tank Flash Gas Stream)	22.30%	
Total Uncontrolled Gas Stream [1]	645.23	tpy
Total Uncontrolled Gas Stream	1,290,456	lb/yr
Average MW of Stream [2]	42.05	lb/lb-mol
Mass Density of Oil Tank FG Stream [2]	0.112063633	lb/scf
Molar Volume [3]	375.23	scf/lb-mol
Total Gas Stream from TL [4]	11,515,386	scf/yr
Capture Efficiency	98.70%	
Capture Gas Stream [5]	11,365,686	scf/yr
Tanks & TL Comb Gas Heating Value [2]	1,722	Btu/scf
Truck Loading Energy Content to Combustor [6]	2.2347	MMBtu/hr

[1] Total truck loading stream routed to combustor is estimated using composition from oil tank flash gas from Promax as follows

Total Uncontrolled Gas Stream (tpy) = 501.31 tons VOC / yr × 1 / 1 - 22.30% = 645.23 tons VOC / yr

[2] From oil tank flash gas stream in Promax simulation.

[3] Estimated molar volume (scf/lb-mol) = 42.05 lb / lb-mol × scf / 0.112063633 lb = 375.23 scf / lb-mol

[4] Total estimated volume of gas associated with truck loading calculated as follows:

Total Gas Stream from TL (scf/yr) = 1,290,456 lb / yr × 375.23 scf / lb-mol × 42.05 lb = 11,515,386 scf / yr

[5] Captured Gas Stream (scf/yr) = 11,515,386 scf / yr × 98.70% = 11,365,686 scf / yr

[6] Total Loading Energy Content to Combustor, MMBtu/hr = 11,365,686 scf / yr × 1,722 Btu / scf × MMBtu / 1,000,000 Btu × yr / 8760 hr = 2.2347 MMBtu / hr

Truck Loading - PW - Emissions Routed to Combustor		
PW Throughput (daily)	1500	bopd
PW Throughput (annual)	547,500	bopy
PW Throughput (annual 1000s gal)	22.995	
Emission Factor	4.75	lb VOC/1000 gal
Uncontrolled VOC Emissions (per AP-42)	0.55	tpy VOC
Mass % C1 & C2 (PW Tank Flash Gas Stream)	52.29%	
Total Uncontrolled Gas Stream [1]	1.15	tpy
Total Uncontrolled Gas Stream	2,291	lb/yr
Average MW of Stream [2]	26.72	lb/lb-mol
Mass Density of PW Tank FG Stream [2]	0.070512075	lb/scf
Molar Volume [3]	378.98	scf/lb-mol
Total Gas Stream from TL [4]	32,491	scf/yr
Capture Efficiency	70.00%	
Capture Gas Stream [5]	22,744	scf/yr
Tanks & TL Comb Gas Heating Value [2]	1,722	Btu/scf
Truck Loading Energy Content to Combustor [6]	0.0045	MMBtu/hr

[1] Total truck loading stream routed to combustor is estimated using composition from produced water tank flash gas from Promax as follows

Total Uncontrolled Gas Stream (tpy) = 0.55 tons VOC / yr × 1 / 1 - 52.29% = 1.15 tons VOC / yr

[2] From PW tank flash gas stream in Promax simulation.

[3] Estimated molar volume (scf/lb-mol) = 26.72 lb / lb-mol × scf / 0.070512075 lb = 378.98 scf / lb-mol

[4] Total estimated volume of gas associated with truck loading calculated as follows:

Total Gas Stream from TL (scf/yr) = 2,291 lb / yr × 378.98 scf / lb-mol × 26.72 lb = 32,491 scf / yr

[5] Captured Gas Stream (scf/yr) = 32,491 scf / lb-mol × 70.00% = 22,744 scf / yr

[6] Total Loading Energy Content to Combustor, MMBtu/hr = 22,744 scf / yr × 1,722 Btu / scf × MMBtu / 1,000,000 Btu × yr / 8760 hr = 0.0045 MMBtu / hr

Oil Tanks and Produced Water Tanks - Energy Content and Volume Routed to the Combustor from Working and Breathing Losses

Oil Tanks - Working & Breathing Losses		
Type Tank	Cone	
Number of Oil Tanks	8	
Per tank annual throughput	26,367,600	gal/yr
Approx. Standing Losses (Per Tank)	2,327.27	lb VOC/yr
Approx. Working Losses (Per Tank)	37,647.13	lb VOC/yr
Total Uncontrolled VOC Losses (Per Tank) [1]	19.99	tpy VOC
Mass % C1 & C2 (Oil Tank Flash Gas Stream)	22.30%	
Total Uncontrolled Gas Stream (total battery) [2]	205.80	tpy
Total Uncontrolled Gas Stream (total battery)	411,599.68	lb/yr
Average MW of Stream [3]	42.05	lb/lb-mol
Oil Tanks Flash Gas Heating Value [2]	2,146	Btu/scf
Mass Density of Oil Tank FG Stream [2]	0.112063633	lb/scf
Molar Volume [4]	375.23	scf/lb-mol
Total Gas Stream From Oil Tank W/B Losses [5]	3,672,910.39	scf/yr
Capture Efficiency	98.00%	
Captured Gas Stream [6]	3,599,452.18	scf/yr
OT W/B Total Energy Content to Combustor [7]	0.88	MMBtu/hr

[1] Obtained from Oil Tank Working and Breathing Losses Calculations.

[2] Total oil tank working and breaking loss stream is estimated using composition % of C1 and C2 from oil tank flash gas from Promax as follows:

Total Uncontrolled Gas Stream (tpy) = 19.99 tons VOC / yr × 1 / (1-23.68%) × 8 (No of Tanks) = 205.80 tons VOC / yr

[3] From oil tank flash gas stream in Promax simulation.

[4] Estimated molar volume (scf/lb-mol) = 42.05 lb / lb-mol × scf / 0.112063633 lb = 375.23 scf / lb-mol

[5] Total estimated volume of gas associated with OT W/B losses calculated as follows:

Total Gas Stream (scf/yr) = 411,600 lb / yr × 375.23 scf / lb-mol × lb-mol / 42.05 lb = 3,672,910 scf / yr

[6] Captured Gas Stream = 3,672,910 scf / yr × 98.00% = 3,599,452 scf / yr

[7] Total OT W/B Energy Content to Combustor, MMBtu/hr = 3,599,452 scf / yr × 2146 Btu / scf × MMBtu / 1,000,000 Btu × yr / 8,760 hr = 0.8817 MMBtu / hr

Water Tanks - Working & Breathing Losses (Assumes all fluid is Oil with 1% emitted)		
Type Tank	Cone	
Number of Water Tanks	4	
Per tank annual throughput	5,748,750	gal/yr
Approx. Standing Losses (Per Tank)	23.27	lb VOC/yr
Approx. Working Losses (Per Tank)	112.56	lb VOC/yr
Total Uncontrolled VOC Losses (Per Tank) [1]	0.07	tpy VOC
Mass % C1 & C2 (Water Tank Flash Gas Stream)	52.29%	
Total Uncontrolled Gas Stream (total battery) [2]	0.57	tpy
Total Uncontrolled Gas Stream (total battery)	1,138.91	lb/yr
Average MW of Stream [3]	26.72	lb/lb-mol
Water Tanks Flash Gas Heating Value [3]	1,162	Btu/scf
Mass Density of Water Tank FG Stream [3]	0.070512075	lb/scf
Molar Volume [4]	378.98	scf/lb-mol
Total Gas Stream From Water Tank W/B Losses [5]	16,151.98	scf/yr
Capture Efficiency	98.00%	
Captured Gas Stream [6]	15,828.94	scf/yr
WT W/B Total Energy Content to Combustor [7]	0.00210	MMBtu/hr

[1] Obtained from Oil Tank Working and Breathing Losses Calculations.

[2] Total water tank working and breaking loss stream is estimated using composition % of C1 and C2 from water tank flash gas from Promax as follows:

Total Uncontrolled Gas Stream (tpy) = 0.07 tons VOC / yr × 1 / (1-54.81%) × 4 (No of Tanks) = 0.57 tons VOC / yr

[3] From water tank flash gas stream in Promax simulation.

[4] Estimated molar volume (scf/lb-mol) = 26.72 lb / lb-mol × scf / 0.070512075 lb = 378.98 scf / lb-mol

[5] Total estimated volume of gas associated with OT W/B losses calculated as follows:

Total Gas Stream (scf/yr) = 1138.91 lb / yr × 378.98 scf / lb-mol × lb-mol / 26.72 lb = 16,152 scf / yr

[6] Captured Gas Stream = 16,152 scf / yr × 98.00% = 15,829 scf / yr

[7] Total OT W/B Energy Content to Combustor, MMBtu/hr = 15,829 scf / yr × 1,162 Btu / scf × MMBtu / 1,000,000 Btu × yr / 8760 hr = 0.0021 MMBtu / hr

STANDARD FLARE - CRITERIA POLLUTANTS

Flare Criteria Pollutant Emissions
Number of Flares 2

Parameter	FL-1-FL-2 (Each)	FL-1-FL-2 (Total)	Units
Operating Hours:	8,760	8,760	hr/yr
Produced Gas Flow:	50	100	mmscf/yr
Produced Gas Flow:	5,708	11,416	scf/hr
Pilot Gas Fuel Use:	N/A	N/A	MMscf/yr
Flare Stream:	1,156	1,156	Btu/scf
Flare Stream:	57780	115560	MMBtu/yr
Destruction Efficiency:	98%	98%	-

		FL-1-FL-2 (Each) Emissions		FL-1-FL-2 (Total) Emissions	
Pollutant	Emission Factor (lb/MMBtu) [1,2]	lb/hr	tpy	lb/hr	tpy
NO_X	0.14	0.92	4.04	1.85	8.09
CO	0.035	0.23	1.01	0.46	2.02
VOC	Mass Balance	1.62	7.08	3.23	14.16

[1] NO_X and CO emission factors taken from Oil and Gas Production Facilities Chapter 6, Section 2 Permit Guidance

[2] VOC emissions calculated separately in the Flare VOC page.

Flare Stream Analysis and VOC Calculation

273.973	MSCF/D

Component	Mol Wt	Total Streams Burned in Flare							Net Heating Value	Net Btu Value Rate[3]
		Mol %	lb/hr[2]	Uncontrolled lb/hr	Uncontrolled tons/yr	scfd	Controlled Emissions lb/hr	Controlled Emissions tons/yr	Btu/scf	Btu/hr
Nitrogen	28.0134	0.68	5.77	5.77	25.252	1,874	-	-	0.00	0
Carbon Dioxide	44.01	1.82	24.07	24.07	105.443	4,981	-	-	0.00	0
Methane	16.042	74.95	361.74	361.74	1,584.433	205,329	7.23	31.69	919.00	7,862,381
Ethane	30.069	12.19	110.30	110.30	483.093	33,400	2.21	9.66	1,619.00	2,253,108
Propane	44.096	6.63	87.90	87.90	384.997	18,151	1.76	7.70	2,315.00	1,750,785
Iso-butane	58.122	0.74	12.99	12.99	56.912	2,036	0.26	1.14	3,000.00	254,452
N-butane	58.122	1.73	30.29	30.29	132.666	4,745	0.61	2.65	3,011.00	595,326
2-2 Dimethylpropane	72.15	0.00	0.00	0.00	0.000	0	<0.01	<0.01		0
Iso-pentane	72.149	0.37	8.01	8.01	35.086	1,011	0.16	0.70	3,699.00	155,814
N-pentane	72.149	0.37	8.01	8.01	35.086	1,011	0.16	0.70	3,707.00	156,151
2-2 Dimethylbutane	86.18	0.01	0.13	0.13	0.568	14	<0.01	0.01		0
Cyclopentane	70.1	0.00	0.00	0.00	0.000	0	<0.01	<0.01		0
2-3 Dimethylbutane	86.18	0.03	0.88	0.88	3.862	93	0.02	0.08		0
2 Methylpentane	86.18	0.08	2.10	2.10	9.199	222	0.04	0.18		0
3 Methylpentane	86.18	0.04	1.11	1.11	4.884	118	0.02	0.10		0
n-Hexane	86.175	0.11	2.77	2.77	12.152	293	0.06	0.24	4,404.00	53,793
Methylcyclopentane	84.16	0.05	1.14	1.14	4.991	123	0.02	0.10		0
Benzene	78.114	0.01	0.24	0.24	1.029	27	<0.01	0.02	3,590.90	4,099
Cyclohexane	84.16	0.04	1.01	1.01	4.436	110	0.02	0.09		0
2-Methylhexane	100.2	0.01	0.39	0.39	1.717	36	<0.01	0.03		0
3-Methylhexane	100.2	0.01	0.36	0.36	1.585	33	<0.01	0.03		0
2,2,4 Trimethylpentane	114.23	0.00	0.00	0.00	0.000	0	<0.01	<0.01		0
Other Heptanes	100.202	0.03	0.90	0.90	3.962	82	0.02	0.08		0
n-Heptane	100.202	0.02	0.72	0.72	3.169	66	0.01	0.06		0
Methylcyclohexane	98.19	0.03	1.00	1.00	4.400	93	0.02	0.09		0
Toluene	92.141	0.01	0.30	0.30	1.336	30	<0.01	0.03		0
Other C-8's	128.2	0.02	0.73	0.73	3.210	52	0.01	0.06	6,493.00	14,083
n-Octane	128.2	0.01	0.23	0.23	1.014	16	<0.01	0.02	6,493.00	4,447
Ethylbenzene	106.167	0.00	0.00	0.00	0.000	0	<0.01	<0.01	4,970.50	0
M&P Xylene	106.5	0.00	0.10	0.10	0.421	8	<0.01	0.01	4,957.10	1,698
O-Xylene	106.5	0.00	0.03	0.03	0.140	3	<0.01	<0.01	4,957.10	566
Other C-9's	128.259	0.01	0.19	0.19	0.845	14	<0.01	0.02		0
n-Nonane	128.259	0.00	0.04	0.04	0.169	3	<0.01	<0.01		0
Other C10s	142.29	0.00	0.00	0.00	0.000	0	<0.01	<0.01		0
n-Decane	142.29	0.00	0.00	0.00	0.000	0	<0.01	<0.01		0
Undecanes Plus	156.31	0.00	0.00	0.00	0.000	0	<0.01	<0.01		0
	Totals	100	663.48	663.48	2,906.06	273,973	-	-		**13,106,703**
			Total HAPS	**3.443**	**15.078**		**0.069**	**0.302**		
			Total VOC	**161.61**	**707.83**	-	**3.23**	**14.16**	**Heat Value (Btu/scf)**	**1148**
			MW (Stream) =			**22.05**				

[1] Stream composition obtained from Extended Gas Analysis

[2] Hourly Emissions (lb/hr) calculated as follows = Total daily Flowrate (MSCF/day) x Mol (%) / 379.4 scf/lb-mol x Mol. Weight (lb/lb-mole) x (1 day/24 hrs)

Eg. Propane Hourly Emissions (lb/hr) = $\frac{273.97 \text{ MSCF}}{\text{day}} \mid \frac{1000 \text{ scf}}{\text{MMSCF}} \mid 6.63\% \mid \frac{\text{lb-mol}}{379.4 \text{ scf}} \mid \frac{44.10 \text{ lb}}{\text{lb-mole}} \mid \frac{1 \text{ day}}{24 \text{ hr}} = \frac{87.90 \text{ lb}}{\text{hr}}$

[3] Net Btu Value Rate , Btu/hr = Heat Value, Btu/scf * Total Flow, scf/hr.

AIR ASSISTED FLARE EMISSION CALCULATIONS - CRITERIA AIR POLLUTANTS

Unit ID =	**AAF-1**
Description	Air Assisted Flare
Number of Combustion Devices =	1
Combustor Type =	AP-42 converted to HHV
Max Burner Design Capacity (MMBtu/hr) =	54.0
Fuel HHV (Btu/scf) [1] =	2,175
Flash Factor from Promax (Mscf/bbl oil) =	0.0976
Annual Fuel Use (MMscf/yr) [2] =	49.04
Annual Operating Hours =	8,760
Percentage Time LPT Flash Gas Routed to Combustion Device [3] =	10%

Criteria Air Pollutant Emissions

Unit ID: Pollutant	AAF-1 lb/hr [5]	AAF-1 tons/yr [6]
NO_X	1.70	0.75
CO	0.43	0.19
SO_2	<0.01	<0.01
$PM_{10/2.5}$ [4]	0.07	0.03
PM_{COND} [4]	0.02	<0.01
PM_{TOT} [4]	0.09	0.04

Emission Factor

Pollutant	Units	Uncontrolled [8]	Converted to HHV [8]
NO_X	lb/MMBtu	0.14	0.14
CO	lb/MMBtu	0.04	0.04
SO_2	lb/MMscf	0.60	1.28
$PM_{10/2.5}$	lb/MMscf	5.70	12.15
PM_{COND}	lb/MMscf	1.90	4.05
PM_{TOT}	lb/MMscf	7.60	16.20

[1] Calculated by Promax process simulation (report attached).

[2] Combustion device annual fuel use is calculated using flash factors from Promax as follows

Annual Fuel Use (MMscf/yr)= 0.0976 Mscf / barrel oil × 13,760 Bbl / day × 365 day / yr × MMscf / 1000 Mscf × 10% × 1 (No of Flares) = 49.04 MMscf / yr

[3] Under normal operation conditions flash gas is compressed with a VRU and sent to sales. When sales line pressure exceeds VRU discharge pressure flash gas is routed to combustion device.

[4] All PM (total, condensable and filterable) is assumed to be < 1 micrometer in diameter. Total PM is the sum of filterable PM and condensable PM

[5] NO_X and CO emissions (lb/hr) = Emission Factor (lb/MMBtu) x Annual Fuel Usage (MMscf/yr) x Fuel HHV (Btu/scf) / 8,760 hr/yr.

Example Hourly NO_X Emission, Each lb/hr = 0.14 lb / MMBtu × 49.04 MMscf / yr × 2,175 Btu / scf × yr / 8,760 hr = 1.70 lb / hr

[6] SO_2 and $PM_{10}/PM_{2.5}/PM_{COND}/PM_{TOT}$ Emissions (lb/hr) = Emission Factor (lb/MMscf) x Annual Fuel Usage (MMscf/yr) / 8760 hr/yr.

Example Hourly SO_2 Emission, Each lb/hr = 1.28 lb / MMscf × 49.04 MMscf / yr × yr / 8,760 hr = 0.01 lb / hr

[7] Emissions (tpy) = Emissions (lb/hr) x Hours of Operation per year (8,760 hr/yr)/ 2,000 lb/ton x (10% LPT flash gas routed to combustion device during downtime)

Example Annual NO_X Emissions, Each tpy = 1.70 lb / hr × 8,760 hr / yr × ton / 2,000 lb × 10% = 0.75 ton / yr

[8] NO_X and CO emission factors taken from Oil and Gas Production Facilities Chapter 6, Section 2 Permitting Guidance. All other emission factors shown above are taken from AP-42 Section 1.4, Tables 1.4-1 and 1.4-2 (7/98) and are based on an average higher heating value (HHV) of 1,020 Btu/scf. AP-42 emission factors in lb/MMscf may be converted to other heating values by multiplying the given emission factor by the ratio of the specified heating value to the average heating value.

Example SO_2 Emission Factor, lb/MMscf = 0.60 lb / MMscf × 2,175 Btu / scf × scf / 1,020 Btu = 1.28 lb / MMscf

AIR ASSISTED FLARE EMISSION CALCULATIONS - VOC EMISSIONS

LPT Flash Gas Routed to Combustion Device

LPT VOC Flash Factor (lb/bbl) [1] =	8.33
Oil Production (bbl/day) =	13760
Control Efficiency [2] =	98%
Percentage Time LPT Flash Gas Routed to Combustion Device [3] =	10%

Uncontrolled VOC Emissions (LPT VOC Flash Rate)

	AAF-1	
Pollutant	**lb/hr [4]**	**tons/yr [5]**
VOC	4,777.90	2092.72

Proposed Controlled VOC Emissions [6,7]

	AAF-1	
Pollutant	**lb/hr**	**tons/yr**
VOC	95.56	41.85

[1] Flash emissions taken from Promax simulation

[2] Assumes 98% combustion device destruction efficiency.

[3] Under normal operation conditions flash gas is compressed with a VRU and sent to sales. When sales line pressure exceeds VRU discharge pressure flash gas is routed to combustion device.

[4] Uncontrolled LPT VOC Flash Rate (lb/hr) = Oil Production (bbl/day) x (day/24 hr) x LPT VOC Flash Factor (lb/bbl)

$$\text{LPT VOC Flash Rate (lb/hr)} = \frac{13760\ \text{bbl}}{\text{day}} \times \frac{\text{day}}{24\ \text{hr}} \times \frac{8.3335\ \text{lb}}{\text{bbl}} = \frac{4777.9016\ \text{lb}}{\text{hr}}$$

[5] Uncontrolled LPT VOC Flash Rate (tpy) = Emissions (lb/hr) x Hours of Operation per year (8760 hr/yr)/ 2,000 lb/ton x (10% LPT flash gas routed to combustion device during downtime)

$$\text{LPT VOC Flash Rate (tpy)} = \frac{4777.90\ \text{lb}}{\text{hr}} \times \frac{8{,}760\ \text{hr}}{\text{yr}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} \times 10\% = \frac{2092.72\ \text{ton}}{\text{yr}}$$

[6] VOC emissions to combustion device are based on average production throughput

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

$$\text{Controlled Hourly Emissions (lb/hr)} = \frac{4777.90\ \text{lb}}{\text{hr}} \times (1 - 98\%) = \frac{95.56\ \text{lb}}{\text{hr}}$$

$$\text{Controlled Annual Emissions (tpy)} = \frac{2092.72\ \text{tons}}{\text{yr}} \times (1 - 98\%) = \frac{41.85\ \text{tons}}{\text{yr}}$$

AIR ASSISTED FLARE EMISSION CALCULATIONS - HAZARDOUS AIR POLLUTANTS

Unit ID =	**AAF-1**
Description	**Air Assisted Flare**
Combustion Type =	AP-42 Converted to HHV
Number of Combustion Devices	1
Max Burner Design Capacity (MMBtu/hr) =	54
Annual Fuel Use (MMscf/yr) =	49.04
Fuel HHV (Btu/scf) =	2,175
Annual Operating Hours =	8,760
Percentage Time LPT Flash Gas Routed to Combustion Device [3] =	10%

Hazardous Air Pollutant Emissions

	AAF-1	
Pollutant	**lb/hr [4]**	**tons/yr [5]**
n-Hexane	0.02	<0.01
Formaldehyde	<0.01	<0.01
Benzene	<0.01	<0.01
Toluene	<0.01	<0.01
Other HAPs	<0.01	<0.01
Total HAPs	0.02	<0.01

AP-42 Emission Factor , (lb/MMscf) [1]

Pollutant	**Uncontrolled 1,4-3 (7/98)**	**AP-42 Converted to HHV 1,4-3 (7/98)**
n-Hexane	1.80E+00	3.84E+00
Formaldehyde	7.50E-02	1.60E-01
Benzene	2.10E-03	4.48E-03
Toluene	3.40E-03	7.25E-03
Other HAPs	1.90E-03	4.05E-03

[1] Emission factors shown above based on an average higher heating value (HHV) of 1,020 Btu/scf. Emission factors may be converted to other heating values by multiplying the given emission factor

[2] Air Assisted Flare fuel use is calculated on the AAF Criteria Pollutant Page.

[3] Under normal operation conditions flash gas is compressed with a VRU and sent to sales. When sales line pressure exceeds VRU discharge pressure flash gas is routed to combustion device.

[4] Emissions (lb/hr) = Emission Factor (lb/MMscf) x Annual Fuel Usage (MMscf/yr) / 8760 hr/yr.

Example Hourly n-Hexane Emissions, Each lb/hr = $\frac{3.84\ \text{lb}}{\text{MMscf}} \times \frac{49.04\ \text{MMscf}}{\text{yr}} \times \frac{\text{yr}}{8{,}760\ \text{hr}} = \frac{0.02\ \text{lb}}{\text{hr}}$

[5] Emissions (tpy) = Emissions (lb/hr) x Hours of Operation per year (8760 hr/yr)/ 2,000 lb/ton

Example Annual n-Hexane Emissions, Each tpy = $\frac{0.02\ \text{lb}}{\text{hr}} \times \frac{8{,}760\ \text{hr}}{\text{yr}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} \times 10\% = \frac{<0.01\ \text{ton}}{\text{yr}}$

FUGITIVE EMISSION CALCULATIONS - VOC EMISSIONS

Fugitive Emission Calculations

Hours of Operation (hrs/yr) 8760

Source Type/Service	Number of Sources [1]	Emission Factor [2] (lb/hr/source)	Control Efficiency	TOC (lb/hr) [3]	TOC (tons/yr) [4]	VOC Wt%
Valves - Gas	253	9.92E-03	0.00%	2.51	10.99	25.50%
Flanges - Gas	466	8.60E-04	0.00%	0.40	1.75	25.50%
Compressor/Pump Seals - Gas	2	5.29E-03	0.00%	1.06E-02	4.63E-02	25.50%
Connectors - Gas	130	4.41E-04	0.00%	5.73E-02	2.51E-01	25.50%
Open Ended Lines-Gas	0	4.41E-03	0.00%	0.00E+00	0.00E+00	25.50%
		Total TOC (Gas Components) =		**2.98**	**13.05**	
Valves - Light Oil	134	5.51E-03	0.00%	7.39E-01	3.23E+00	97.70%
Valves -Heavy Oil	2	1.85E-05	0.00%	3.70E-05	1.62E-04	97.70%
Connectors - Light Oil	9	4.63E-04	0.00%	4.17E-03	1.83E-02	97.70%
Compressor/Pump Seals - Light Oil	2	2.87E-02	0.00%	5.73E-02	2.51E-01	97.70%
Flanges - Light Liquid	266	2.43E-04	0.00%	6.45E-02	2.83E-01	97.70%
Other - Light Oil	0	1.65E-02	0.00%	0.00E+00	0.00E+00	97.70%
		Total TOC (Liquid Components) =		**0.86**	**3.79**	

VOC Emissions [5]

Source Type/Service	VOC lb/hr	VOC tons/yr
Valves - Gas	0.64	2.80
Flanges - Gas	0.10	0.45
Compressor/Pump Seals - Gas	<0.01	0.01
Connectors - Gas	0.01	0.06
Open Ended Lines - Gas	0.00	0.00
Total (Gas Comp.) =	**0.76**	**3.33**
Valves - Light Oil	0.72	3.16
Valves -Heavy Oil	<0.01	<0.01
Connectors - Light Oil	<0.01	0.02
Compressor/Pump Seals - Light Oil	0.06	0.25
Flanges - Light Liquid	0.06	0.28
Other - Light Oil	0.00	0.00
Total (Liquid Comp.) =	**0.84**	**3.70**
Total (All Components) =	**1.60**	**7.03**

[1] Component Count based on equipment proposed to be used at the site.

[2] Emission factors taken from EPA-453/R-95-017, Protocol for Equipment Leak Emission Estimates, Table 2-4, Oil and Gas Production Operations Average Emission Factors and converted into lb/hr/source.

[3] TOC (lb/hr) = Emission Factor (lb/hr/source) x Number of Sources

Eg. Valves - Gas (lb/hr) = 9.92E-03 lb/hr-source | 253 (source) = 2.51 lb/hr

[4] TOC(tpy) = Controlled Hourly Emissions, Each (lb/hr) x 8,760 (hrs/yr) x (1 ton/2000 lb)

Eg. Valves - Gas (tpy) = 2.51 lb/hr | 8,760 hr/yr | 1 ton/2,000 lb = 10.99 ton/yr

[5] Total organic compound (TOC) emission rates multiplied by VOC content of stream (weight percent) to obtain VOC emissions.

Eg. Valves - Gas VOC (lb/hr) = 2.51 lb/hr | 25.50% = 0.64 lb/hr

Eg. Valves - Gas VOC (tpy) = 10.99 ton/yr | 25.50% = 2.80 ton/yr

FUGITIVE EMISSION CALCULATIONS - SPECIATED HAP EMISSIONS

Fugitive Hazardous Air Pollutant (HAP) Emissions (lb/hr) [1]

Source Type/Service	n-Hexane	Benzene	Toluene	Ethylbenzene	Xylenes	Total
Valves - Gas	0.01	<0.01	<0.01	0.00	<0.01	0.01
Flanges - Gas	<0.01	<0.01	<0.01	0.00	<0.01	<0.01
Compressor/Pump Seals - Gas	<0.01	<0.01	<0.01	0.00	<0.01	<0.01
Connectors - Gas	<0.01	<0.01	<0.01	0.00	<0.01	<0.01
Open Ended Lines-Gas	0.00	0.00	0.00	0.00	0.00	0.00
Total (All Gas Components) =	0.01	<0.01	<0.01	0.00	<0.01	0.02
Source Type/Service	**n-Hexane**	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**Total**
Valves - Light Oil	0.02	<0.01	<0.01	<0.01	0.01	0.04
Valves -Heavy Oil	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Connectors - Light Oil	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Compressor/Pump Seals - Light Oil	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Flanges - Light Liquid	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Other - Light Oil	0.00	0.00	0.00	0.00	0.00	0.00
Total (All Liquid Components) =	0.02	<0.01	0.01	<0.01	0.01	0.05
Total (Gas + Liquid Components) =	0.03	<0.01	0.01	<0.01	0.01	0.07

Fugitive Hazardous Air Pollutant (HAP) Emissions (tpy) [1]

Source Type/Service	n-Hexane	Benzene	Toluene	Ethylbenzene	Xylenes	Total
Valves - Gas	0.05	<0.01	<0.01	0.00	<0.01	0.06
Flanges - Gas	<0.01	<0.01	<0.01	0.00	<0.01	<0.01
Compressor/Pump Seals - Gas	<0.01	<0.01	<0.01	0.00	<0.01	<0.01
Connectors - Gas	<0.01	<0.01	<0.01	0.00	<0.01	<0.01
Open Ended Lines-Gas	0.00	0.00	0.00	0.00	0.00	0.00
Total (All Gas Components) =	0.06	<0.01	<0.01	0.00	<0.01	0.07
Source Type/Service	**n-Hexane**	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**Total**
Valves - Light Oil	0.08	<0.01	0.04	<0.01	0.05	0.19
Valves -Heavy Oil	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Connectors - Light Oil	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Compressor/Pump Seals - Light Oil	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Flanges - Light Liquid	<0.01	<0.01	<0.01	<0.01	<0.01	0.02
Other - Light Oil	0.00	0.00	0.00	0.00	0.00	0.00
Total (All Liquid Components) =	0.09	0.01	0.04	0.01	0.06	0.22
Total (Gas + Liquid Components) =	0.15	0.02	0.05	0.01	0.07	0.29

[1] Total organic compound (TOC) emission rates multiplied by VOC content of stream (weight percent) to obtain VOC emissions.

Eg. Valves - Gas VOC, n-Hexane (lb/hr) = $\frac{2.51 \text{ lb}}{\text{hr}} \times 0.44\% = \frac{0.01 \text{ lb}}{\text{hr}}$

Eg. Valves - Gas VOC, n-Hexane (tpy) = $\frac{10.99 \text{ ton}}{\text{yr}} \times 0.44\% = \frac{0.05 \text{ ton}}{\text{yr}}$

Summary Table

Description	Hourly (lb/hr)	Annual (tpy)
Total (Gas Components)	0.02	0.07
Total (Liquid Components)	0.05	0.22
Total (All Components)	0.07	0.29

FUGITIVE EMISSION CALCULATIONS - SPECIATED GAS VOC EMISSIONS

Speciated Gas Analysis for Fugitives (VOC and HAP) [1]

Component	Mol Wt	Mol %	Weight (lb/lbmole Gas)	Wt%	Corrected Wt%	Uncontrolled lb/hr [2]	Uncontrolled tons/yr [3]
Nitrogen	28.0134	0.68	0.19	0.87	-	-	-
Carbon Dioxide	44.01	1.82	0.80	3.63	-	-	-
Methane	16.042	74.95	12.02	54.53	57.09	1.70	7.45
Ethane	30.069	12.19	3.67	16.63	17.41	0.52	2.27
Propane	44.096	6.63	2.92	13.25	13.87	0.41	1.81
Iso-butane	58.122	0.74	0.43	1.96	2.05	0.06	0.27
N-butane	58.122	1.73	1.01	4.57	4.78	0.14	0.62
2-2 Dimethylpropane	72.15	0.00	0.00	0.00	0.00	0.00	0.00
Iso-pentane	72.149	0.37	0.27	1.21	1.26	0.04	0.16
N-pentane	72.149	0.37	0.27	1.21	1.26	0.04	0.16
2-2 Dimethylbutane	86.18	0.01	0.00	0.02	0.02	<0.01	<0.01
Cyclopentane	70.1	0.00	0.00	0.00	0.00	0.00	0.00
2-3 Dimethylbutane	86.18	0.03	0.03	0.13	0.14	<0.01	0.02
2 Methylpentane	86.18	0.08	0.07	0.32	0.33	<0.01	0.04
3 Methylpentane	86.18	0.04	0.04	0.17	0.18	<0.01	0.02
n-Hexane	86.175	0.11	0.09	0.42	0.44	0.01	0.06
Methylcyclopentane	84.16	0.05	0.04	0.17	0.18	<0.01	0.02
Benzene	78.114	0.01	0.01	0.04	0.04	<0.01	<0.01
Cyclohexane	84.16	0.04	0.03	0.15	0.16	<0.01	0.02
2-Methylhexane	100.2	0.01	0.01	0.06	0.06	<0.01	<0.01
3-Methylhexane	100.2	0.01	0.01	0.06	0.06	<0.01	<0.01
2,2,4 Trimethylpentane	114.23	0.00	0.00	0.00	0.00	0.00	0.00
Other Heptanes	100.202	0.03	0.03	0.14	0.14	<0.01	0.02
n-Heptane	100.202	0.02	0.02	0.11	0.11	<0.01	0.01
Methylcyclohexane	98.19	0.03	0.03	0.15	0.16	<0.01	0.02
Toluene	92.141	0.01	0.01	0.05	0.05	<0.01	<0.01
Other C-8's	128.2	0.02	0.02	0.10	0.12	<0.01	0.02
n-Octane	128.2	0.01	0.01	0.03	0.04	<0.01	<0.01
Ethylbenzene	106.167	0.00	0.00	0.00	0.00	0.00	0.00
M&P Xylene	106.5	0.00	0.00	0.01	0.02	<0.01	<0.01
O-Xylene	106.5	0.00	0.00	0.01	0.01	<0.01	<0.01
Other C-9's	128.259	0.01	0.01	0.03	0.03	<0.01	<0.01
n-Nonane	128.259	0.00	0.00	0.01	0.01	<0.01	<0.01
Other C10s	142.29	0.00	0.00	0.00	0.00	0.00	0.00
n-Decane	142.29	0.00	0.00	0.00	0.00	0.00	0.00
Undecanes Plus	156.31	0.00	0.00	0.00	0.00	0.00	0.00
	Totals	**100.00**	**22.05**	**100.00**	**100.00**		
	Total VOC	**10.36**	**5.37**	**24.34**	**25.50**	**0.76**	**3.33**
	Total HAP	**0.1320**	**0.1144**	**0.5180**	**0.5433**	**0.02**	**0.07**
	Total Hydrocarbon		**21.06**			**2.98**	**13.05**

[1] Stream composition obtained from Gas Analysis for Combs Ranch 29-33-70 C SX 7H - Analysis dated August 06, 2014.

[2] Uncontrolled hourly emission rate (lb/hr) = Component Weight % (%) x Uncontrolled Hourly Total Emission Rate (lb/hr).

$$\text{Gas Service Propane Emission Rate (lb/hr)} = \frac{13.87\%}{} \left| \frac{2.98 \text{ lb}}{\text{hr}} \right. = \frac{0.41 \text{ lb}}{\text{hr}}$$

[3] Uncontrolled annual emission rate (tpy) = Uncontrolled hourly emission rate (lb/hr) x (8,760 hr/yr) / (2,000 lb/ton).

$$\text{Gas Service Propane Emission Rate (tpy)} = \frac{0.41 \text{ lb}}{\text{hr}} \left| \frac{8{,}760 \text{ hr}}{\text{yr}} \right| \frac{1 \text{ ton}}{2{,}000 \text{ lb}} = \frac{1.81 \text{ ton}}{\text{yr}}$$

FUGITIVE EMISSION CALCULATIONS - SPECIATED LIQUID VOC EMISSIONS

Speciated Liquid Analysis for Fugitives (VOC and HAP) [1]

Component	Mol Wt	Mol %	Weight (lb/lbmole Gas)	Wt%	Corrected Wt%	Uncontrolled lb/hr [2]	Uncontrolled tons/yr [3]
Nitrogen	28.0134	0.03	0.01	0.01	-	-	-
Carbon Dioxide	44.01	0.30	0.13	0.11	-	-	-
Methane	16.042	5.81	0.93	0.75	0.92	<0.01	0.03
Ethane	30.069	4.66	1.40	1.13	1.38	0.01	0.05
Propane	44.096	7.68	3.39	2.73	3.34	0.03	0.13
Iso-butane	58.122	1.88	1.09	0.88	1.08	<0.01	0.04
N-butane	58.122	6.11	3.55	2.86	3.50	0.03	0.13
2-2 Dimethylpropane	72.15	0.10	0.07	0.06	0.07	<0.01	<0.01
Iso-pentane	72.149	3.06	2.21	1.78	2.18	0.02	0.08
N-pentane	72.149	3.83	2.77	2.23	2.73	0.02	0.10
2-2 Dimethylbutane	86.18	0.06	0.05	0.04	0.05	<0.01	<0.01
Cyclopentane	70.1	0.00	0.00	0.00	0.00	0.00	0.00
2-3 Dimethylbutane	86.18	0.33	0.28	0.23	0.28	<0.01	0.01
2 Methylpentane	86.18	1.74	1.50	1.21	1.48	0.01	0.06
3 Methylpentane	86.18	0.95	0.82	0.66	0.80	<0.01	0.03
n-Hexane	86.175	2.86	2.46	1.98	2.43	0.02	0.09
Methylcyclopentane	84.16	1.76	1.48	1.19	1.46	0.01	0.06
Benzene	78.114	0.36	0.28	0.23	0.28	<0.01	0.01
Cyclohexane	84.16	1.87	1.58	1.27	1.55	0.01	0.06
2-Methylhexane	100.2	1.04	1.04	0.84	1.02	<0.01	0.04
3-Methylhexane	100.2	0.84	0.84	0.68	0.83	<0.01	0.03
2,2,4 Trimethylpentane	114.23	0.00	0.00	0.00	0.00	0.00	0.00
Other Heptanes	100.202	1.31	1.31	1.05	1.30	0.01	0.05
n-Heptane	100.202	2.32	2.32	1.87	2.29	0.02	0.09
Methylcyclohexane	98.19	3.66	3.59	2.89	3.54	0.03	0.13
Toluene	92.141	1.30	1.20	0.97	1.18	0.01	0.04
Other C-8's	128.2	4.31	5.53	3.83	5.46	0.05	0.21
n-Octane	128.2	1.95	2.50	1.79	2.46	0.02	0.09
Ethylbenzene	106.167	0.28	0.30	0.24	0.29	<0.01	0.01
M&P Xylene	106.5	1.20	1.28	1.03	1.26	0.01	0.05
O-Xylene	106.5	0.40	0.42	0.34	0.41	<0.01	0.02
Other C-9's	128.259	3.91	5.01	3.98	4.95	0.04	0.19
n-Nonane	128.259	1.42	1.82	1.47	1.80	0.02	0.07
Other C10s	142.29	4.08	5.80	4.65	5.72	0.05	0.22
n-Decane	142.29	1.18	1.68	1.36	1.66	0.01	0.06
Undecanes Plus	156.31	27.44	42.89	53.69	42.31	0.37	1.60
	Totals	**100.00**	**101.52**	**100.00**	**100.00**		
	Total VOC	**89.20**	**99.05**	**98.01**	**97.70**	**0.84**	**3.70**
	Total HAP	**6.3840**	**5.9296**	**4.7770**	**5.8487**	**0.05**	**0.22**
	Total Hydrocarbon		**101.38**			**0.86**	**3.79**

[1] Stream composition obtained from seperator oil analysis for Combs Ranch 29-33-70 C SX 7H, Analysis Dated August 19, 2014

[1] Uncontrolled hourly emission rate (lb/hr) = Component Weight % (%) x Uncontrolled Hourly Total Emission Rate (lb/hr).

$$\text{Gas Service Propane Emission Rate (lb/hr)} = \frac{3.34\%}{} \left| \frac{2.98 \text{ lb}}{\text{hr}} \right. = \frac{0.03 \text{ lb}}{\text{hr}}$$

[2] Uncontrolled annual emission rate (tpy) = Uncontrolled hourly emission rate (lb/hr) x (8,760 hr/yr) / (2,000 lb/ton).

$$\text{Gas Service Propane Emission Rate (tpy)} = \frac{0.03 \text{ lb}}{\text{hr}} \left| \frac{8{,}760 \text{ hr}}{\text{yr}} \right| \frac{1 \text{ ton}}{2{,}000 \text{ lb}} = \frac{0.13 \text{ ton}}{\text{yr}}$$

APPENDIX C – SUPPORT DOCUMENTS

Figure 1, PROMAX Results

Figure 2, Representative Oil Analysis

Figure 3, Representative Gas Analysis

Wyoming Typical Process Flow Diagram
(using Combs Ranch 29-33-70 C SX 7H Sampled 7/17/14)

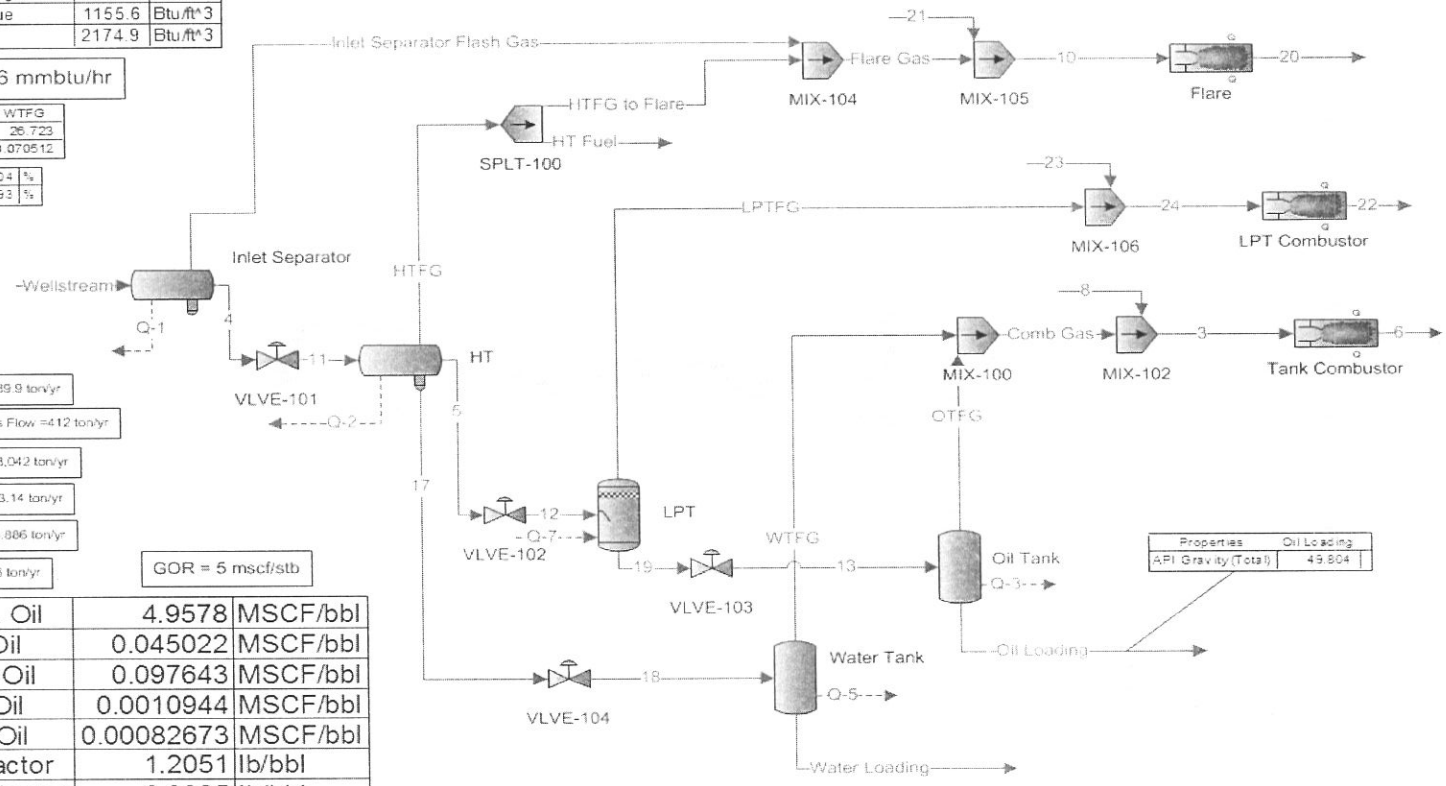
Names	Units	Inlet Separator Flash Gas	HTFG	Comb Gas	OTFG	Oil Loading	Water Loading	WTFG	LPTFG
Temperature	°F	90*	100*	70.89	71*	71	71	71*	90*
Pressure	psig	200*	100*	0.25	0.25	0.25*	0.25*	0.25	5
Molecular Weight	lb/lbmol	22.01	26.45	35.45	42.05	147	18.02	26.72	42.58
Std Liquid Volumetric Flow	bbl/d	4569	45.36	2.2	1.406	2000	1500	0.7939	125.9
Std Vapor Volumetric Flow	MSCFD	9916	90.04	3.842	2.189	1407	1.106e+004	1.653	195.3
Volumetric Net Ideal Gas Heating Value	Btu/ft^3	1153.9	1358.8	1722.4	2145.9			1161.7	2174.9

HTFG Net IG Heating Value	1358.8	Btu/ft^3
Combustor Gas Net IG Heating Value	1722.4	Btu/ft^3
Flare Gas Net IG Heating Value	1155.6	Btu/ft^3
LPTFG Net IG Heating Value	2174.9	Btu/ft^3

HT Firing Rate = -0.3546 mmbtu/hr

Names	Units	OTFG	WTFG
Molecular Weight	lb/lbmol	42.05	26.723
Mass Density	lb/ft^3	0.11206	0.070512

OTFG C1 and C2 Mass Percent	22.304	%
WTFG C1 and C2 Mass Percent	52.293	%



Stream HTFG C3+ Mass Flow =439.9 ton/yr

Stream HTFG to Flare C3+ Mass Flow =412 ton/yr

Stream LPTFG C3+ Mass Flow =3,042 ton/yr

Stream OTFG C3+ Mass Flow =33.14 ton/yr

Stream WTFG C3+ Mass Flow =5.886 ton/yr

Stream 6 C3+ Mass Flow =0.7806 ton/yr

GOR = 5 mscf/stb

Properties	Oil Loading
API Gravity (Total)	49.804

GPU FG Per BBL Oil	4.9578	MSCF/bbl
HT FG Per BBL Oil	0.045022	MSCF/bbl
LPT FG Per BBL Oil	0.097643	MSCF/bbl
OT FG Per BBL Oil	0.0010944	MSCF/bbl
WT FG Per BBL Oil	0.00082673	MSCF/bbl
HT VOC Flash Factor	1.2051	lb/bbl
LPT VOC Flash Factor	8.3335	lb/bbl
OT VOC Flash Factor	0.090807	lb/bbl
WT VOC Flash Factor	0.016127	lb/bbl

SUBJECT TO CHANGE

Questions? Please contact COI - Corporate Air Group

Creation Date: 4/28/2010 - Last Edit Date: 3/16/2015 1:04:54 PM
W:\EHS\Air Permitting\ProMax Simulation Files\WY\Niobrara\200p90#Sep-100p100#HT- LPT-OT-WT-Combustors - using Combs Ranch 29-33-70 C SX 7H study (ST).pmx

August 6, 2014

FESCO, Ltd.
1100 Fesco Ave. - Alice, Texas 78332

For: Chesapeake Energy Corporation
P. O. Box 18496
Oklahoma City, Oklahoma 73154

Sample: Combs Ranch 29-33-70 SX 7H
First Stage Separator Gas
Sampled @ 220 psig & 100 °F

Date Sampled: 07/17/14 Job Number: 44404.001

CHROMATOGRAPH EXTENDED ANALYSIS - SUMMATION REPORT

COMPONENT	MOL%	GPM
Nitrogen	0.684	
Carbon Dioxide	1.818	
Methane	74.945	
Ethane	12.191	3.325
Propane	6.625	1.861
Isobutane	0.743	0.248
n-Butane	1.732	0.557
2-2 Dimethylpropane	0.000	0.000
Isopentane	0.369	0.138
n-Pentane	0.369	0.136
Hexanes	0.270	0.113
Heptanes Plus	0.254	0.103
Totals	100.000	6.482

Computed Real Characteristics Of Heptanes Plus:

Specific Gravity	3.294	(Air=1)
Molecular Weight	95.02	
Gross Heating Value	5044	BTU/CF

Computed Real Characteristics Of Total Sample:

Specific Gravity	0.764	(Air=1)
Compressibility (Z)	0.9960	
Molecular Weight	22.05	
Gross Heating Value		
Dry Basis	1309	BTU/CF
Saturated Basis	1287	BTU/CF

Base Conditions: 15.025 PSI & 60 Deg F

Certified: FESCO, Ltd. - Alice, Texas

Analyst: MR
Processor: MR
Cylinder ID: G-2177

David Dannhaus 361-661-7015

CHROMATOGRAPH EXTENDED ANALYSIS
TOTAL REPORT

COMPONENT	MOL %	GPM	WT %
Nitrogen	0.684		0.869
Carbon Dioxide	1.818		3.629
Methane	74.945		54.532
Ethane	12.191	3.325	16.627
Propane	6.625	1.861	13.251
Isobutane	0.743	0.248	1.959
n-Butane	1.732	0.557	4.566
2,2 Dimethylpropane	0.000	0.000	0.000
Isopentane	0.369	0.138	1.208
n-Pentane	0.369	0.136	1.208
2,2 Dimethylbutane	0.005	0.002	0.020
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.034	0.014	0.133
2 Methylpentane	0.081	0.034	0.317
3 Methylpentane	0.043	0.018	0.168
n-Hexane	0.107	0.045	0.418
Methylcyclopentane	0.045	0.016	0.172
Benzene	0.010	0.003	0.035
Cyclohexane	0.040	0.014	0.153
2-Methylhexane	0.013	0.006	0.059
3-Methylhexane	0.012	0.006	0.055
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C7's	0.030	0.013	0.135
n-Heptane	0.024	0.011	0.109
Methylcyclohexane	0.034	0.014	0.151
Toluene	0.011	0.004	0.046
Other C8's	0.019	0.009	0.095
n-Octane	0.006	0.003	0.031
Ethylbenzene	0.000	0.000	0.000
M & P Xylenes	0.003	0.001	0.014
O-Xylene	0.001	0.000	0.005
Other C9's	0.005	0.003	0.029
n-Nonane	0.001	0.001	0.006
Other C10's	0.000	0.000	0.000
n-Decane	0.000	0.000	0.000
Undecanes (11)	0.000	0.000	0.000
Totals	100.000	6.482	100.000

Computed Real Characteristics Of Total Sample:

Specific Gravity	0.764	(Air=1)
Compressibility (Z)	0.9960	
Molecular Weight	22.05	
Gross Heating Value		
Dry Basis	1309	BTU/CF
Saturated Basis	1287	BTU/CF

August 19, 2014

FESCO, Ltd.
1100 FESCO Avenue - Alice, Texas 78332

For: Chesapeake Energy Corporation
P. O. Box 18496
Oklahoma City, Oklahoma 73154

Sample: Combs Ranch 29-33-70 SX 7H
First Stage Separator Hydrocarbon Liquid
Sampled @ 220 psig & 100 °F

Date Sampled: 07/17/14 Job Number: 44404.002

CHROMATOGRAPH EXTENDED ANALYSIS - GPA 2186-M

COMPONENT	MOL %	LIQ VOL %	WT %
Nitrogen	0.028	0.006	0.006
Carbon Dioxide	0.300	0.098	0.106
Methane	5.813	1.888	0.752
Ethane	4.660	2.389	1.130
Propane	7.677	4.054	2.729
Isobutane	1.876	1.177	0.879
n-Butane	6.105	3.689	2.861
2,2 Dimethylpropane	0.098	0.072	0.057
Isopentane	3.064	2.148	1.782
n-Pentane	3.834	2.664	2.230
2,2 Dimethylbutane	0.057	0.046	0.040
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.329	0.258	0.228
2 Methylpentane	1.744	1.387	1.211
3 Methylpentane	0.946	0.740	0.657
n-Hexane	2.855	2.250	1.983
Heptanes Plus	60.614	77.132	83.346
Totals:	100.000	100.000	100.000

Characteristics of Heptanes Plus:

Specific Gravity	0.8141	(Water=1)
°API Gravity	42.31	@ 60°F
Molecular Weight	170.6	
Vapor Volume	15.15	CF/Gal
Weight	6.78	Lbs/Gal

Characteristics of Total Sample:

Specific Gravity	0.7534	(Water=1)
°API Gravity	56.32	@ 60°F
Molecular Weight	124.0	
Vapor Volume	19.28	CF/Gal
Weight	6.28	Lbs/Gal

Base Conditions: 15.025 PSI & 60 °F

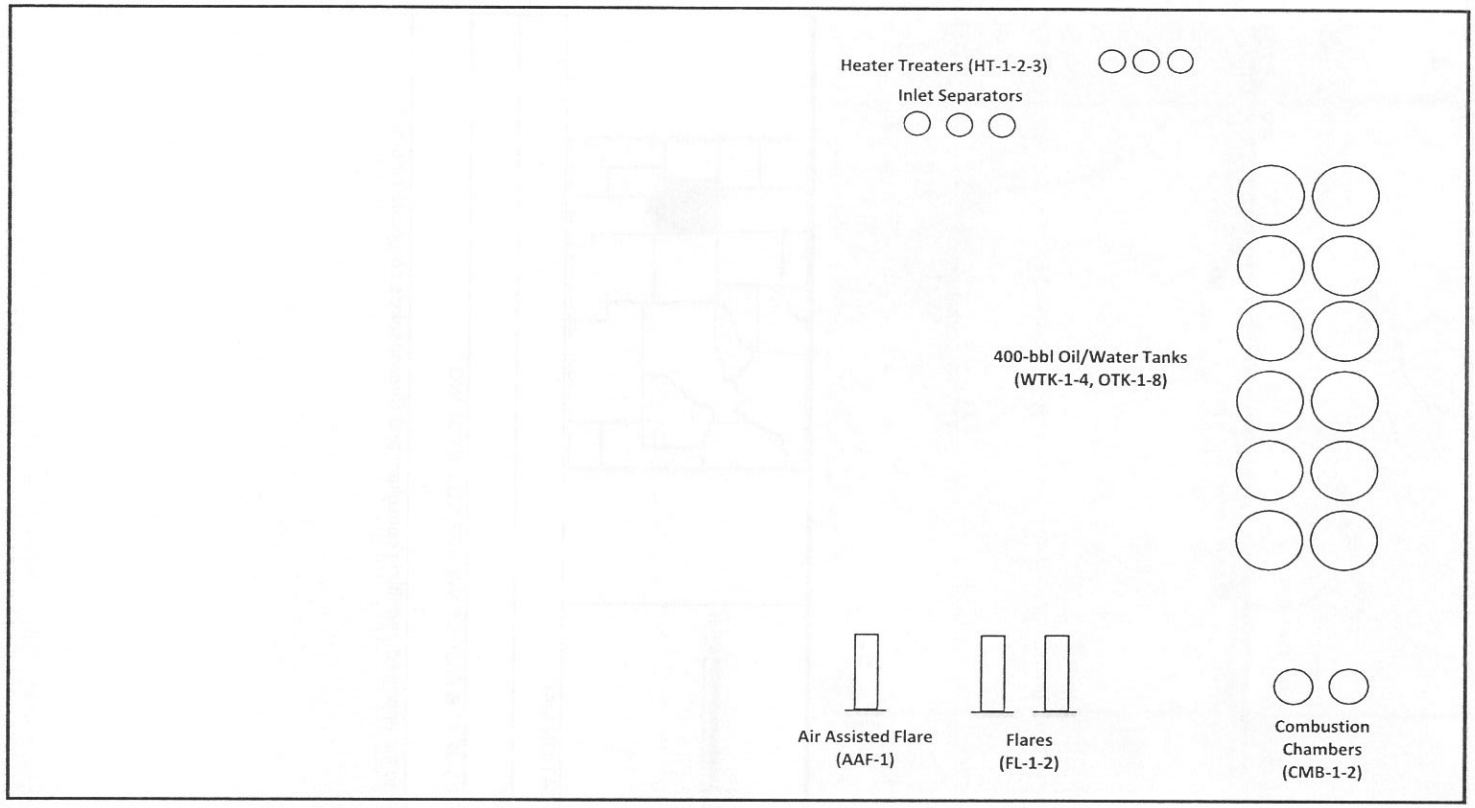
Certified: FESCO, Ltd. - Alice, Texas

Analyst: XG
Processor: XGdjv
Cylinder ID: T-4168

David Dannhaus 361-661-7015

TOTAL EXTENDED REPORT - GPA 2186-M

COMPONENT	Mol %	LiqVol %	Wt %
Nitrogen	0.028	0.006	0.006
Carbon Dioxide	0.300	0.098	0.106
Methane	5.813	1.888	0.752
Ethane	4.660	2.389	1.130
Propane	7.677	4.054	2.729
Isobutane	1.876	1.177	0.879
n-Butane	6.105	3.689	2.861
2,2 Dimethylpropane	0.098	0.072	0.057
Isopentane	3.064	2.148	1.782
n-Pentane	3.834	2.664	2.230
2,2 Dimethylbutane	0.057	0.046	0.040
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.329	0.258	0.228
2 Methylpentane	1.744	1.387	1.211
3 Methylpentane	0.946	0.740	0.657
n-Hexane	2.855	2.250	1.983
Methylcyclopentane	1.760	1.194	1.194
Benzene	0.358	0.192	0.226
Cyclohexane	1.873	1.222	1.271
2-Methylhexane	1.037	0.924	0.838
3-Methylhexane	0.839	0.738	0.678
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C-7's	1.311	1.096	1.048
n-Heptane	2.315	2.048	1.871
Methylcyclohexane	3.655	2.817	2.894
Toluene	1.299	0.834	0.965
Other C-8's	4.314	3.883	3.833
n-Octane	1.947	1.912	1.793
E-Benzene	0.279	0.206	0.239
M & P Xylenes	1.198	0.891	1.026
O-Xylene	0.395	0.288	0.338
Other C-9's	3.909	3.929	3.979
n-Nonane	1.421	1.533	1.469
Other C-10's	4.078	4.505	4.645
n-decane	1.181	1.390	1.355
Undecanes(11)	3.883	4.401	4.602
Dodecanes(12)	2.964	3.629	3.848
Tridecanes(13)	2.896	3.801	4.086
Tetradecanes(14)	2.416	3.397	3.701
Pentadecanes(15)	2.000	3.013	3.322
Hexadecanes(16)	1.666	2.682	2.982
Heptadecanes(17)	1.343	2.286	2.567
Octadecanes(18)	1.254	2.247	2.537
Nonadecanes(19)	1.135	2.120	2.407
Eicosanes(20)	0.902	1.751	2.001
Heneicosanes(21)	0.797	1.627	1.870
Docosanes(22)	0.738	1.571	1.816
Tricosanes(23)	0.534	1.178	1.369
Tetracosanes(24)	0.578	1.322	1.544
Pentacosanes(25)	0.504	1.194	1.401
Hexacosanes(26)	0.412	1.011	1.192
Heptacosanes(27)	0.384	0.979	1.159
Octacosanes(28)	0.308	0.812	0.964
Nonacosanes(29)	0.294	0.801	0.954
Triacontanes(30)	0.269	0.756	0.904
Hentriacontanes Plus(31+)	2.164	6.952	8.462
Total	100.000	100.000	100.000



Drawing is intended to show relative locations of similar site. Not to scale. Wellheads are located on an adjacent pad.

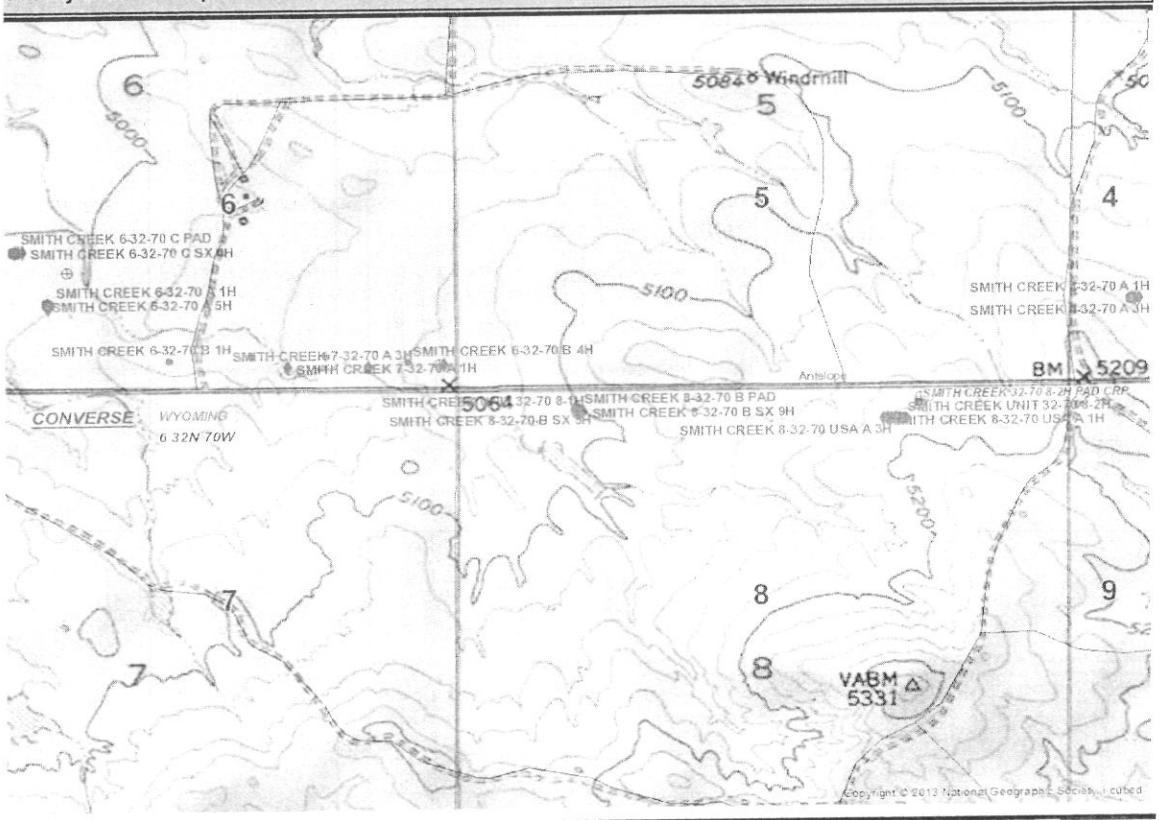
Chesapeake Operating, LLC

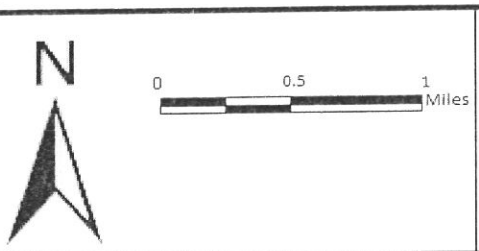
Smith Creek 8-32-70 B PAD

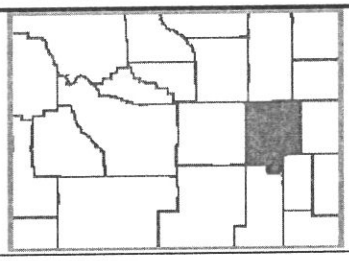
Figure 2: Site Drawing

May 2015

Facility Location Map with Current Site in the Center.



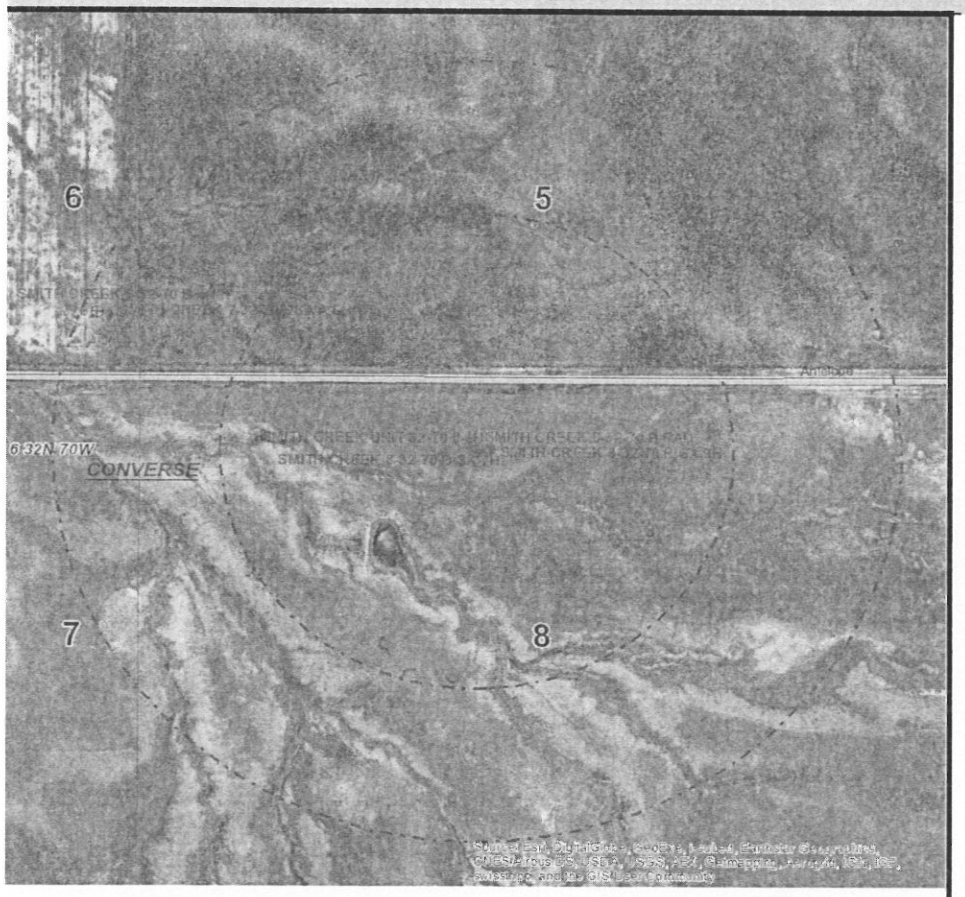




Chesapeake ENERGY	FACILITY LOCATION MAP
	CHESAPEAKE
	SMITH CREEK 8-32-70 B PAD, CONVERSE CO., WYOMING 8/32N/70W

Email the Excel version of this document to the approved permitting consultant and Chesapeake's corporate air group.

Co-Location Map with Current Site in the Center.



Chesapeake Sites within 800 feet: 0

Chesapeake Adjacent Sites between 800 feet and .25 miles: 0

Chesapeake ENERGY

SMITH CREEK 8-32-70 B PAD / 910195
Lat/Long: 42.76591 / -105.28269

0 250 500 1,000 Feet

N

CHK OP Wells

- COMPRESSOR STATION
- DRY
- FACILITY
- GAS
- OIL

CHK NONOP Wells

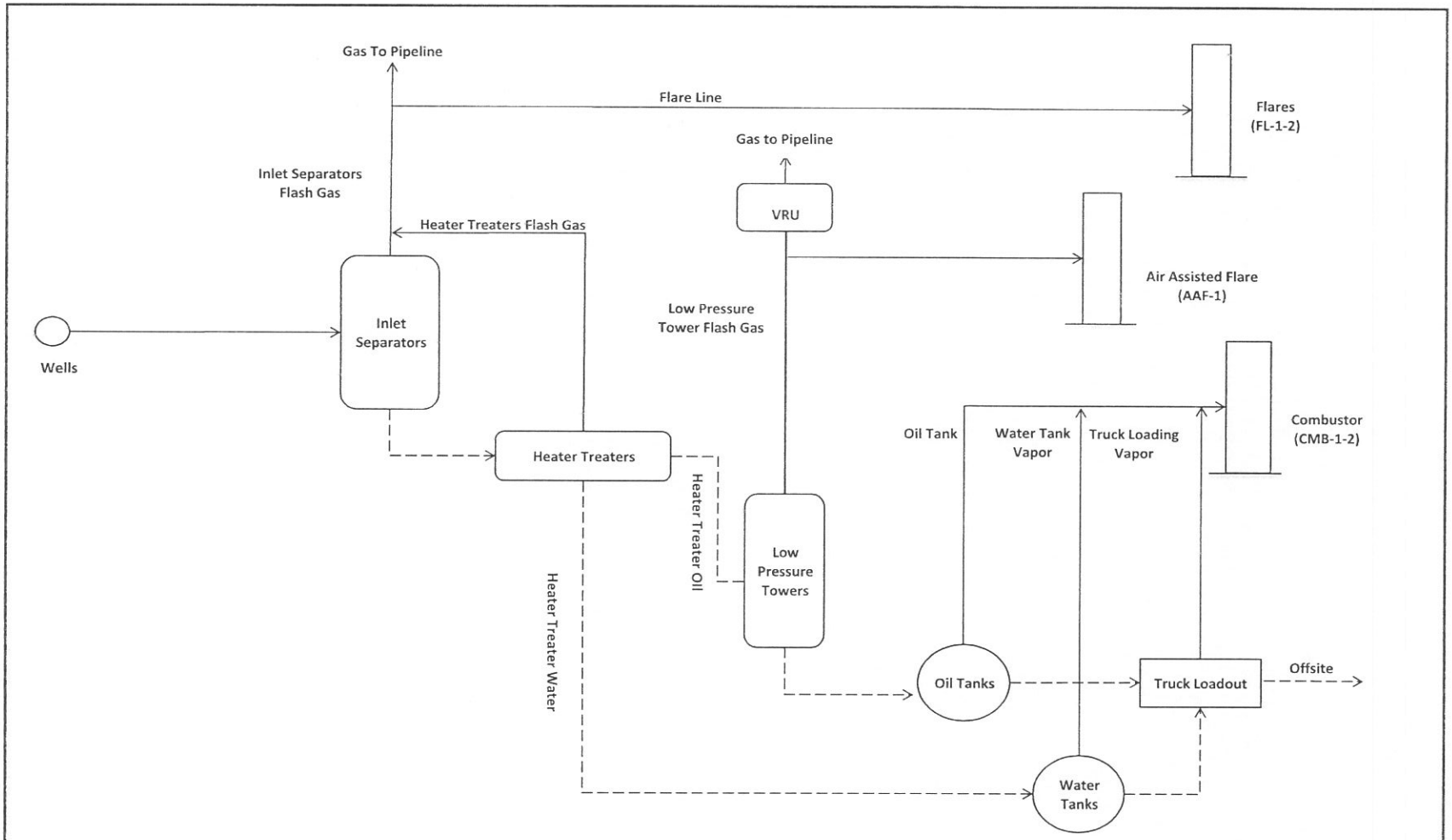
- COMPRESSOR STATION
- DRY
- FACILITY
- GAS
- OIL

Meter Location

- Treatment Plant
- Salt Water Disposal Plant
- Tank
- Water

Pipeline

- Active
- Water Pipe
- COI Active
- Leased



Chesapeake Operating, LLC

Smith Creek 8-32-70 B PAD

Figure 1: Process Flow Diagram

May 2015

CHK Smith Creek 8-32-70 B Pad Equipment List

With this application Chesapeake requests authorization to construct and operate the following equipment at the Smith Creek 8-32-70 B Pad oil and gas production facility:

- One (1) vapor recovery tower (VRT);
- Eight (8) 400 barrel oil storage tanks (OTKs);
- Four (4) 400 barrel produced water storage tanks (WTKs);
- Three (3) heater treaters (HTs);
- Two (2) combustors (CMBs);
- Two (2) flares (FLs);
- Truck Loadout of Condensate and Produced Water (TLs);
- Fugitive Emissions (FUG);
- One (1) Electric vapor recovery unit (VRU); and
- One (1) Air assisted flare (AAF-1).

FACILITYWIDE EMISSION CALCULATIONS - SUMMARY

Wyoming Site: Smith Creek 8-32-70 B Pad

Summary of Criteria Air Pollutant Emissions

Equipment proposed by Chapter 6, Section 2 Construction Permit Application

Equipment	Unit ID	NO_X		CO		VOC		SO_2		PM	
		lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
Two (2) Combustion Chambers (Pilot Gas + Burner + Tanks +TL Combustion)	CMB-1 - CMB-2	0.88	3.86	0.22	0.96	4.02	17.60	<0.01	0.02	0.05	0.21
One (1) Air Assisted Flare	AAF-1	1.70	0.75	0.43	0.19	95.56	41.85	<0.01	<0.01	0.09	0.04
Three (3) 0.50-MMBtu/hr Heater Treater Burners	HT-1 - HT-3	0.15	0.64	0.12	0.54	<0.01	0.04	<0.01	<0.01	0.01	0.05
Eight (8) 400-bbl Oil Tanks - Controlled by Combustion Chamber	OTK-1 - OTK-8	-	-	-	-	1.77	7.76	-	-	-	-
Four (4) 400-bbl Produced Water Tank - Controlled by Combustion Chamber	WTK-1 - WTK-4	-	-	-	-	0.02	0.09	-	-	-	-
Truck Loading - Condensate	TL-1	-	-	-	-	1.49	6.52	-	-	-	-
Truck Loading - PW	TL-2	-	-	-	-	0.04	0.16	-	-	-	-
Two (2) Standard Flares	FL-1 - FL-2	1.85	8.09	0.46	2.02	3.23	14.16	-	-	-	-
Fugitive Emissions	FUG	-	-	-	-	1.60	7.03	-	-	-	-
Total		**4.58**	**13.34**	**1.23**	**3.71**	**107.74**	**95.21**	**0.01**	**0.02**	**0.15**	**0.29**

FACILITYWIDE EMISSION CALCULATIONS - SUMMARY

Wyoming Site: Smith Creek 8-32-70 B Pad

Summary of Hazardous Air Pollutant Hourly Emissions

Equipment proposed by Chapter 6, Section 2 Construction Permit Application

Equipment	Unit ID	Estimated Emissions (lb/hr)										
		Acetaldehyde	Acrolein	Benzene	Ethyl-benzene	Formaldehyde	Methanol	n-Hexane	Toluene	Xylenes	Other HAPs	Total HAPs
Two (2) Combustion Chambers (Pilot Gas + Burner + Tanks +TL Combustion)	CMB-1 - CMB-2	-	-	<0.01	0.01	<0.01	-	0.09	0.04	0.05	<0.01	0.20
One (1) Air Assisted Flare	AAF-1	-	-	<0.01	-	<0.01	-	0.02	<0.01	-	<0.01	0.02
Three (3) 0.50-MMBtu/hr Heater Treater Burners	HT-1 - HT-3	-	-	<0.01	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01
Eight (8) 400-bbl Oil Tanks - Controlled by Combustion Chamber	OTK-1 - OTK-8	-	-	<0.01	<0.01	-	-	0.04	0.02	0.02	-	0.08
Four (4) 400-bbl Produced Water Tank - Controlled by Combustion Chamber	WTK-1 - WTK-4	-	-	<0.01	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01
Truck Loading - Condensate	TL-1	-	-	<0.01	<0.01	-	-	0.03	0.01	0.02	-	0.07
Truck Loading - PW	TL-2	-	-	<0.01	<0.01	-	-	<0.01	<0.01	0.00	-	<0.01
Two (2) Standard Flares	FL-1 - FL-2	-	-	<0.01	0.00	-	-	0.06	<0.01	<0.01	-	0.07
Fugitive Emissions	FUG	-	-	<0.01	<0.01	-	-	0.03	0.01	0.01		0.07
Total		-	-	**0.02**	**0.02**	**<0.01**	-	**0.27**	**0.09**	**0.12**	**<0.01**	**0.52**

FACILITYWIDE EMISSION CALCULATIONS - SUMMARY

Wyoming Site: Smith Creek 8-32-70 B Pad

Summary of Hazardous Air Pollutant Annual Emissions

Equipment proposed by Chapter 6, Section 2 Construction Permit Application

Equipment	Unit ID	Estimated Emissions (tons/yr)										
		Acetaldehyde	Acrolein	Benzene	Ethyl-benzene	Formaldehyde	Methanol	n-Hexane	Toluene	Xylenes	Other HAPs	Total HAPs
Two (2) Combustion Chambers (Pilot Gas + Burner + Tanks +TL Combustion)	CMB-1 - CMB-2	-	-	0.04	0.04	<0.01	-	0.40	0.17	0.24	<0.01	0.89
One (1) Air Assisted Flare	AAF-1	-	-	<0.01	-	<0.01	-	<0.01	<0.01	-	<0.01	<0.01
Three (3) 0.50-MMBtu/hr Heater Treater Burners	HT-1 - HT-3	-	-	<0.01	-	<0.01	-	0.01	<0.01	-	<0.01	0.01
Eight (8) 400-bbl Oil Tanks - Controlled by Combustion Chamber	OTK-1 - OTK-8	-	-	0.02	0.02	-	-	0.15	0.07	0.11	-	0.37
Four (4) 400-bbl Produced Water Tank - Controlled by Combustion Chamber	WTK-1 - WTK-4	-	-	<0.01	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01
Truck Loading - Condensate	TL-1	-	-	0.01	0.02	-	-	0.13	0.06	0.09	-	0.31
Truck Loading - PW	TL-2	-	-	<0.01	<0.01	-	-	<0.01	<0.01	<0.01	-	<0.01
Two (2) Standard Flares	FL-1 - FL-2	-	-	0.02	0.00	-	-	0.24	0.03	0.01	-	0.30
Fugitive Emissions	FUG	-	-	0.02	0.01	-	-	0.15	0.05	0.07	-	0.29
Total		**-**	**-**	**0.11**	**0.09**	**<0.01**	**-**	**1.10**	**0.39**	**0.52**	**<0.01**	**2.20**

OIL TANK EMISSION CALCULATIONS - CRITERIA AIR POLLUTANTS

Unit ID =	OTK-1 - OTK-8 (Each)	OTK-1 - OTK-8 (Total)
Number of Tanks =	8	-
Capacity (bbl) =	400	-
Capacity (gal) =	16,800	-
Throughput (bbl/yr)[1] =	627,800	5,022,400.00
Throughput (gal/yr)[1] =	26,367,600	210,940,800
Throughput (bbl/d)[1] =	1,720	13,760
Tanks 4.0.9d Working Losses (lb/yr)[2] =	37,647.13	-
Tanks 4.0.9d Breathing Losses (lb/yr)[2] =	2,327.27	-
Tanks 4.0.9d Total Losses (lb/yr)[2] =	39,974.40	
Flash Emission Factor (lb VOC/bbl)[3] =	0.09081	-
Capture Efficiency =	98.00%	98.00%
Control Type =	Combustion Chamber	Combustion Chamber
Control Efficiency =	98.00%	98.00%

Uncontrolled VOC Emissions

Emissions	OTK-1 - OTK-8 (Each) Avg. lb/hr[5]	OTK-1 - OTK-8 (Each) tons/yr[6]	OTK-1 - OTK-8 (Total) Avg. lb/hr[7]	OTK-1 - OTK-8 (Total) tons/yr[8]
Working	4.30	18.82	34.38	150.59
Breathing	0.27	1.16	2.13	9.31
Flashing	6.51	28.50	52.06	228.03
Total	11.07	48.49	88.57	387.93

Proposed Uncaptured VOC Emissions[9] - Emissions that are not Captured by the Combustors (Represented under Oil Tanks in the Summary Tables)

Emissions	OTK-1 - OTK-8 (Each) Avg. lb/hr[10]	OTK-1 - OTK-8 (Each) tons/yr[11]	OTK-1 - OTK-8 (Total) Avg. lb/hr[12]	OTK-1 - OTK-8 (Total) tons/yr[13]
Working	0.09	0.38	0.69	3.01
Breathing	0.01	0.02	0.04	0.19
Flashing	0.13	0.57	1.04	4.56
Total	0.22	0.97	1.77	7.76

Proposed Controlled VOC Emissions[14] - Captured and Controlled by Combustors (Represented under Combustors in the Summary Tables)

Emissions	OTK-1 - OTK-8 (Each) Avg. lb/hr[15]	OTK-1 - OTK-8 (Each) tons/yr[16]	OTK-1 - OTK-8 (Total) Avg. lb/hr[17]	OTK-1 - OTK-8 (Total) tons/yr[18]
Working	0.0842	0.37	0.67	2.95
Breathing	0.01	0.02	0.04	0.18
Flashing	0.13	0.56	1.02	4.47
Total	0.22	0.95	1.74	7.60

[1] Individual tank throughputs shown for worst-case breathing emissions estimate only and not intended as a per tank limit.

[2] Working and breathing losses for all tanks modeled as Gasoline RVP 11 for conservative emissions estimate. Flashing emission factor calculated with Promax process simulations. Process simulation results and EPA Tanks 4.09d emissions reports attached. Tank vapor destroyed by combustion chamber with manufactured-estimated 98% control efficiency.

[3] Calculated by Promax process simulation (report attached).

[4] Control efficiency of the combustor is 98 %.

[5] Due to variable short-term emission rates, average lb/hr based on annual emissions shown for reference only.

Uncontrolled Hourly Emissions, Each (lb/hr) = Tanks 4.0.9d Working Losses (lb/yr) / 8,760 (hrs/yr) and Tanks 4.0.9d Breathing Losses (lb/yr) / 8,760 (hrs/yr) and Flash Emission Factor (lb VOC/bbl) x Throughput (bbl/yr) / 8,760 (hrs/yr)

Uncontrolled Working Hourly Emissions, Each (lb/hr) = 37,647.13 lb/yr ÷ 8,760 hr/yr = 4.30 lb/hr

[6] Uncontrolled Hourly Emissions, Total (lb/hr) = Uncontrolled Hourly Emissions, Each (lb/hr) * Total Number of Tanks

Uncontrolled Hourly Emissions, Total (lb/hr) = 4.30 lb/hr * 08 Tanks = 34.38 lb/hr

[7] Uncontrolled Annual Emissions, Each (tpy) = Uncontrolled Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

Uncontrolled Annual Emissions, Each (tpy) = 4.30 lb/hr * 8,760 hr/yr * 1 ton/2,000 lb = 18.82 ton/yr

[8] Uncontrolled Annual Emissions, Total (tpy) = Uncontrolled Annual Emissions, Each (tpy) * Total Number of Tanks

Uncontrolled Annual Working Emissions, Total (tpy) = 18.82 ton/yr * 08 Tanks = 150.59 ton/yr

[9] Uncaptured Hourly/ Annual Emissions (lb/hr or tpy) = Uncontrolled Emissions (lb/hr or tpy) * (1- Capture Efficiency (%))

[10] Proposed Uncaptured Hourly Emissions (lb/hr) = Uncontrolled Emissions (lb/hr) * (1- Capture efficiency (%))

Proposed Uncaptured Working Hourly Emissions (lb/hr) = 4.30 lb/hr * 1 - 98% = 0.09 lb/hr

[11] Proposed Uncaptured Hourly Emissions, Total (lb/hr) = Proposed Uncaptured Hourly Emissions, Each (lb/hr) * Total Number of Tanks

Proposed Uncaptured Working Hourly Emissions, Total (lb/hr) = 0.09 lb/hr * 08 Tanks = 0.69 lb/hr

[12] Proposed Uncaptured Annual Emissions, Each (tpy) = Uncaptured Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

Proposed Uncaptured Working Annual Emissions, Each (tpy) = 0.09 lb/hr * 8,760 hr/yr * 1 ton/2,000 lb = 0.38 ton/yr

[13] Proposed Uncaptured Annual Emissions, Total (tpy) = Uncaptured Annual Emissions, Each (tpy) * Total Number of Tanks

Uncaptured Annual Working Emissions, Total (tpy) = 0.38 ton/yr * 08 Tanks = 3.01 ton/yr

OIL TANK EMISSION CALCULATIONS - CRITERIA AIR POLLUTANTS

[14] Controlled VOC emissions are captured vapors from the tanks which are routed and combusted by the Combustors and shown and accounted for under the combustors in the summary tables.
Captured Emissions = Uncontrolled Emissions - Uncaptured Emissions.

[15] Proposed Controlled Hourly Emissions (lb/hr) =

Captured Emissions (Uncontrolled Emissions - Uncaptured Emissions) (lb/hr) * (1- Control efficiency (%))

Proposed Controlled Working Hourly Emissions (lb/hr) = [4.30 lb - 0.09 lb] / hr × 1 - 98% = 0.08 lb / hr

[16] Proposed Controlled Hourly Emissions, Total (lb/hr) =

Proposed Controlled Hourly Emissions, Each (lb/hr) * Total Number of Tanks

Proposed Controlled Working Hourly Emissions, Total (lb/hr) = 0.08 lb / hr × 08 Tanks = 0.67 lb / hr

[17] Proposed Controlled Annual Emissions, Each (tpy) =

Controlled Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

Proposed Controlled Working Annual Emissions, Each (tpy) = 0.08 lb / hr × 8,760 hr / yr × 1 ton / 2,000 lb = 0.37 ton / yr

[18] Proposed Controlled Annual Emissions, Total (tpy) =

Controlled Annual Emissions, Each (tpy) * Total Number of Tanks

Controlled Working Annual Working Emissions, Total (tpy) = 0.37 ton / yr × 08 Tanks = 2.95 ton / yr

OIL TANK EMISSION CALCULATIONS - HAZARDOUS AIR POLLUTANTS

Unit ID =	OTK-1 - OTK-8 (Each)	OTK-1 - OTK-8 (Total)
Number of Tanks =	8	-
Capacity (bbl) =	400	-
Capacity (gal) =	16,800	-
Throughput (bbl/yr) =	627,800	5,022,400
Throughput (gal/yr) =	26,367,600	210,940,800
Throughput (bbl/d) =	1,720	13,760
Capture Efficiency =	98.00%	98.00%
Control Type =	Combustion Chamber	Combustion Chamber
Control Efficiency =	98.00%	98.00%

Uncontrolled Hazardous Air Pollutant Emissions

Pollutant	OTK-1 - OTK-8 (Each) Avg. lb/hr [2]	OTK-1 - OTK-8 (Each) tons/yr [3]	OTK-1 - OTK-8 (Total) Avg. lb/hr [4]	OTK-1 - OTK-8 (Total) tons/yr [5]
Total VOC [1]	11.07	48.49	88.57	387.93
n-Hexane	0.22	0.96	1.76	7.69
Benzene	0.03	0.11	0.20	0.88
Toluene	0.11	0.47	0.85	3.74
Ethylbenzene	0.03	0.12	0.21	0.93
Xylenes	0.15	0.66	1.21	5.29
Other HAPs	0.00	0.00	0.00	0.00
Total HAPs	0.53	2.32	4.23	18.53

Proposed Uncaptured VOC Emissions[6] - Not captured by the combustors (Represented under Oil Tanks in the summary tables)

Pollutant	OTK-1 - OTK-8 (Each) Avg. lb/hr [7]	OTK-1 - OTK-8 (Each) tons/yr [8]	OTK-1 - OTK-8 (Total) Avg. lb/hr [9]	OTK-1 - OTK-8 (Total) tons/yr [10]
Total VOC	0.22	0.97	1.77	7.76
n-Hexane	<0.01	0.02	0.04	0.15
Benzene	<0.01	<0.01	<0.01	0.02
Toluene	<0.01	<0.01	0.02	0.07
Ethylbenzene	<0.01	<0.01	<0.01	0.02
Xylenes	<0.01	0.01	0.02	0.11
Other HAPs	0.00	0.00	0.00	0.00
Total HAPs	0.01	0.05	0.08	0.37

Proposed Controlled Hazardous Air Pollutant Emissions [11] - Controlled by Combustor (Represented under Combustor in the summary tables)

Pollutant	OTK-1 - OTK-8 (Each) Avg. lb/hr [12]	OTK-1 - OTK-8 (Each) tons/yr [13]	OTK-1 - OTK-8 (Total) Avg. lb/hr [14]	OTK-1 - OTK-8 (Total) tons/yr [15]
Total VOC	0.22	0.95	1.74	7.60
n-Hexane	<0.01	0.02	0.03	0.15
Benzene	<0.01	<0.01	<0.01	0.02
Toluene	<0.01	<0.01	0.02	0.07
Ethylbenzene	<0.01	<0.01	<0.01	0.02
Xylenes	<0.01	0.01	0.02	0.10
Other HAPs	0.00	0.00	0.00	0.00
Total HAPs	0.01	0.05	0.08	0.36

Estimated Hazardous Air Pollutant Composition (wt%) [16]

Pollutant	Wt%
n-Hexane	1.983%
Benzene	0.226%
Toluene	0.965%
Ethylbenzene	0.239%
Xylenes	1.364%
Other HAPs	0.000%
Total HAPs	4.78%

[1] VOC emissions calculated in the Criteria Air Pollutant calculations.

[2] Due to variable short-term emission rates, average lb/hr based on annual emissions shown for reference only.

Uncontrolled Hourly Emissions, Each (lb/hr) = Tanks Uncontrolled VOC, Each (lb/yr) * HAP Composition wt%

Uncontrolled n-Hexane Hourly Emissions, Each (lb/hr) = 11.07 lb/hr | 1.98% = 0.22 lb/hr

[3] Uncontrolled n-Hexane Hourly Emissions, Total (lb/hr) = Uncontrolled Hourly Emissions, Each (lb/hr) * Total Number of Tanks

Uncontrolled n-Hexane Hourly Emissions, Total (lb/hr) = 0.22 lb/hr | 08 Tanks = 1.76 lb/hr

[4] Uncontrolled Annual Emissions, Each (tpy) = Uncontrolled Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

Uncontrolled n-Hexane Annual Emissions, Each (tpy) = 0.22 lb/hr | 8,760 hr/yr | 1 ton/2,000 lb = 0.96 ton/yr

[5] Uncontrolled Annual Emissions, Total (tpy) = Uncontrolled Annual Emissions, Each (tpy) * Total Number of Tanks

Uncontrolled n-Hexane Annual Emissions, Total (tpy) = 0.96 ton/yr | 08 Tanks = 7.69 ton/yr

[6] Uncaptured Hourly/ Annual Emissions (lb/hr or tpy) are represented at emissions at the tank level.

[7] Proposed Uncaptured Hourly Emissions (lb/hr) = Uncontrolled Emissions (lb/hr) * (1- Capture efficiency (%))

Proposed Uncaptured n-Hexane Working Hourly Emissions (lb/hr) = 0.22 lb/hr | 1 - 98% = <0.01 lb/hr

[8] Proposed Uncaptured Hourly Emissions, Total (lb/hr) = Proposed Uncaptured Hourly Emissions, Each (lb/hr) * Total Number of Tanks

Proposed Uncaptured n-Hexane Hourly Emissions, Total (lb/hr) = <0.01 lb/hr | 08 Tanks = 0.04 lb/hr

[9] Proposed Uncaptured Annual Emissions, Each (tpy) = Uncaptured Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

Proposed Uncaptured Annual n-Hexane Emissions, Each (tpy) = <0.01 lb/hr | 8,760 hr/yr | 1 ton/2,000 lb = 0.02 ton/yr

[10] Proposed Uncaptured Annual Emissions, Total (tpy) = Uncaptured Annual Emissions, Each (tpy) * Total Number of Tanks

Proposed Uncaptured n-Hexane Hourly Emissions, Total (tpy) = 0.02 ton/yr | 08 Tanks = 0.15 ton/yr

OIL TANK EMISSION CALCULATIONS - HAZARDOUS AIR POLLUTANTS

[11] Controlled HAP emissions are captured vapors from the tanks which are routed and combusted by the Combustors and shown and accounted for under the combustors in the summary tables. Captured Emissions = Uncontrolled Emissions - Uncaptured Emissions.

[12] Proposed Controlled Hourly Emissions, Each (lb/hr) = Captured Emissions (Uncontrolled Emissions - Uncaptured Emissions) (lb/hr) * (1- Control efficiency (%))

Proposed Controlled n-Hexane Hourly Emissions, Each (lb/hr) = [0.22 lb/hr - <0.01 lb/hr] × 1 - 98% = <0.01 lb/hr

[13] Proposed Controlled Hourly Emissions, Total (lb/hr) = Proposed Controlled Hourly Emissions, Each (lb/hr) * Total Number of Tanks

Proposed Controlled n-Hexane Hourly Emissions, Total (lb/hr) = <0.01 lb/hr × 08 Tanks = 0.03 lb/hr

[14] Proposed Controlled Annual Emissions, Each (tpy) = Controlled Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

Proposed Controlled n-Hexane Annual Emissions, Each (tpy) = <0.01 lb/hr × 8,760 hr/yr × 1 ton/2,000 lb = 0.02 ton/yr

[15] Proposed Controlled Annual Emissions, Total (tpy) = Controlled Annual Emissions, Each (tpy) * Total Number of Tanks

Proposed Controlled n-Hexane Annual Emissions, Total (tpy) = 0.02 ton/yr × 08 Tanks = 0.15 ton/yr

[16] Representative separator oil analysis attached. HAP weight % calculated as % of total VOCs in sample. All HAP assumed to volatilize from liquids for most conservative estimate.

FIXED ROOF OIL TANKS - EMISSION CALCULATIONS

Fixed-Roof Tank Emissions
Based on AP-42, February 1996, Section 7.1.3.1.

Enter or select all information in **bold** lines. All other values are automatically calculated or are defaults. *Italics* indicate descriptions that are not used in the calculations. Defaults shown in blue text may be overwritten on a case-by-case basis.

Variable	Instructions/Defaults	Value
Tank Identification		*Smith Creek 8-32-70 B Pad (PN 910195) OTK1-OTK-8 (Each)*
Actual Location		*Converse County*
Location for Calculation Purposes	Select nearest city with defined meteorological data	Casper, Wyoming
Type of Substance	Select Organic Liquid, Petroleum Distillate, or Crude Oil	Petroleum Distillate
Contents of Tank	Select from list (add new compounds in 'VOLs' tab):	Gasoline (RVP 11)
Tank/Roof Type	Select Cone, Dome, or Horizontal Tank	Cone
Underground?	Select Aboveground or Underground	Aboveground
Diameter, ft		12
Shell Height or Length, ft		20
Nominal Capacity, gal		15,075
Throughput, gallons/yr		26,367,600
Tank Paint Color	Select from list (Default = White)	Gray/Light
Tank Paint Condition	Select from list (Default = Good)	Good
Effective Diameter, ft		12.0
Geometric Capacity, gal		16,920
Maximum Liquid Height, ft		20.0
Average Liquid Height, ft	Default = Maximum Liquid Height / 2	10.00
Cone Tank Roof Slope, ft/ft	Default = 0.0625; N/A for Horizontal tanks	0.0625
Dome Tank Roof Radius, ft	Default = Effective Diameter	N/A
Dome Tank Roof Height, ft		N/A
Roof Outage, ft		0.125
Vapor Space Outage, ft		10.13
Vapor Space Volume, ft^3		1145
Average Daily Minimum Ambient Temperature, F		31.60
Average Daily Maximum Ambient Temperature, F		68.51
Daily Total Solar Insolation Factor, Btu/ft^2/day		1394
Daily Average Ambient Temperature, F		45.1
Tank Paint Solar Absorbance, dimensionless		0.540
Daily Vapor Temperature Range, R		40.5
Daily Average Liquid Surf. Temperature, F		52.3
Daily Minimum Liquid Surf. Temperature, F		42.1
Daily Maximum Liquid Surf. Temperature, F		62.4
Liquid Bulk Temperature		47.3
Vapor Molecular Weight, lb/lbmol		65.0
Antoine's Coefficient A		N/A
Antoine's Coefficient B		N/A
Antoine's Coefficient C		N/A
Type of Substance (for use in calculations)		Gas
Vapor Pressure at Daily Av. Liquid Surf. Temp., psia		4.962
Vapor Pressure at Daily Min. Liquid Surf. Temp., psia		4.049
Vapor Pressure at Daily Max. Liquid Surf. Temp., psia		6.034
Vapor Pressure Calculation Method		AP-42 Figure 7.1-14b; RVP=11 ASTM Slope=3
Vapor Density, lb/ft^3		0.058714
Daily Vapor Pressure range, psi		1.985
Breather Vent Pressure Setting, psig	Default = 0.03	0.0300
Breather Vent Vacuum Setting, psig	Default = -0.03	-0.0300
Breather Vent Pressure Setting Range, psi		0.0600
Ambient Pressure, psia		12.1
Vapor Space Expansion Factor		0.3474
Vented Vapor Saturation Factor		0.273
Annual Turnovers		1558.32
Turnover Factor		0.19
Working Loss Product Factor		1.00
Standing Storage Loss, lb/yr		2327
Working Loss, lb/yr		37647
Total Losses, lb/yr		39974

WATER TANK EMISSION CALCULATIONS - CRITERIA AIR POLLUTANTS

Unit ID =	WTK-1 - WTK-4 (Each)	WTK-1 - WTK-4 (Total)
Number of Tanks =	4	-
Capacity (bbl) =	400	-
Capacity (gal) =	16,800	-
Throughput (bbl/yr)[1] =	136,875	547,500
Throughput (gal/yr)[1] =	5,748,750	22,995,000
Throughput (bbl/d)[1] =	375	1,500
Tanks 4.0.9d Working Losses (lb/yr)[2] =	11,256.32	-
Tanks 4.0.9d Breathing Losses (lb/yr)[2] =	2,327.27	-
Tanks 4.0.9d Total Losses (lb/yr)[2] =	13,583.59	
1% Tanks 4.0.9d Working Losses (lb/yr)[2] =	112.56	
1% Tanks 4.0.9d Breathing Losses (lb/yr)[2] =	23.27	
Flash Emission Factor (lb VOC/bbl)[3] =	0.01613	-
Capture Efficiency =	98.00%	98.00%
Control Type =	Combustion Chamber	Combustion Chamber
Control Efficiency [4] =	98.00%	98.00%

Uncontrolled VOC Emissions

Emissions	WTK-1 - WTK-4 (Each) Avg. lb/hr [5]	WTK-1 - WTK-4 (Each) tons/yr [6]	WTK-1 - WTK-4 (Total) Avg. lb/hr [7]	WTK-1 - WTK-4 (Total) tons/yr [8]
Working	0.01	0.06	0.05	0.23
Breathing	<0.01	0.01	0.01	0.05
Flashing	0.25	1.10	1.01	4.41
Total	0.27	1.17	1.07	4.69

Proposed Uncaptured VOC Emissions[9] - Not captured by the combustors (Represented under PW Tanks in the summary tables)

Emissions	WTK-1 - WTK-4 (Each) Avg. lb/hr [10]	WTK-1 - WTK-4 (Each) tons/yr [11]	WTK-1 - WTK-4 (Total) Avg. lb/hr [12]	WTK-1 - WTK-4 (Total) tons/yr [13]
Working	<0.01	<0.01	<0.01	<0.01
Breathing	<0.01	<0.01	<0.01	<0.01
Flashing	<0.01	0.02	0.02	0.09
Total	0.01	0.02	0.02	0.09

Proposed Controlled VOC Emissions[14] - Controlled by Combustor (Represented under Combustor in the summary tables)

Emissions	WTK-1 - WTK-4 (Each) Avg. lb/hr [15]	WTK-1 - WTK-4 (Each) tons/yr [16]	WTK-1 - WTK-4 (Total) Avg. lb/hr [17]	WTK-1 - WTK-4 (Total) tons/yr [18]
Working	<0.01	<0.01	<0.01	<0.01
Breathing	<0.01	<0.01	<0.01	<0.01
Flashing	<0.01	0.02	0.02	0.09
Total	0.01	0.02	0.02	0.09

[1] Individual tank throughputs shown for worst-case breathing emissions estimate only and not intended as a per tank limit.

[2] Working and breathing losses for produced water modeled assuming all water is crude (Gasoline RVP 11 for conservative emissions estimate) and 1% of the calculated emissions are emitted. Flashing emission factor calculated with Promax process simulations. Process simulation results and EPA Tanks 4.09d emissions reports attached. Tank vapor destroyed by combustion chamber with manufactured-estimated 98% control efficiency.

[3] Calculated by Promax process simulation (report attached).

[4] Control efficiency of the combustor is 98 %.

[5] Due to variable short-term emission rates, average lb/hr based on annual emissions shown for reference only.

Uncontrolled Hourly Emissions, Each (lb/hr) = Tanks 4.0.9d Working Losses (lb/yr) / 8,760 (hrs/yr) and Tanks 4.0.9d Breathing Losses (lb/yr) / 8,760 (hrs/yr) and Flash Emission Factor (lb VOC/bbl) x Throughput (bbl/yr) / 8,760 (hrs/yr)

Uncontrolled Working Hourly Emissions, Each (lb/hr) = 112.56 lb/yr | 1 yr/8,760 hr = 0.01 lb/hr

[6] Uncontrolled Hourly Emissions, Total (lb/hr) = Uncontrolled Hourly Emissions, Each (lb/hr) * Total Number of Tanks

Uncontrolled Hourly Emissions, Total (lb/hr) = 0.01 lb/hr | 4 Tanks = 0.05 lb/hr

[7] Uncontrolled Annual Emissions, Each (tpy) = Uncontrolled Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

Uncontrolled Annual Emissions, Each (tpy) = 0.01 lb/hr | 8,760 hr/yr | 1 ton/2,000 lb = 0.06 ton/yr

[8] Uncontrolled Annual Emissions, Total (tpy) = Uncontrolled Annual Emissions, Each (tpy) * Total Number of Tanks

Uncontrolled Annual Working Emissions, Total (tpy) = 0.06 ton/yr | 4 Tanks = 0.23 ton/yr

[9] Uncaptured Hourly/ Annual Emissions (lb/hr or tpy) = Uncontrolled Emissions (lb/hr or tpy) * (1- Capture Efficiency (%))

[10] Proposed Uncaptured Hourly Emissions (lb/hr) = Uncontrolled Emissions (lb/hr) * (1- Capture efficiency (%))

Proposed Uncaptured Working Hourly Emissions (lb/hr) = 0.01 lb/hr | 1 - 98% = <0.01 lb/hr

[11] Proposed Uncaptured Hourly Emissions, Total (lb/hr) = Proposed Uncaptured Hourly Emissions, Each (lb/hr) * Total Number of Tanks

Proposed Uncaptured Working Hourly Emissions, Total (lb/hr) = <0.01 lb/hr | 4 Tanks = <0.01 lb/hr

[12] Proposed Uncaptured Annual Emissions, Each (tpy) = Uncaptured Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

Proposed Uncaptured Working Annual Emissions, Each (tpy) = <0.01 lb/hr | 8,760 hr/yr | 1 ton/2,000 lb = <0.01 ton/yr

[13] Proposed Uncaptured Annual Emissions, Total (tpy) = Uncaptured Annual Emissions, Each (tpy) * Total Number of Tanks

Uncaptured Annual Working Emissions, Total (tpy) = <0.01 ton/yr | 4 Tanks = <0.01 ton/yr

WATER TANK EMISSION CALCULATIONS - CRITERIA AIR POLLUTANTS

[14] Controlled VOC emissions are captured vapors from the tanks which are routed and combusted by the Combustors and shown and accounted for under the combustors in the summary tables.
Captured Emissions = Uncontrolled Emissions - Uncaptured Emissions.

[15] Proposed Controlled Hourly Emissions (lb/hr) =

Captured Emissions (Uncontrolled Emissions - Uncaptured Emissions) (lb/hr) * (1- Control efficiency (%))

Proposed Controlled Working Hourly Emissions (lb/hr) = [0.01 lb - <0.01 lb] / hr | 1 - 98% = <0.01 lb / hr

[16] Proposed Controlled Hourly Emissions, Total (lb/hr) =

Proposed Controlled Hourly Emissions, Each (lb/hr) * Total Number of Tanks

Proposed Controlled Working Hourly Emissions, Total (lb/hr) = <0.01 lb / hr | 4 Tanks = <0.01 lb / hr

[17] Proposed Controlled Annual Emissions, Each (tpy) =

Controlled Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

Proposed Controlled Working Annual Emissions, Each (tpy) = <0.01 lb / hr | 8,760 hr / yr | 1 ton / 2,000 lb = <0.01 ton / yr

[18] Proposed Controlled Annual Emissions, Total (tpy) =

Controlled Annual Emissions, Each (tpy) * Total Number of Tanks

Controlled Working Annual Working Emissions, Total (tpy) = <0.01 ton / yr | 4 Tanks = <0.01 ton / yr

WATER TANK EMISSION CALCULATIONS - HAZARDOUS AIR POLLUTANTS

Unit ID =	WTK-1 - WTK-4 (Each)	WTK-1 - WTK-4 (Total)
Number of Tanks =	4	-
Capacity (bbl) =	400	-
Capacity (gal) =	16,800	-
Throughput (bbl/yr) =	136,875	547,500
Throughput (gal/yr) =	5,748,750	22,995,000
Throughput (bbl/d) =	375	1,500
Capture Efficiency =	98.00%	98.00%
Control Type =	Combustion Chamber	Combustion Chamber
Control Efficiency =	98.00%	98.00%
Overall Reduction Efficiency =	96.0400%	

Uncontrolled Hazardous Air Pollutant Emissions

Pollutant	WTK-1 - WTK-4 (Each) Avg. lb/hr [2]	WTK-1 - WTK-4 (Each) tons/yr [3]	WTK-1 - WTK-4 (Total) Avg. lb/hr [4]	WTK-1 - WTK-4 (Total) tons/yr [5]
Total VOC [1]	0.27	1.17	1.07	4.69
n-Hexane	<0.01	0.02	0.02	0.09
Benzene	<0.01	<0.01	<0.01	0.01
Toluene	<0.01	0.01	0.01	0.05
Ethylbenzene	<0.01	<0.01	<0.01	0.01
Xylenes	<0.01	0.02	0.01	0.06
Other HAPs	0.00	0.00	0.00	0.00
Total HAPs	0.01	0.06	0.05	0.22

Proposed Uncaptured HAP Emissions[6] - Not captured by the combustors (Represented under PW Tanks in the summary tables)

Pollutant	WTK-1 - WTK-4 (Each) Avg. lb/hr [7]	WTK-1 - WTK-4 (Each) tons/yr [8]	WTK-1 - WTK-4 (Total) Avg. lb/hr [9]	WTK-1 - WTK-4 (Total) tons/yr [10]
Total VOC [1]	0.01	0.02	0.02	0.09
n-Hexane	<0.01	<0.01	<0.01	<0.01
Benzene	<0.01	<0.01	<0.01	<0.01
Toluene	<0.01	<0.01	<0.01	<0.01
Ethylbenzene	<0.01	<0.01	<0.01	<0.01
Xylenes	<0.01	<0.01	<0.01	<0.01
Other HAPs	0.00	0.00	0.00	0.00
Total HAPs	<0.01	<0.01	<0.01	<0.01

Proposed Controlled Hazardous Air Pollutant (HAP) Emissions[11] - Controlled by Combustor (Represented under Combustor in the summary tables)

Pollutant	WTK-1 - WTK-4 (Each) Avg. lb/hr [12]	WTK-1 - WTK-4 (Each) tons/yr [13]	WTK-1 - WTK-4 (Total) Avg. lb/hr [14]	WTK-1 - WTK-4 (Total) tons/yr [15]
Total VOC [1]	0.01	0.02	0.02	0.09
n-Hexane	<0.01	<0.01	<0.01	<0.01
Benzene	<0.01	<0.01	<0.01	<0.01
Toluene	<0.01	<0.01	<0.01	<0.01
Ethylbenzene	<0.01	<0.01	<0.01	<0.01
Xylenes	<0.01	<0.01	<0.01	<0.01
Other HAPs	0.00	0.00	0.00	0.00
Total HAPs	<0.01	<0.01	<0.01	<0.01

Estimated Hazardous Air Pollutant Composition (wt%) [16]

Pollutant	Wt%
n-Hexane	1.983%
Benzene	0.226%
Toluene	0.965%
Ethylbenzene	0.239%
Xylenes	1.364%
Other HAPs	0.000%
Total HAPs	4.78%

[1] VOC emission calculated in the Criteria Air Pollutant calculations.

[2] Due to variable short-term emission rates, average lb/hr based on annual emissions shown for reference only.

Uncontrolled Hourly Emissions, Each (lb/hr) = Tanks Uncontrolled VOC, Each (lb/yr) * HAP Composition wt%

Uncontrolled n-Hexane Hourly Emissions, Each (lb/hr) = 0.27 lb/hr | 1.98% = <0.01 lb/hr

[3] Uncontrolled n-Hexane Hourly Emissions, Total (lb/hr) = Uncontrolled Hourly Emissions, Each (lb/hr) * Total Number of Tanks

Uncontrolled n-Hexane Hourly Emissions, Total (lb/hr) = 0.01 lb/hr | 4 Tanks = 0.02 lb/hr

[7] Uncontrolled Annual Emissions, Each (tpy) = Uncontrolled Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

Uncontrolled n-Hexane Annual Emissions, Each (tpy) = 0.01 lb/hr | 8,760 hr/yr | 1 ton/2,000 lb = 0.02 ton/yr

[11] Uncontrolled Annual Emissions, Total (tpy) = Uncontrolled Annual Emissions, Each (tpy) * Total Number of Tanks

Uncontrolled n-Hexane Annual Emissions, Total (tpy) = 0.02 ton/yr | 4 Tanks = 0.09 ton/yr

[6] Uncaptured Hourly/ Annual Emissions (lb/hr or tpy) are represented at emissions at the tank level.

[7] Proposed Uncaptured Hourly Emissions (lb/hr) = Uncontrolled Emissions (lb/hr) * (1- Capture efficiency (%))

Proposed Uncaptured n-Hexane Working Hourly Emissions (lb/hr) <0.01 lb/hr | 1 - 98% = <0.01 lb/hr

[8] Proposed Uncaptured Hourly Emissions, Total (lb/hr) = Proposed Uncaptured Hourly Emissions, Each (lb/hr) * Total Number of Tanks

Proposed Uncaptured n-Hexane Hourly Emissions, Total (lb/hr) = <0.01 lb/hr | 4 Tanks = <0.01 lb/hr

[9] Proposed Uncaptured Annual Emissions, Each (tpy) = Uncaptured Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

Proposed Uncaptured Annual n-Hexane Emissions, Each (tpy) = <0.01 lb/hr | 8,760 hr/yr | 1 ton/2,000 lb = <0.01 ton/yr

[10] Proposed Uncaptured Annual Emissions, Total (tpy) = Uncaptured Annual Emissions, Each (tpy) * Total Number of Tanks

Proposed Uncaptured n-Hexane Hourly Emissions, Total (tpy) = <0.01 ton/yr | 04 Tanks = <0.01 ton/yr

WATER TANK EMISSION CALCULATIONS - HAZARDOUS AIR POLLUTANTS

[11] Controlled HAP emissions are captured vapors from the tanks which are combusted by the Combustors and shown under the combustors in the summary tables.
Captured Emissions = Uncontrolled Emissions - Uncaptured Emissions.

[12] Proposed Controlled Hourly Emissions, Each (lb/hr) =
Proposed Controlled n-Hexane Hourly Emissions, Each (lb/hr) =

$$\frac{\text{[0.01 lb - <0.01 lb]}}{\text{hr}} \times 1 - 98\% = \frac{\text{<0.01 lb}}{\text{hr}}$$

Captured Emissions (Uncontrolled Emissions - Uncaptured Emissions) (lb/hr) * (1 - Control efficiency [%])

[13] Proposed Controlled Hourly Emissions, Total (lb/hr) =
Proposed Controlled n-Hexane Hourly Emissions, Total (lb/hr) =

$$\frac{\text{<0.01 lb}}{\text{hr}} \times 4 \text{ Tanks} = \frac{\text{<0.01 lb}}{\text{hr}}$$

Proposed Controlled Hourly Emissions, Each (lb/hr) * Total Number of Tanks

[14] Proposed Controlled Annual Emissions, Each (tpy) =
Proposed Controlled n-Hexane Annual Emissions, Each (tpy) =

$$\frac{\text{<0.01 lb}}{\text{hr}} \times \frac{8{,}760 \text{ hr}}{\text{yr}} \times \frac{1 \text{ ton}}{2{,}000 \text{ lb}} = \frac{\text{<0.01 ton}}{\text{yr}}$$

Controlled Hourly Emissions, Each (lb/hr) * 8,760 (hrs/yr) * (1 ton/2000 lb)

[15] Proposed Controlled Annual Emissions, Total (tpy) =
Proposed Controlled n-Hexane Annual Emissions, Total (tpy) =

$$\frac{\text{<0.01 ton}}{\text{yr}} \times 4 \text{ Tanks} = \frac{\text{<0.01 ton}}{\text{yr}}$$

Controlled Annual Emissions, Each (tpy) * Total Number of Tanks

[16] Representative separator oil analysis attached. HAP weight % calculated as % of total VOCs in sample. All HAP assumed to volatilize from liquids for most conservative estimate.

FIXED ROOF WATER TANKS - EMISSION CALCULATIONS

Fixed-Roof Tank Emissions
Based on AP-42, February 1996, Section 7.1.3.1.

Enter or select all information in **bold** lines. All other values are automatically calculated or are defaults. *Italics* indicate descriptions that are not used in the calculations. Defaults shown in blue text may be overwritten on a case-by-case basis.

Variable	Instructions/Defaults	Value
Tank Identification		***Smith Creek 8-32-70 B Pad (PN 910195) WTK-1- WTK-4 (Each)***
Actual Location		***Converse County***
Location for Calculation Purposes	**Select nearest city with defined meteorological data**	**Casper, Wyoming**
Type of Substance	**Select Organic Liquid, Petroleum Distillate, or Crude Oil**	**Petroleum Distillate**
Contents of Tank	**Select from list (add new compounds in 'VOLs' tab):**	**Gasoline (RVP 11)**
Tank/Roof Type	**Select Cone, Dome, or Horizontal Tank**	**Cone**
Underground?	**Select Aboveground or Underground**	**Aboveground**
Diameter, ft		**12**
Shell Height or Length, ft		**20**
Nominal Capacity, gal		**16,075**
Throughput, gallons/yr		**5,748,750**
Tank Paint Color	**Select from list (Default = White)**	**Gray/Light**
Tank Paint Condition	**Select from list (Default = Good)**	**Good**
Effective Diameter, ft		12.0
Geometric Capacity, gal		16,920
Maximum Liquid Height, ft		20.0
Average Liquid Height, ft	Default = Maximum Liquid Height / 2	10.00
Cone Tank Roof Slope, ft/ft	Default = 0.0625; N/A for Horizontal tanks	0.0625
Dome Tank Roof Radius, ft	Default = Effective Diameter	N/A
Dome Tank Roof Height, ft		N/A
Roof Outage, ft		0.125
Vapor Space Outage, ft		10.13
Vapor Space Volume, ft^3		1145
Average Daily Minimum Ambient Temperature, F		31.60
Average Daily Maximum Ambient Temperature, F		58.51
Daily Total Solar Insolation Factor, Btu/ft^2/day		1394
Daily Average Ambient Temperature, F		45.1
Tank Paint Solar Absorbance, dimensionless		0.540
Daily Vapor Temperature Range, R		40.5
Daily Average Liquid Surf. Temperature, F		52.3
Daily Minimum Liquid Surf. Temperature, F		42.1
Daily Maximum Liquid Surf. Temperature, F		62.4
Liquid Bulk Temperature		47.3
Vapor Molecular Weight, lb/lbmol		65.0
Antoine's Coefficient A		N/A
Antoine's Coefficient B		N/A
Antoine's Coefficient C		N/A
Type of Substance (for use in calculations)		Gas
Vapor Pressure at Daily Av. Liquid Surf. Temp., psia		4.962
Vapor Pressure at Daily Min. Liquid Surf. Temp., psia		4.049
Vapor Pressure at Daily Max. Liquid Surf. Temp., psia		6.034
Vapor Pressure Calculation Method		AP-42 Figure 7.1-14b: RVP=11 ASTM Slope=3
Vapor Density, lb/ft^3		0.058714
Daily Vapor Pressure range, psi		1.985
Breather Vent Pressure Setting, psig	Default = 0.03	0.0300
Breather Vent Vacuum Setting, psig	Default = -0.03	-0.0300
Breather Vent Pressure Setting Range, psi		0.0600
Ambient Pressure, psia		12.1
Vapor Space Expansion Factor		0.3474
Vented Vapor Saturation Factor		0.273
Annual Turnovers		339.75
Turnover Factor		0.25
Working Loss Product Factor		1.00
Standing Storage Loss, lb/yr		**2327**
Working Loss, lb/yr		**11256**
Total Losses, lb/yr		**13584**

TRUCK LOADING OF CONDENSATE CALCULATIONS - CRITERIA AND HAZARDOUS AIR POLLUTANTS

Unit ID =	**TL-1**
Fill Method =	Submerged
Type of Service =	Dedicated
Mode of Operation =	Normal
Saturation Factor =	0.6
Emission Factor (lb/1000 gal)[1] =	4.75
Oil Throughput for Truck-Loadout (bbl/day) =	13,760
Throughput (gal/hr) =	24,080
Annual Throughput (gal/yr) =	210,940,800
Throughput (1000 gal) =	210,941
Control Type =	Submerged Loading
Vapor Capture Efficiency =	98.70%
Captured Vapor Routed to =	Combustor
Combustion Chamber Efficiency [2] =	98.00%

True Vapor pressure of liquid loaded (average psia), P [1] =	4.962	psia
Molecular weight of vapor, M [1] =	65	lb/lb-mol
Average Temperature of bulk liquid loaded, T [1] =	47.294	F
Average Temperature of bulk liquid loaded, T=	507.294	R

Uncontrolled Hazardous Air Pollutant Emissions [3]

Pollutant	TL-1 lb/hr [4]	TL-1 tons/yr [5]
Total VOC	114.46	501.31
n-Hexane	2.27	9.94
Benzene	0.26	1.13
Toluene	1.10	4.84
Ethylbenzene	0.27	1.20
Xylenes	1.56	6.84
Other HAPs	0.00	0.00
Total HAPs	5.17	23.95

Proposed Uncaptured VOC Emissions - Not captured by the combustors (Represented under Truck Loading - Condensate in the summary tables)

Pollutant	TL-1 lb/hr [6]	TL-1 tons/yr [7]
Total VOC	1.49	6.52
n-Hexane	0.03	0.13
Benzene	<0.01	0.01
Toluene	0.01	0.06
Ethylbenzene	<0.01	0.02
Xylenes	0.02	0.09
Other HAPs	0.00	0.00
Total HAPs [11]	0.07	0.31

Proposed Controlled Hazardous Air Pollutant Emissions [8] - Controlled by Combustor (Represented under Combustor in the summary tables)

Pollutant	TL-1 lb/hr [9]	TL-1 tons/yr [10]
Total VOC	2.26	9.90
n-Hexane	0.04	0.20
Benzene	<0.01	0.02
Toluene	0.02	0.10
Ethylbenzene	<0.01	0.02
Xylenes	0.03	0.13
Other HAPs	0.00	0.00
Total HAPs [11]	0.11	0.47

Estimated Hazardous Air Pollutant Composition (wt%) [12]

Pollutant	Wt%
n-Hexane	1.98%
Benzene	0.23%
Toluene	0.97%
Ethylbenzene	0.24%
Xylenes	1.36%
Other HAPs	0.00%
Total HAPs	4.78%

[1] AP-42 5.2-4 Eq.1: Loading Loss (lb/1000gal) = 12.46*S*P*M/T. Properties based on EPA TANKS 4.0.9d.

Loss Equation and Variables are from AP-42, Section 5.2, Transportation and Marketing of Petroleum Liquids (June 2008).

True vapor pressure, molecular weight of tank vapors from AP-42, Section 7.1, Table 7.1-2, Organic Liquid Storage Tanks (November 2006).

[2] Control efficiency of the combustor is 98 %.

[3] Due to variable short-term emission rates, average lb/hr based on annual emissions shown for reference only.

[4] Uncontrolled Hourly VOC Emissions, (lb/hr) = Maximum Loading Rate (gal/hr) * Emission Factor (lb/1000 gal) / 1000

$$\frac{4.75\ \text{lb}}{1000\ \text{gal}} \times \frac{24{,}080\ \text{gal}}{\text{hr}} \times \frac{1}{1000} = \frac{114.46\ \text{lb}}{\text{hr}}$$

[5] Uncontrolled Annual VOC Emissions, (tpy) = Throughput (gal/hr) * Emission Factor (lb/1000 gal) / 2000

$$\frac{4.75\ \text{lb}}{1000\ \text{gal}} \times \frac{210{,}941\ \text{gal}}{\text{yr}} \times \frac{\text{ton}}{2000\ \text{lb}} = \frac{501.31\ \text{ton}}{\text{yr}}$$

[6] Proposed Uncaptured Hourly VOC Emissions (lb/hr) = Uncontrolled Emissions (lb/hr) * (1- Capture efficiency (%))

$$\frac{114.46\ \text{lb}}{\text{hr}} \times 1 - 98.70\% = \frac{1.49\ \text{lb}}{\text{hr}}$$

[7] Proposed Uncaptured Annual VOC Emissions, (tpy) = Uncontrolled Annual VOC Emissions (tpy) * (1- Capture efficiency (%))

$$\frac{501.31\ \text{ton}}{\text{yr}} \times 1 - 98.70\% = \frac{6.52\ \text{ton}}{\text{yr}}$$

[8] Controlled VOC emissions are captured vapors from the truckloading of condensate which are combusted by the Combustors and shown under the combustors in the summary table. Captured Emissions = Uncontrolled Emissions - Uncaptured Emissions.

[9] Proposed Controlled Hourly VOC Emissions (lb/hr) = Captured VOC Emissions (Uncontrolled Emissions - Uncaptured Emissions) (lb/hr) * (1 - control efficiency)

$$\frac{[114.46\ \text{lb} - 1.49\ \text{lb}]}{\text{hr}} \times 1 - 98.00\% = \frac{2.26\ \text{lb}}{\text{hr}}$$

[10] Proposed Controlled Annual VOC Emissions, (tpy) = Captured Annual VOC Emissions (Uncontrolled Emissions - Uncaptured Emissions) (tpy) * (1 - control efficiency)

$$\frac{[501.31\ \text{ton} - 6.52\ \text{ton}]}{\text{yr}} \times 1 - 99.00\% = \frac{9.90\ \text{ton}}{\text{yr}}$$

[11] HAP Emissions = VOC Emissions * HAP Composition wt%

[12] Representative separator oil analysis attached. HAP weight % calculated as % of total VOCs in sample. All HAP assumed to volatilize from liquids for most conservative estimate.

TRUCK LOADING OF PW CALCULATIONS - CRITERIA AND HAZARDOUS AIR POLLUTANTS

Unit ID =	**TL-2**
Fill Method =	Submerged
Type of Service =	Dedicated
Mode of Operation =	Normal
Saturation Factor =	0.6
Emission Factor (lb/1000 gal)[1] =	4.75
PW Throughput for Truck-Loadout (bbl/day) =	1,500
Throughput (gal/hr) =	2,625
Total Annual Throughput for PW Truck-Loadout (gal/yr) =	22,995,000
Total Annual Throughput for PW Truck-Loadout (as Condensate) (gal/yr)[3] =	229,950
Throughput (1000 gal) =	22,995
Control Type =	Submerged Loading
Vapor Capture Efficiency =	70.00%
Captured Vapor Routed to =	Combastor
Combustion Chamber Efficiency[2] =	98.00%

Note: Throughput (gal/hr) for PW loading was estimated assuming that 1% of all loading PW throughput will be equal to the emissions profile of condensate loading.

True Vapor pressure of liquid loaded (average psia), P[1] =	4.962	psia
Molecular weight of vapor, M[1] =	65	lb/lb-mol
Average Temperature of bulk liquid loaded, T[1] =	47.294	F
Average Temperature of bulk liquid loaded, T=	507.294	R

Uncontrolled Hazardous Air Pollutant Emissions[3]

Pollutant	TL-2 lb/hr[4]	TL-2 tons/yr[5]
Total VOC	0.12	0.55
n-Hexane	<0.01	0.01
Benzene	<0.01	<0.01
Toluene	<0.01	<0.01
Ethylbenzene	<0.01	<0.01
Xylenes	<0.01	<0.01
Other HAPs	0.00	0.00
Total HAPs	<0.01	0.03

Proposed Uncaptured VOC Emissions - Not captured by the combustors (Represented under Truck Loading - PW in the summary tables)

Pollutant	TL-2 lb/hr[6]	TL-2 tons/yr[7]
Total VOC	0.04	0.16
n-Hexane	<0.01	<0.01
Benzene	<0.01	<0.01
Toluene	<0.01	<0.01
Ethylbenzene	<0.01	<0.01
Xylenes	<0.01	<0.01
Other HAPs	0.00	0.00
Total HAPs[11]	<0.01	0.01

Proposed Controlled Hazardous Air Pollutant Emissions[8] - Controlled by Combustor (Represented under Combustor in the summary tables)

Pollutant	TL-2 lb/hr[9]	TL-2 tons/yr[10]
Total VOC	<0.01	<0.01
n-Hexane	<0.01	<0.01
Benzene	<0.01	<0.01
Toluene	<0.01	<0.01
Ethylbenzene	<0.01	<0.01
Xylenes	<0.01	<0.01
Other HAPs	0.00	0.00
Total HAPs[11]	<0.01	<0.01

Estimated Hazardous Air Pollutant Composition (wt%)[12]

Pollutant	Wt%
n-Hexane	1.98%
Benzene	0.23%
Toluene	0.97%
Ethylbenzene	0.24%
Xylenes	1.36%
Other HAPs	0.00%
Total HAPs	4.78%

[1] AP-42 5.2-4 Eq.1: Loading Loss (lb/1000gal) = 12.46*S*P*M/T. Properties based on EPA TANKS 4.0.9d. Throughput (gal/yr) for PW loading was estimated assuming that 1% of all loading PW throughput will be equal to the emissions profile of condensate loading.

Loss Equation and Variables are from AP-42, Section 5.2, Transportation and Marketing of Petroleum Liquids (June 2008).

True vapor pressure, molecular weight of tank vapors from AP-42, Section 7.1, Table 7.1-2, Organic Liquid Storage Tanks (November 2006).

[2] Control efficiency of the combustor is 98 %.

[3] Due to variable short-term emission rates, average lb/hr based on annual emissions shown for reference only. Note that only 1% of the produced water can be considered as condensate. Therefore the emissions obtained are multiplied by 1% to estimate emissions from produced water loading.

[4] Uncontrolled Hourly VOC Emissions, (lb/hr) = Maximum Loading Rate (gal/hr) * Emission Factor (lb/1000 gal) / 1000

$$\frac{4.75\ \text{lb}}{1000\ \text{gal}} \times \frac{2{,}625\ \text{gal}}{\text{hr}} \times \frac{1}{1000} = \frac{0.12\ \text{lb}}{\text{hr}}$$

[5] Uncontrolled Annual VOC Emissions, (tpy) = Throughput (gal/hr) * Emission Factor (lb/1000 gal) / 2000

$$\frac{4.75\ \text{lb}}{1000\ \text{gal}} \times \frac{22{,}995\ \text{gal}}{\text{yr}} \times \frac{\text{ton}}{2000\ \text{lb}} = \frac{0.55\ \text{ton}}{\text{yr}}$$

[6] Proposed Uncaptured Hourly VOC Emissions (lb/hr) = Uncontrolled Emissions (lb/hr) * (1- Capture efficiency (%))

$$\frac{0.12\ \text{lb}}{\text{hr}} \times (1 - 70.00\%) = \frac{0.04\ \text{lb}}{\text{hr}}$$

[7] Proposed Uncaptured Annual VOC Emissions, (tpy) = Uncontrolled Annual VOC Emissions (tpy) * (1- Capture efficiency (%))

$$\frac{0.55\ \text{ton}}{\text{yr}} \times (1 - 70.00\%) = \frac{0.16\ \text{ton}}{\text{yr}}$$

[8] Controlled VOC emissions are captured vapors from the truck loading of produced water which are combusted by the Combustors and shown under the combustors in the summary tables. Captured Emissions = Uncontrolled Emissions - Uncaptured Emissions.

[9] Proposed Controlled Hourly VOC Emissions (lb/hr) = Captured VOC Emissions (Uncontrolled Emissions - Uncaptured Emissions) (lb/hr) * (1 - control efficiency)

$$\frac{[0.12\ \text{lb} - 0.04\ \text{lb}]}{\text{hr}} \times (1 - 98.00\%) = \frac{<0.01\ \text{lb}}{\text{hr}}$$

[10] Proposed Controlled Annual VOC Emissions, (tpy) = Captured VOC Emissions (Uncontrolled Emissions - Uncaptured Emissions) (tpy) * (1 - control efficiency)

$$\frac{[0.55\ \text{ton} - 0.16\ \text{ton}]}{\text{yr}} \times (1 - 98.00\%) = \frac{0.01\ \text{ton}}{\text{yr}}$$

[11] HAP Emissions = VOC Emissions * HAP Composition wt%

[12] Representative separator oil analysis attached. HAP weight % calculated as % of total VOCs in sample. All HAP assumed to volatilize from liquids for most conservative estimate.

HEATER TREATER EMISSIONS CALCULATIONS - CRITERIA AIR POLLUTANTS

Unit ID =	HT-1 - HT-3 (Each)	HT-1 - HT-3 (Total)
Description	Heater Treater	-
Number of Heater Treaters =	3	-
Combustor Type =	AP-42 converted to HHV	
Control Efficiency =	0%	
Max Burner Design Capacity (MMBtu/hr) =	0.5	-
Fuel HHV (Btu/scf) [1] =	1,359	-
Annual Fuel Use (MMscf/yr) [2] =	3.22	9.67
Annual Operating Hours =	8,760	-

Criteria Air Pollutant Emissions

Unit ID: Pollutant	HT-1 - HT-3 (Each) lb/hr [4]	HT-1 - HT-3 (Each) tons/yr [5]	HT-1 - HT-3 (Total) lb/hr [6]	HT-1 - HT-3 (Total) tons/yr [6]
NO_x	0.05	0.21	0.15	0.64
CO	0.04	0.18	0.12	0.54
VOC	<0.01	0.01	<0.01	0.04
SO_2	<0.01	<0.01	<0.01	<0.01
$PM_{10/2.5}$ [3]	<0.01	0.01	<0.01	0.04
PM_{COND} [3]	<0.01	<0.01	<0.01	0.01
PM_{TOT} [3]	<0.01	0.02	0.01	0.05

AP-42 Emission Factor for Units < 100 MMBtu/hr. (lb/MMscf) [7]

Pollutant	Uncontrolled 1,4-1,-2 (7/98)	AP-42 Controlled to HHV 1,4-1, -2 (7/98)
NO_x	100.00	133.22
CO	84.00	111.90
VOC	5.50	7.33
SO_2	0.60	0.80
$PM_{10/2.5}$	5.70	7.59
PM_{COND}	1.90	2.53
PM_{TOT}	7.60	10.12

[1] Calculated by Promax process simulation (report attached).

[2] Heater Treater Emissions are based on the heat input rating of the heater treaters. Annual Fuel Usage rate as follows:

Annual Fuel Use (MMscf/yr)= $\frac{500{,}000\ \text{Btu}}{\text{hr}} \times \frac{\text{scf}}{1{,}359\ \text{Btu}} \times \frac{8{,}760\ \text{hr}}{\text{yr}} \times \frac{\text{MMscf}}{1{,}000{,}000\ \text{scf}} \times \frac{3\ \text{(No of Heaters)}}{} = \frac{9.67\ \text{MMscf}}{\text{yr}}$

[3] All PM (total, condensable and filterable) is assumed to be < 1 micrometer in diameter. Total PM is the sum of filterable PM and condensable PM

[4] Emissions (lb/hr) = Emission Factor (lb/MMscf) x Annual Fuel Usage (MMscf/yr) / 8760 hr/yr.

Example Hourly NO_x Emission, Each lb/hr = $\frac{133.22\ \text{lb}}{\text{MMscf}} \times \frac{3.22\ \text{MMscf}}{\text{yr}} \times \frac{\text{yr}}{8{,}760\ \text{hr}} = \frac{0.05\ \text{lb}}{\text{hr}}$

[5] Emissions (tpy) = Emissions (lb/hr) x Hours of Operation per year (8760 hr/yr)/ 2,000 lb/ton

Example Annual NO_x Emissions, Each tpy = $\frac{0.05\ \text{lb}}{\text{hr}} \times \frac{8{,}760\ \text{hr}}{\text{yr}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} = \frac{0.21\ \text{ton}}{\text{yr}}$

[6] Total Emissions = Emissions per Heater Treater x Number of Heater Treaters

Example Hourly NO_x Emissions, Total lb/hr = $\frac{0.05\ \text{lb}}{\text{hr}} \times 3\ \text{Heaters} = \frac{0.15\ \text{lb}}{\text{hr}}$

Example Annual NO_x Emissions, Total tpy = $\frac{0.21\ \text{ton}}{\text{yr}} \times 3\ \text{Heaters} = \frac{0.64\ \text{ton}}{\text{yr}}$

[7] Emission factors shown above based on an average higher heating value (HHV) of 1,020 Btu/scf. Emission factors may be converted to other heating values by multiplying the given emission factor by the ratio of the specified heating value to the average heating value.

Example NO_x Emission Factor, lb/scf = $\frac{100\ \text{lb}}{\text{MMscf}} \times \frac{1{,}359\ \text{Btu}}{\text{scf}} \times \frac{\text{scf}}{1{,}020\ \text{Btu}} = \frac{133.22\ \text{lb}}{\text{MMscf}}$

HEATER TREATER EMISSIONS CALCULATIONS - HAZARDOUS AIR POLLUTANTS

Unit ID =	HT-1 - HT-3 (Each)	HT-1 - HT-3 (Total)
Description =	Heater Treater	-
Number of Heater-Treaters =	3	-
Combustor Type =	AP-42 converted to HHV	
Max Burner Design Capacity (MMBtu/hr) =	0.5	-
Fuel HHV (Btu/scf) =	1,359	
Annual Fuel Use (MMscf/yr) [2] =	3.22	9.67
Annual Operating Hours =	8,760	-

HAP Emissions

Pollutant	HT-1 - HT-3 (Each) lb/hr [3]	HT-1 - HT-3 (Each) tons/yr [4]	HT-1 - HT-3 (Total) lb/hr [5]	HT-1 - HT-3 (Total) tons/yr [5]
n-Hexane	<0.01	<0.01	<0.01	0.01
Formaldehyde	<0.01	<0.01	<0.01	<0.01
Benzene	<0.01	<0.01	<0.01	<0.01
Toluene	<0.01	<0.01	<0.01	<0.01
Other HAPs	<0.01	<0.01	<0.01	<0.01
Total HAPs	<0.01	<0.01	<0.01	0.01

AP-42 Emission Factor , (lb/MMscf) [1]

Pollutant	Uncontrolled 1,4-3 (7/98)	AP-42 Controlled to HHV 1,4-3 (7/98)
n-Hexane	1.80E+00	2.40E+00
Formaldehyde	7.50E-02	9.99E-02
Benzene	2.10E-03	2.80E-03
Toluene	3.40E-03	4.53E-03
Other HAPs	1.90E-03	2.53E-03

[1] Emission factors shown above based on an average higher heating value (HHV) of 1,020 Btu/scf. Emission factors may be converted to other heating values by multiplying the given emission factor by the ratio of the specified heating value to the average heating value.

[2] Annual fuel use is calculated on Heater Treater Criteria Page.

[3] Emissions (lb/hr) = Emission Factor (lb/MMscf) x Annual Fuel Usage (MMscf/yr) / 8760 hr/yr.

Example Hourly n-Hexane Emissions, Each lb/hr = $\frac{2.40\ \text{lb}}{\text{MMscf}} \times \frac{3.22\ \text{MMscf}}{\text{yr}} \times \frac{\text{yr}}{8{,}760\ \text{hr}} = \frac{<0.01\ \text{lb}}{\text{hr}}$

[4] Emissions (tpy) = Emissions (lb/hr) x Hours of Operation per year (8760 hr/yr)/ 2,000 lb/ton

Example Annual n-Hexane Emissions, Each tpy = $\frac{<0.01\ \text{lb}}{\text{hr}} \times \frac{8{,}760\ \text{hr}}{\text{yr}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} = \frac{<0.01\ \text{ton}}{\text{yr}}$

[5] Total Emissions = Emissions per Heater Treater * Number of Heater Treaters

Example Hourly n-Hexane Emissions, Total lb/hr = $\frac{<0.01\ \text{lb}}{\text{hr}} \times 3\ \text{Heaters} = \frac{<0.01\ \text{lb}}{\text{hr}}$

Example Annual n-Hexane Emissions, Total tpy = $\frac{<0.01\ \text{ton}}{\text{yr}} \times 3\ \text{Heaters} = \frac{0.01\ \text{ton}}{\text{yr}}$

COMBUSTION CHAMBER CALCULATIONS - CRITERIA AIR POLLUTANTS

Unit ID =	CMB-1 - CMB-2 (Each)	CMB-1 - CMB-2 (Total)
Combustion Type =	AP-42 Converted to HHV	-
Number of Combustors =	2	-
Max Burner Design Capacity (MMBtu/hr) =	12	-
Burner Fuel Use (MMscf/yr)[4] =	15.71	31.43
Pilot Gas Flow Rate (Mscf/d) =	0.75	1.50
Pilot Fuel Use (MMscf/yr) =	0.27	0.55
Annual Fuel Use (MMscf/yr) =	15.99	-
Fuel HHV (Btu/scf)[4] =	1,722	-
Annual Operating Hours =	8,760	-

Criteria Air Pollutant Emissions [5]

Unit ID: Pollutant	CMB-1 - CMB-2 (Each)		CMB-1 - CMB-2 (Total)	
	lb/hr [5,6]	tons/yr [7]	lb/hr [8]	tons/yr [8]
NO_x	0.44	1.93	0.88	3.86
CO	0.11	0.48	0.22	0.96
SO_2	<0.01	<0.01	<0.01	0.02
$PM_{10/2.5}$ [1]	0.02	0.08	0.04	0.15
PM_{cond} [1]	<0.01	0.03	0.01	0.05
PM_{tot} [1]	0.02	0.10	0.05	0.21

Emission Factors

Pollutant	Units	Uncontrolled [2]	Converted to HHV [3]
NO_x	lb/MMBtu	0.14	0.14
CO	lb/MMBtu	0.04	0.04
SO_2	lb/MMscf	0.60	1.01
$PM_{10/2.5}$	lb/MMscf	5.70	9.62
PM_{cond}	lb/MMscf	1.90	3.21
PM_{tot}	lb/MMscf	7.60	12.83

[1] All PM (total, condensable and filterable) is assumed to be < 1 micrometer in diameter. Total PM is the sum of filterable PM and condensable PM

[2] NO_x and CO emission factors taken from Oil and Gas Production Facilities Chapter 6, Section 2 Permitting Guidance. All other emission factors shown above are taken from AP-42 Section 1.4, Tables 1.4-1 and 1.4-2 (7/98) and are based on an average higher heating value (HHV) of 1,020 Btu/scf. AP-42 emission factors in lb/MMscf may be converted to other heating values by multiplying the given emission factor by the ratio of the specified heating value to the average heating value.

Example SO_2 Emission Factor, lb/MMscf = 0.60 lb / MMscf × 1,722 Btu / scf × scf / 1,020 Btu = 1.01 lb / MMscf

[3] Combustion annual burner fuel (total) use is calculated on Combustion Firing Rate estimation page.

[4] Calculated by Promax process simulation (report attached).

[5] NO_x and CO emissions (lb/hr) = Emission Factor (lb/MMBtu) x Annual Fuel Usage (MMscf/yr) x Fuel HHV (Btu/scf) / 8760 hr/yr.

Example Hourly NO_x Emission, Each lb/hr = 0.14 lb / MMBtu × 15.99 MMscf / yr × 1,722 Btu / scf × yr / 8,760 hr = 0.44 lb / hr

[6] SO_2 and $PM_{10}/PM_{2.5}/PM_{cond}/PM_{tot}$ Emissions (lb/hr) = Emission Factor (lb/MMscf) x Annual Fuel Usage (MMscf/yr) / 8760 hr/yr.

Example Hourly SO_2 Emission, Each lb/hr = 1.01 lb / MMscf × 15.99 MMscf / yr × yr / 8,760 hr = <0.01 lb / hr

[7] Emissions (tpy) = Emissions (lb/hr) x Hours of Operation per year (8760 hr/yr)/ 2,000 lb/ton

Example Annual NO_x Emissions, Each tpy = 0.44 lb / hr × 8,760 hr / yr × ton / 2,000 lb = 1.93 ton / yr

[8] Total Emissions = Emissions per Combustor x Number of Combustors

Example Hourly NO_x Emissions, Total lb/hr = 0.44 lb / hr × 2 Combustors = 0.88 lb / hr

Example Annual NO_x Emissions, Total tpy = 1.93 ton / hr × 2 Combustors = 3.86 ton / yr

COMBUSTION CHAMBER CALCULATIONS - VOCs

Combustor Controlled Emissions - VOC
Unit ID = CMB-1-CMB-2
Number of Combustors = 2
Control Efficiency = 98.00%

The combustor controls the Oil Tanks (OTK-1 - OTK-8), Produced Water Tanks (WTK-1 - WTK-4), Truck-loadout of condensate(TL-1) and Truck-loadout of produced water (TL-2). The summary of these emissions are given in the table below:

	All the Combustors		Per Combustor	
Description	**Hourly (lb/hr)**	**Annual (tpy)**	**Hourly (lb/hr)**	**Annual (tpy)**
Oil Tanks	1.74	7.60	0.87	3.80
PW Tanks	0.02	0.09	0.01	0.05
Truck Loading - Cond	2.26	9.90	1.13	4.95
Truck Loading - PW	<0.01	<0.01	<0.01	<0.01
Total	**4.02**	**17.60**	**2.01**	**8.80**

Note 1: The above emissions have been calculated under the individual emission units (Oil Tanks, PW Tanks, Truck Loadout - Condensate and Truck Loading - PW) and are shown here for representative purposes only.
Note 2: The captured, controlled emissions from all the above sources have been assigned under the combustors in the summary tables and the uncaptured, non-combusted emissions have been assigned under the respective emission sources in the summary tables. Refer to the individual emission source for a more detailed version of the calculations.

COMBUSTION CHAMBER CALCULATIONS - HAZARDOUS AIR POLLUTANTS

Unit ID =	CMB-1 - CMB-2 (Each)	CMB-1 - CMB-2 (Total)
Combustion Type =	AP-42 Converted to HHV	-
Number of Combustors =	2	-
Max Burner Design Capacity (MMBtu/hr) =	12	-
Burner Fuel Use (MMscf/yr)[2] =	15.71	31.43
Pilot Gas Flow Rate (Mscf/d) =	0.75	1.50
Pilot Fuel Use (MMscf/yr) =	1.00	2.00
Annual Fuel Use (MMscf/yr) =	16.71	-
Fuel HHV (Btu/scf) =	1,722	-
Annual Operating Hours =	8,760	-

Criteria Air Pollutant Emissions

Unit ID: Pollutant	CMB-1 - CMB-2 (Each)		CMB-1 - CMB-2 (Total)	
	lb/hr [3]	tons/yr [4]	lb/hr [5]	tons/yr [5]
n-Hexane	<0.01	0.03	0.01	0.05
Formaldehyde	<0.01	<0.01	<0.01	<0.01
Benzene	<0.01	<0.01	<0.01	<0.01
Toluene	<0.01	<0.01	<0.01	<0.01
Other HAPs	<0.01	<0.01	<0.01	<0.01
Total HAPs	<0.01	0.03	0.01	0.05

AP-42 Emission Factor , (lb/MMscf) [1]

Pollutant	Uncontrolled 1.4-3 (7/98)	AP-42 Converted to HHV 1.4-3 (7/98)
n-Hexane	1.80E+00	3.04E+00
Formaldehyde	7.50E-02	1.27E-01
Benzene	2.10E-03	3.55E-03
Toluene	3.40E-03	5.74E-03
Other HAPs	1.90E-03	3.21E-03

[1] Emission factors shown above based on an average higher heating value (HHV) of 1,020 Btu/scf. Emission factors may be converted to other heating values by multiplying the given emission factor by the ratio of the specified heating value to the average heating value.

[2] Combustion annual burner fuel use is calculated on Combustion Firing Rate estimation page.

[3] Emissions (lb/hr) = Emission Factor (lb/MMscf) x Annual Fuel Usage (MMscf/yr) / 8760 hr/yr.

Example Hourly n-Hexane Emissions, Each lb/hr = $\frac{3.04\ \text{lb}}{\text{MMscf}} \times \frac{16.71\ \text{MMscf}}{\text{yr}} \times \frac{\text{yr}}{8{,}760\ \text{hr}} = \frac{0.01\ \text{lb}}{\text{hr}}$

[4] Emissions (tpy) = Emissions (lb/hr) x Hours of Operation per year (8760 hr/yr)/ 2,000 lb/ton

Example Annual n-Hexane Emissions, Each tpy = $\frac{0.01\ \text{lb}}{\text{hr}} \times \frac{8{,}760\ \text{hr}}{\text{yr}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} = \frac{0.05\ \text{ton}}{\text{yr}}$

[5] Total Emissions = Emissions per Combustor * Number of Combustors

Example Hourly n-Hexane Emissions, Total lb/hr = $\frac{0.01\ \text{lb}}{\text{hr}} \times 2\ \text{Combustors} = \frac{0.01\ \text{lb}}{\text{hr}}$

Example Annual n-Hexane Emissions, Total tpy = $\frac{0.03\ \text{ton}}{\text{hr}} \times 2\ \text{Combustors} = \frac{0.05\ \text{ton}}{\text{yr}}$

COMBUSTION FIRING RATE CALCULATIONS

Grand Total Energy Content Routed to Combustor		
OT/WT Flash	1.41	MMBtu/hr
TL - Cond	2.23	MMBtu/hr
TL-PW	0.00	MMBtu/hr
OT Working & Working	0.88	MMBtu/hr
WT Working & Breathing	0.062410	MMBtu/hr
Total	4.53	MMBtu/hr
Safety Factor	50.00%	
Grand Total Energy Routed to Combustor	6.79	MMBtu/hr

Grand Total Gas Volume Routed to Combustor		
OT/WT Flash	5,949,083	scf/yr
TL - Cond	11,365,686	scf/yr
TL - PW	22,744	scf/yr
OT Working & Working	3,599,452	scf/yr
WT Working & Breathing	15,829	scf/yr
Total	20,952,794	scf/yr
Safety Factor	50.00%	
Grand Total Volume Routed to Combustor	31,429,191	scf/yr

Flash Emissions Routed to Combustor		
Barrel Oil Per Day Produced [1]	13760	bopd
Barrel Water Per Day Produced [1]	1500	bwpd
Oil Tanks Flash Gas Rate [2]	0.001094386	Mscf/bbl oil
Oil Tanks Flash Gas Energy Content [2]	2,146	Btu/scf
Oil Tanks Flash Gas Volume [3]	15.06	Mscf/day
Oil Tanks Energy Stream [4]	32.31	MMBtu/day
Water Tanks Flash Gas Rate [5]	0.000826735	Mscf/bbl water
Water Tanks Flash Gas Energy Content [1]	1,162	Btu/scf
Water Tanks Flash gas Volume [5]	1.24	Mscf/day
Water Tanks Energy Stream [6]	1.44	MMBtu/day
Total Energy Content to Combustor (OT + WT) from Flash [7]	1.41	MMBtu/hr

[1] Obtained from Oil Tank and Water Tank calculations.
[2] From oil and water tank flash gas stream in Promax simulation.

[3] Oil Tank Flash Gas Volume, Mscf/day = 13,760 bopd × 0.001094386 Mscf/bbl oil × 15.06 Mscf/day

[4] Oil Tank Energy Stream, MMBtu/day = 2,146 Btu/scf × 15.06 Mscf/day × MMBtu/1000 Btu × 32.31 MMBtu/day

[5] Water Tank Flash Gas Volume, Mscf/day = 1,500 bopd × 0.000826735 Mscf/bbl oil × 1.24 Mscf/day

[6] Water Tank Energy Stream, MMBtu/day = 1,162 Btu/scf × 1.24 Mscf/day × MMBtu/1000 Btu × 1.44 MMBtu/day

[7] Total Energy Content (OT+WT) to Combustor, MMBtu/hr = 32.31 MMBtu/day × 1.44 MMBtu/day × 1 day/24 hrs = 1.41 MMBtu/hr

COMBUSTION FIRING RATE CALCULATIONS

Truck Loading - Condensate - Emissions Routed to Combustor		
Oil Throughput (daily)	11760	bopd
Oil Throughput (annual)	5,922,869	bopy
Oil Throughput (annual 1000s gal)	210,941	
Emission Factor	4.75	lb VOC/1000 gal
Uncontrolled VOC Emissions (per AP-42)	501.31	tpy VOC
Mass % C1 & C2 (Oil Tank Flash Gas Stream)	22.30%	
Total Uncontrolled Gas Stream [1]	645.23	tpy
Total Uncontrolled Gas Stream	1,290,456	lb/yr
Average MW of Stream [2]	42.05	lb/lb-mol
Mass Density of Oil Tank FG Stream [2]	0.112063633	lb/scf
Molar Volume [3]	375.23	scf/lb-mol
Total Gas Stream from TL [4]	11,515,386	scf/yr
Capture Efficiency	98.70%	
Gauture Gas Stream [5]	11,365,686	scf/yr
Tanks & TL Comb Gas Heating Value [7]	1,722	Btu/scf
Truck Loading Energy Content to Combustor [6]	2.2347	MMBtu/hr

[1] Total truck loading stream routed to combustor is estimated using composition from oil tank flash gas from Promax as follows

Total Uncontrolled Gas Stream (tpy) = 501.31 tons VOC / yr × 1 / 1 - 22.30% = 645.23 tons VOC / yr

[2] From oil tank flash gas stream in Promax simulation.

[3] Estimated molar volume (scf/lb-mol) = 42.05 lb / lb-mol × scf / 0.112063633 lb = 375.23 scf / lb-mol

[4] Total estimated volume of gas associated with truck loading calculated as follows:

Total Gas Stream from TL (scf/yr) = 1,290,456 lb / yr × 375.23 scf / lb-mol × 42.05 lb / lb-mol = 11,515,386 scf / yr

[5] Captured Gas Stream (scf/yr) = 11,515,386 scf / yr × 98.70% = 11,365,686 scf / yr

[6] Total Loading Energy Content to Combustor, MMBtu/hr = 11,365,686 scf / yr × 1,722 Btu / scf × MMBtu / 1,000,000 Btu × yr / 8760 hr = 2.2347 MMBtu / hr

Truck Loading - PW - Emissions Routed to Combustor		
PW Throughput (daily)	1500	bopd
PW Throughput (annual)	547,500	bopy
PW Throughput (annual 1000s gal)	22,995	
Emission Factor	4.75	lb VOC/1000 gal
Uncontrolled VOC Emissions (per AP-42)	0.55	tpy VOC
Mass % C1 & C2 (PW Tank Flash Gas Stream)	52.29%	
Total Uncontrolled Gas Stream [1]	1.15	tpy
Total Uncontrolled Gas Stream	2,291	lb/yr
Average MW of Stream [2]	26.72	lb/lb-mol
Mass Density of PW Tank FG Stream [2]	0.070512075	lb/scf
Molar Volume [3]	378.98	scf/lb-mol
Total Gas Stream from TL [4]	32,491	scf/yr
Capture Efficiency	70.00%	
Capture Gas Stream [5]	22,744	scf/yr
Tanks & TL Comb Gas Heating Value [7]	1,722	Btu/scf
Truck Loading Energy Content to Combustor [6]	0.0045	MMBtu/hr

[1] Total truck loading stream routed to combustor is estimated using composition from produced water tank flash gas from Promax as follows

Total Uncontrolled Gas Stream (tpy) = 0.55 tons VOC / yr × 1 / 1 - 52.29% = 1.15 tons VOC / yr

[2] From PW tank flash gas stream in Promax simulation.

[3] Estimated molar volume (scf/lb-mol) = 26.72 lb / lb-mol × scf / 0.070512075 lb = 378.98 scf / lb-mol

[4] Total estimated volume of gas associated with truck loading calculated as follows:

Total Gas Stream from TL (scf/yr) = 2,291 lb / yr × 378.98 scf / lb-mol × 26.72 lb / lb-mol = 32,491 scf / yr

[5] Captured Gas Stream (scf/yr) = 32,491 scf / lb-mol × 70.00% = 22,744 scf / yr

[6] Total Loading Energy Content to Combustor, MMBtu/hr = 22,744 scf / yr × 1,722 Btu / scf × MMBtu / 1,000,000 Btu × yr / 8760 hr = 0.0045 MMBtu / hr

COMBUSTION FIRING RATE CALCULATIONS

Oil Tanks and Produced Water Tanks - Energy Content and Volume Routed to the Combustor from Working and Breathing Losses

Oil Tanks - Working & Breathing Losses		
Type Tank	Cone	
Number of Oil Tanks	8	
Per tank annual throughput	26,367,600	gal/yr
Approx. Standing Losses (Per Tank)	2,327.27	lb VOC/yr
Approx. Working Losses (Per Tank)	37,647.13	lb VOC/yr
Total Uncontrolled VOC Losses (Per Tank) [1]	19.99	tpy VOC
Mass % C1 & C2 (Oil Tank Flash Gas Stream)	22.30%	
Total Uncontrolled Gas Stream (total battery) [2]	205.80	tpy
Total Uncontrolled Gas Stream (total battery)	411,599.68	lb/yr
Average MW of Stream [3]	42.05	lb/lb-mol
Oil Tanks Flash Gas Heating Value [2]	2,146	Btu/scf
Mass Density of Oil Tank FG Stream [2]	0.112063633	lb/scf
Molar Volume [4]	375.23	scf/lb-mol
Total Gas Stream From Oil Tank W/B Losses [5]	3,672,910.39	scf/yr
Capture Efficiency	98.00%	
Captured Gas Stream [6]	3,599,452.18	scf/yr
OT W/B Total Energy Content to Combustor [7]	0.88	MMBtu/hr

[1] Obtained from Oil Tank Working and Breathing Losses Calculations.

[2] Total oil tank working and breaking loss stream is estimated using composition % of C1 and C2 from oil tank flash gas from Promax as follows:

Total Uncontrolled Gas Stream (tpy) = 19.99 tons VOC / yr × 1 / (1-23.68%) × 8 (No of Tanks) = 205.80 tons VOC / yr

[3] From oil tank flash gas stream in Promax simulation.

[4] Estimated molar volume (scf/lb-mol) = 42.05 lb / lb-mol × scf / 0.112063633 lb = 375.23 scf / lb-mol

[5] Total estimated volume of gas associated with OT W/B losses calculated as follows:

Total Gas Stream (scf/yr) = 411,600 lb / yr × 375.23 scf / lb-mol × lb-mol / 42.05 lb = 3,672,910 scf / yr

[6] Captured Gas Stream = 3,672,910 scf / yr × 98.00% = 3,599,452 scf / yr

[7] Total OT W/B Energy Content to Combustor, MMBtu/hr = 3,599,452 scf / yr × 2146 Btu / scf × MMBtu / 1,000,000 Btu × yr / 8,760 hr = 0.8817 MMBtu / hr

Water Tanks - Working & Breathing Losses (Assumes all fluid is Oil with 1% emitted)		
Type Tank	Cone	
Number of Water Tanks	4	
Per tank annual throughput	5,748,750	gal/yr
Approx. Standing Losses (Per Tank)	23.27	lb VOC/yr
Approx. Working Losses (Per Tank)	112.56	lb VOC/yr
Total Uncontrolled VOC Losses (Per Tank) [1]	0.07	tpy VOC
Mass % C1 & C2 (Water Tank Flash Gas Stream)	52.29%	
Total Uncontrolled Gas Stream (total battery) [2]	0.57	tpy
Total Uncontrolled Gas Stream (total battery)	1,138.91	lb/yr
Average MW of Stream [3]	26.72	lb/lb-mol
Water Tanks Flash Gas Heating Value [3]	1,162	Btu/scf
Mass Density of Water Tank FG Stream [3]	0.070512075	lb/scf
Molar Volume [4]	378.98	scf/lb-mol
Total Gas Stream From Water Tank W/B Losses [5]	16,151.98	scf/yr
Capture Efficiency	98.00%	
Captured Gas Stream [6]	15,828.94	scf/yr
WT W/B Total Energy Content to Combustor [7]	0.00210	MMBtu/hr

[1] Obtained from Oil Tank Working and Breathing Losses Calculations.

[2] Total water tank working and breaking loss stream is estimated using composition % of C1 and C2 from water tank flash gas from Promax as follows:

Total Uncontrolled Gas Stream (tpy) = 0.07 tons VOC / yr × 1 / (1-54.81%) × 4 (No of Tanks) = 0.57 tons VOC / yr

[3] From water tank flash gas stream in Promax simulation.

[4] Estimated molar volume (scf/lb-mol) = 26.72 lb / lb-mol × scf / 0.070512075 lb = 378.98 scf / lb-mol

[5] Total estimated volume of gas associated with OT W/B losses calculated as follows:

Total Gas Stream (scf/yr) = 1138.91 lb / yr × 378.98 scf / lb-mol × lb-mol / 26.72 lb = 16,152 scf / yr

[6] Captured Gas Stream = 16,152 scf / yr × 98.00% = 15,829 scf / yr

[7] Total OT W/B Energy Content to Combustor, MMBtu/hr = 15,829 scf / yr × 1,162 Btu / scf × MMBtu / 1,000,000 Btu × yr / 8760 hr = 0.0021 MMBtu / hr

STANDARD FLARE - CRITERIA POLLUTANTS

Flare Criteria Pollutant Emissions
Number of Flares 2

Parameter	FL-1-FL-2 (Each)	FL-1-FL-2 (Total)	Units
Operating Hours:	8,760	8,760	hr/yr
Produced Gas Flow:	50	100	mmscf/yr
Produced Gas Flow:	5,708	11,416	scf/hr
Pilot Gas Fuel Use:	N/A	N/A	MMscf/yr
Flare Stream:	1,156	1,156	Btu/scf
Flare Stream:	57780	115560	MMBtu/yr
Destruction Efficiency:	98%	98%	-

		FL-1-FL-2 (Each) Emissions		FL-1-FL-2 (Total) Emissions	
Pollutant	Emission Factor (lb/MMBtu) [1,2]	lb/hr	tpy	lb/hr	tpy
NO_X	0.14	0.92	4.04	1.85	8.09
CO	0.035	0.23	1.01	0.46	2.02
VOC	Mass Balance	1.62	7.08	3.23	14.16

[1] NO_X and CO emission factors taken from Oil and Gas Production Facilities Chapter 6, Section 2 Permit Guidance

[2] VOC emissions calculated separately in the Flare VOC page.

STANDARD FLARE - VOC EMISSIONS

Flare Stream Analysis and VOC Calculation

273.973	MSCF/D

Component	Mol Wt	Mol %	lb/hr [2]	Total Streams Burned in Flare: Uncontrolled lb/hr	Uncontrolled tons/yr	scfd	Controlled Emissions lb/hr	Controlled Emissions tons/yr	Net Heating Value Btu/scf	Net Btu Value Rate[3] Btu/hr
Nitrogen	28.0134	0.68	5.77	5.77	25.252	1,874	-	-	0.00	0
Carbon Dioxide	44.01	1.82	24.07	24.07	105.443	4,981	-	-	0.00	0
Methane	16.042	74.95	361.74	361.74	1,584.433	205,329	7.23	31.69	919.00	7,862,381
Ethane	30.069	12.19	110.30	110.30	483.093	33,400	2.21	9.66	1,619.00	2,253,108
Propane	44.096	6.63	87.90	87.90	384.997	18,151	1.76	7.70	2,315.00	1,750,785
Iso-butane	58.122	0.74	12.99	12.99	56.912	2,036	0.26	1.14	3,000.00	254,452
N-butane	58.122	1.73	30.29	30.29	132.666	4,745	0.61	2.65	3,011.00	595,326
2-2 Dimethylpropane	72.15	0.00	0.00	0.00	0.000	0	<0.01	<0.01		0
Iso-pentane	72.149	0.37	8.01	8.01	35.086	1,011	0.16	0.70	3,699.00	155,814
N-pentane	72.149	0.37	8.01	8.01	35.086	1,011	0.16	0.70	3,707.00	156,151
2-2 Dimethylbutane	86.18	0.01	0.13	0.13	0.568	14	<0.01	0.01		0
Cyclopentane	70.1	0.00	0.00	0.00	0.000	0	<0.01	<0.01		0
2-3 Dimethylbutane	86.18	0.03	0.88	0.88	3.862	93	0.02	0.08		0
2 Methylpentane	86.18	0.08	2.10	2.10	9.199	222	0.04	0.18		0
3 Methylpentane	86.18	0.04	1.11	1.11	4.884	118	0.02	0.10		0
n-Hexane	86.175	0.11	2.77	2.77	12.152	293	0.06	0.24	4,404.00	53,793
Methylcyclopentane	84.16	0.05	1.14	1.14	4.991	123	0.02	0.10		0
Benzene	78.114	0.01	0.24	0.24	1.029	27	<0.01	0.02	3,590.90	4,099
Cyclohexane	84.16	0.04	1.01	1.01	4.436	110	0.02	0.09		0
2-Methylhexane	100.2	0.01	0.39	0.39	1.717	36	<0.01	0.03		0
3-Methylhexane	100.2	0.01	0.36	0.36	1.585	33	<0.01	0.03		0
2,2,4 Trimethylpentane	114.23	0.00	0.00	0.00	0.000	0	<0.01	<0.01		0
Other Heptanes	100.202	0.03	0.90	0.90	3.962	82	0.02	0.08		0
n-Heptane	100.202	0.02	0.72	0.72	3.169	66	0.01	0.06		0
Methylcyclohexane	98.19	0.03	1.00	1.00	4.400	93	0.02	0.09		0
Toluene	92.141	0.01	0.30	0.30	1.336	30	<0.01	0.03		0
Other C-8's	128.2	0.02	0.73	0.73	3.210	52	0.01	0.06	6,493.00	14,083
n-Octane	128.2	0.01	0.23	0.23	1.014	16	<0.01	0.02	6,493.00	4,447
Ethylbenzene	106.167	0.00	0.00	0.00	0.000	0	<0.01	<0.01	4,970.50	0
M&P Xylene	106.5	0.00	0.10	0.10	0.421	8	<0.01	0.01	4,957.10	1,698
O-Xylene	106.5	0.00	0.03	0.03	0.140	3	<0.01	<0.01	4,957.10	566
Other C-9's	128.259	0.01	0.19	0.19	0.845	14	<0.01	0.02		0
n-Nonane	128.259	0.00	0.04	0.04	0.169	3	<0.01	<0.01		0
Other C10s	142.29	0.00	0.00	0.00	0.000	0	<0.01	<0.01		0
n-Decane	142.29	0.00	0.00	0.00	0.000	0	<0.01	<0.01		0
Undecanes Plus	156.31	0.00	0.00	0.00	0.000	0	<0.01	<0.01		0
	Totals	100	663.48	663.48	2,906.06	273,973	-	-		**13,106,703**
			Total HAPS	**3.443**	**15.078**		**0.069**	**0.302**		
			Total VOC	**161.61**	**707.83**	-	**3.23**	**14.16**	**Heat Value (Btu/scf)**	**1148**
			MW (Stream) =			**22.05**				

[1] Stream composition obtained from Extended Gas Analysis

[2] Hourly Emissions (lb/hr) calculated as follows = Total daily Flowrate (MSCF/day) x Mol (%) / 379.4 scf/lb-mol x Mol. Weight (lb/lb-mole) x (1 day/24 hrs)

Eg. Propane Hourly Emissions (lb/hr) = $\frac{273.97 \text{ MSCF}}{\text{day}} \mid \frac{1000 \text{ scf}}{\text{MMSCF}} \mid 6.63\% \mid \frac{\text{lb-mol}}{379.4 \text{ scf}} \mid \frac{44.10 \text{ lb}}{\text{lb-mole}} \mid \frac{1 \text{ day}}{24 \text{ hr}} = \frac{87.90 \text{ lb}}{\text{hr}}$

[3] Net Btu Value Rate , Btu/hr = Heat Value, Btu/scf * Total Flow, scf/hr.

AIR ASSISTED FLARE EMISSION CALCULATIONS - CRITERIA AIR POLLUTANTS

Unit ID =	**AAF-1**
Description	Air Assisted Flare
Number of Combustion Devices =	1
Combustor Type =	AP-42 converted to HHV
Max Burner Design Capacity (MMBtu/hr) =	54.0
Fuel HHV (Btu/scf) [1] =	2,175
Flash Factor from Promax (Mscf/bbl oil) =	0.0976
Annual Fuel Use (MMscf/yr) [2] =	49.04
Annual Operating Hours =	8,760
Percentage Time LPT Flash Gas Routed to Combustion Device [4] =	10%

Criteria Air Pollutant Emissions

Unit ID: Pollutant	AAF-1 lb/hr [5]	AAF-1 tons/yr [6]
NO_X	1.70	0.75
CO	0.43	0.19
SO_2	<0.01	<0.01
$PM_{10/2.5}$ [4]	0.07	0.03
PM_{COND} [4]	0.02	<0.01
PM_{TOT} [4]	0.09	0.04

Emission Factor

Pollutant	Units	Uncontrolled [8]	Converted to HHV [8]
NO_X	lb/MMBtu	0.14	0.14
CO	lb/MMBtu	0.04	0.04
SO_2	lb/MMscf	0.60	1.28
$PM_{10/2.5}$	lb/MMscf	5.70	12.15
PM_{COND}	lb/MMscf	1.90	4.05
PM_{TOT}	lb/MMscf	7.60	16.20

[1] Calculated by Promax process simulation (report attached).

[2] Combustion device annual fuel use is calculated using flash factors from Promax as follows

Annual Fuel Use (MMscf/yr)= 0.0976 Mscf / barrel oil × 13,760 Bbl / day × 365 day / yr × MMscf / 1000 Mscf × 10% × 1 (No of Flares) = 49.04 MMscf / yr

[3] Under normal operation conditions flash gas is compressed with a VRU and sent to sales. When sales line pressure exceeds VRU discharge pressure flash gas is routed to combustion device.

[4] All PM (total, condensable and filterable) is assumed to be < 1 micrometer in diameter. Total PM is the sum of filterable PM and condensable PM

[5] NO_X and CO emissions (lb/hr) = Emission Factor (lb/MMBtu) x Annual Fuel Usage (MMscf/yr) x Fuel HHV (Btu/scf) / 8,760 hr/yr.

Example Hourly NO_X Emission, Each lb/hr = 0.14 lb / MMBtu × 49.04 MMscf / yr × 2,175 Btu / scf × yr / 8,760 hr = 1.70 lb / hr

[6] SO_2 and $PM_{10}/PM_{2.5}/PM_{COND}/PM_{TOT}$ Emissions (lb/hr) = Emission Factor (lb/MMscf) x Annual Fuel Usage (MMscf/yr) / 8760 hr/yr.

Example Hourly SO_2 Emission, Each lb/hr = 1.28 lb / MMscf × 49.04 MMscf / yr × yr / 8,760 hr = 0.01 lb / hr

[7] Emissions (tpy) = Emissions (lb/hr) x Hours of Operation per year (8,760 hr/yr)/ 2,000 lb/ton x (10% LPT flash gas routed to combustion device during downtime)

Example Annual NO_X Emissions, Each tpy = 1.70 lb / hr × 8,760 hr / yr × ton / 2,000 lb × 10% = 0.75 ton / yr

[8] NO_X and CO emission factors taken from Oil and Gas Production Facilities Chapter 6, Section 2 Permitting Guidance. All other emission factors shown above are taken from AP-42 Section 1.4, Tables 1.4-1 and 1.4-2 (7/98) and are based on an average higher heating value (HHV) of 1,020 Btu/scf. AP-42 emission factors in lb/MMscf may be converted to other heating values by multiplying the given emission factor by the ratio of the specified heating value to the average heating value.

Example SO_2 Emission Factor, lb/MMscf = 0.60 lb / MMscf × 2,175 Btu / scf × scf / 1,020 Btu = 1.28 lb / MMscf

AIR ASSISTED FLARE EMISSION CALCULATIONS - VOC EMISSIONS

LPT Flash Gas Routed to Combustion Device

LPT VOC Flash Factor (lb/bbl) [1] =	8.33
Oil Production (bbl/day) =	13760
Control Efficiency [2] =	98%
Percentage Time LPT Flash Gas Routed to Combustion Device [3] =	10%

Uncontrolled VOC Emissions (LPT VOC Flash Rate)

	AAF-1	
Pollutant	lb/hr [4]	tons/yr [5]
VOC	4,777.90	2092.72

Proposed Controlled VOC Emissions [6,7]

	AAF-1	
Pollutant	lb/hr	tons/yr
VOC	95.56	41.85

[1] Flash emissions taken from Promax simulation

[2] Assumes 98% combustion device destruction efficiency.

[3] Under normal operation conditions flash gas is compressed with a VRU and sent to sales. When sales line pressure exceeds VRU discharge pressure flash gas is routed to combustion device.

[4] Uncontrolled LPT VOC Flash Rate (lb/hr) = Oil Production (bbl/day) x (day/24 hr) x LPT VOC Flash Factor (lb/bbl)

$$\text{LPT VOC Flash Rate (lb/hr)} = \frac{13760\ \text{bbl}}{\text{day}} \times \frac{\text{day}}{24\ \text{hr}} \times \frac{8.3335\ \text{lb}}{\text{bbl}} = 4777.9016\ \frac{\text{lb}}{\text{hr}}$$

[5] Uncontrolled LPT VOC Flash Rate (tpy) = Emissions (lb/hr) x Hours of Operation per year (8760 hr/yr)/ 2,000 lb/ton x (10% LPT flash gas routed to combustion device during downtime)

$$\text{LPT VOC Flash Rate (tpy)} = \frac{4777.90\ \text{lb}}{\text{hr}} \times \frac{8{,}760\ \text{hr}}{\text{yr}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} \times 10\% = \frac{2092.72\ \text{ton}}{\text{yr}}$$

[6] VOC emissions to combustion device are based on average production throughput

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

$$\text{Controlled Hourly Emissions (lb/hr)} = \frac{4777.90\ \text{lb}}{\text{hr}} \times (1 - 98\%) = \frac{95.56\ \text{lb}}{\text{hr}}$$

$$\text{Controlled Annual Emissions (tpy)} = \frac{2092.72\ \text{tons}}{\text{yr}} \times (1 - 98\%) = \frac{41.85\ \text{tons}}{\text{yr}}$$

AIR ASSISTED FLARE EMISSION CALCULATIONS - HAZARDOUS AIR POLLUTANTS

Unit ID =	**AAF-1**
Description	**Air Assisted Flare**
Combustion Type =	AP-42 Converted to HHV
Number of Combustion Devices	1
Max Burner Design Capacity (MMBtu/hr) =	54
Annual Fuel Use (MMscf/yr) =	49.04
Fuel HHV (Btu/scf) =	2,175
Annual Operating Hours =	8,760
Percentage Time LPT Flash Gas Routed to Combustion Device [3] =	10%

Hazardous Air Pollutant Emissions

	AAF-1	
Pollutant	**lb/hr [4]**	**tons/yr [5]**
n-Hexane	0.02	<0.01
Formaldehyde	<0.01	<0.01
Benzene	<0.01	<0.01
Toluene	<0.01	<0.01
Other HAPs	<0.01	<0.01
Total HAPs	0.02	<0.01

AP-42 Emission Factor, (lb/MMscf) [1]

Pollutant	**Uncontrolled 1,4-3 (7/98)**	**AP-42 Converted to HHV 1,4-3 (7/98)**
n-Hexane	1.80E+00	3.84E+00
Formaldehyde	7.50E-02	1.60E-01
Benzene	2.10E-03	4.48E-03
Toluene	3.40E-03	7.25E-03
Other HAPs	1.90E-03	4.05E-03

[1] Emission factors shown above based on an average higher heating value (HHV) of 1,020 Btu/scf. Emission factors may be converted to other heating values by multiplying the given emission factor

[2] Air Assisted Flare fuel use is calculated on the AAF Criteria Pollutant Page.

[3] Under normal operation conditions flash gas is compressed with a VRU and sent to sales. When sales line pressure exceeds VRU discharge pressure flash gas is routed to combustion device.

[4] Emissions (lb/hr) = Emission Factor (lb/MMscf) x Annual Fuel Usage (MMscf/yr) / 8760 hr/yr.

Example Hourly n-Hexane Emissions, Each lb/hr = $\frac{3.84\ \text{lb}}{\text{MMscf}} \times \frac{49.04\ \text{MMscf}}{\text{yr}} \times \frac{\text{yr}}{8{,}760\ \text{hr}} = \frac{0.02\ \text{lb}}{\text{hr}}$

[5] Emissions (tpy) = Emissions (lb/hr) x Hours of Operation per year (8760 hr/yr)/ 2,000 lb/ton

Example Annual n-Hexane Emissions, Each tpy = $\frac{0.02\ \text{lb}}{\text{hr}} \times \frac{8{,}760\ \text{hr}}{\text{yr}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} \times 10\% = \frac{<0.01\ \text{ton}}{\text{yr}}$

FUGITIVE EMISSION CALCULATIONS - VOC EMISSIONS

Fugitive Emission Calculations

Hours of Operation (hrs/yr) 8760

Source Type/Service	Number of Sources [1]	Emission Factor [2] (lb/hr/source)	Control Efficiency	TOC (lb/hr) [3]	TOC (tons/yr) [4]	VOC Wt%
Valves - Gas	253	9.92E-03	0.00%	2.51	10.99	25.50%
Flanges - Gas	466	8.60E-04	0.00%	0.40	1.75	25.50%
Compressor/Pump Seals - Gas	2	5.29E-03	0.00%	1.06E-02	4.63E-02	25.50%
Connectors - Gas	130	4.41E-04	0.00%	5.73E-02	2.51E-01	25.50%
Open Ended Lines-Gas	0	4.41E-03	0.00%	0.00E+00	0.00E+00	25.50%
		Total TOC (Gas Components) =		**2.98**	**13.05**	
Valves - Light Oil	134	5.51E-03	0.00%	7.39E-01	3.23E+00	97.70%
Valves -Heavy Oil	2	1.85E-05	0.00%	3.70E-05	1.62E-04	97.70%
Connectors - Light Oil	9	4.63E-04	0.00%	4.17E-03	1.83E-02	97.70%
Compressor/Pump Seals - Light Oil	2	2.87E-02	0.00%	5.73E-02	2.51E-01	97.70%
Flanges - Light Liquid	266	2.43E-04	0.00%	6.45E-02	2.83E-01	97.70%
Other - Light Oil	0	1.65E-02	0.00%	0.00E+00	0.00E+00	97.70%
		Total TOC (Liquid Components) =		**0.86**	**3.79**	

VOC Emissions [5]

Source Type/Service	VOC lb/hr	VOC tons/yr
Valves - Gas	0.64	2.80
Flanges - Gas	0.10	0.45
Compressor/Pump Seals - Gas	<0.01	0.01
Connectors - Gas	0.01	0.06
Open Ended Lines - Gas	0.00	0.00
Total (Gas Comp.) =	**0.76**	**3.33**
Valves - Light Oil	0.72	3.16
Valves -Heavy Oil	<0.01	<0.01
Connectors - Light Oil	<0.01	0.02
Compressor/Pump Seals - Light Oil	0.06	0.25
Flanges - Light Liquid	0.06	0.28
Other - Light Oil	0.00	0.00
Total (Liquid Comp.) =	**0.84**	**3.70**
Total (All Components) =	**1.60**	**7.03**

[1] Component Count based on equipment proposed to be used at the site.

[2] Emission factors taken from EPA-453/R-95-017, Protocol for Equipment Leak Emission Estimates, Table 2-4, Oil and Gas Production Operations Average Emission Factors and converted into lb/hr/source.

[3] TOC (lb/hr) = Emission Factor (lb/hr/source) x Number of Sources

Eg. Valves - Gas (lb/hr) = $\frac{9.92E\text{-}03 \text{ lb}}{\text{hr-source}} \times 253 \text{ (source)} = \frac{2.51 \text{ lb}}{\text{hr}}$

[4] TOC(tpy) = Controlled Hourly Emissions, Each (lb/hr) x 8,760 (hrs/yr) x (1 ton/2000 lb)

Eg. Valves - Gas (tpy) = $\frac{2.51 \text{ lb}}{\text{hr}} \times \frac{8{,}760 \text{ hr}}{\text{yr}} \times \frac{1 \text{ ton}}{2{,}000 \text{ lb}} = \frac{10.99 \text{ ton}}{\text{yr}}$

[5] Total organic compound (TOC) emission rates multiplied by VOC content of stream (weight percent) to obtain VOC emissions.

Eg. Valves - Gas VOC (lb/hr) = $\frac{2.51 \text{ lb}}{\text{hr}} \times 25.50\% = \frac{0.64 \text{ lb}}{\text{hr}}$

Eg. Valves - Gas VOC (tpy) = $\frac{10.99 \text{ ton}}{\text{yr}} \times 25.50\% = \frac{2.80 \text{ ton}}{\text{yr}}$

FUGITIVE EMISSION CALCULATIONS - SPECIATED HAP EMISSIONS

Fugitive Hazardous Air Pollutant (HAP) Emissions (lb/hr) [1]

Source Type/Service	n-Hexane	Benzene	Toluene	Ethylbenzene	Xylenes	Total
Valves - Gas	0.01	<0.01	<0.01	0.00	<0.01	0.01
Flanges - Gas	<0.01	<0.01	<0.01	0.00	<0.01	<0.01
Compressor/Pump Seals - Gas	<0.01	<0.01	<0.01	0.00	<0.01	<0.01
Connectors - Gas	<0.01	<0.01	<0.01	0.00	<0.01	<0.01
Open Ended Lines-Gas	0.00	0.00	0.00	0.00	0.00	0.00
Total (All Gas Components) =	0.01	<0.01	<0.01	0.00	<0.01	0.02
Source Type/Service	**n-Hexane**	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**Total**
Valves - Light Oil	0.02	<0.01	<0.01	<0.01	0.01	0.04
Valves -Heavy Oil	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Connectors - Light Oil	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Compressor/Pump Seals - Light Oil	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Flanges - Light Liquid	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Other - Light Oil	0.00	0.00	0.00	0.00	0.00	0.00
Total (All Liquid Components) =	0.02	<0.01	0.01	<0.01	0.01	0.05
Total (Gas + Liquid Components) =	0.03	<0.01	0.01	<0.01	0.01	0.07

Fugitive Hazardous Air Pollutant (HAP) Emissions (tpy) [1]

Source Type/Service	n-Hexane	Benzene	Toluene	Ethylbenzene	Xylenes	Total
Valves - Gas	0.05	<0.01	<0.01	0.00	<0.01	0.06
Flanges - Gas	<0.01	<0.01	<0.01	0.00	<0.01	<0.01
Compressor/Pump Seals - Gas	<0.01	<0.01	<0.01	0.00	<0.01	<0.01
Connectors - Gas	<0.01	<0.01	<0.01	0.00	<0.01	<0.01
Open Ended Lines-Gas	0.00	0.00	0.00	0.00	0.00	0.00
Total (All Gas Components) =	0.06	<0.01	<0.01	0.00	<0.01	0.07
Source Type/Service	**n-Hexane**	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**Total**
Valves - Light Oil	0.08	<0.01	0.04	<0.01	0.05	0.19
Valves -Heavy Oil	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Connectors - Light Oil	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Compressor/Pump Seals - Light Oil	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Flanges - Light Liquid	<0.01	<0.01	<0.01	<0.01	<0.01	0.02
Other - Light Oil	0.00	0.00	0.00	0.00	0.00	0.00
Total (All Liquid Components) =	0.09	0.01	0.04	0.01	0.06	0.22
Total (Gas + Liquid Components) =	0.15	0.02	0.05	0.01	0.07	0.29

[1] Total organic compound (TOC) emission rates multiplied by VOC content of stream (weight percent) to obtain VOC emissions.

Eg. Valves - Gas VOC, n-Hexane (lb/hr) = $\frac{2.51 \text{ lb}}{\text{hr}} \times 0.44\% = \frac{0.01 \text{ lb}}{\text{hr}}$

Eg. Valves - Gas VOC, n-Hexane (tpy) = $\frac{10.99 \text{ ton}}{\text{yr}} \times 0.44\% = \frac{0.05 \text{ ton}}{\text{yr}}$

Summary Table

Description	Hourly (lb/hr)	Annual (tpy)
Total (Gas Components)	0.02	0.07
Total (Liquid Components)	0.05	0.22
Total (All Components)	0.07	0.29

FUGITIVE EMISSION CALCULATIONS - SPECIATED GAS VOC EMISSIONS

Speciated Gas Analysis for Fugitives (VOC and HAP) [1]

Component	Mol Wt	Mol %	Weight (lb/lbmole Gas)	Wt%	Corrected Wt%	Uncontrolled lb/hr [2]	Uncontrolled tons/yr [3]
Nitrogen	28.0134	0.68	0.19	0.87	-	-	-
Carbon Dioxide	44.01	1.82	0.80	3.63	-	-	-
Methane	16.042	74.95	12.02	54.53	57.09	1.70	7.45
Ethane	30.069	12.19	3.67	16.63	17.41	0.52	2.27
Propane	44.096	6.63	2.92	13.25	13.87	0.41	1.81
Iso-butane	58.122	0.74	0.43	1.96	2.05	0.06	0.27
N-butane	58.122	1.73	1.01	4.57	4.78	0.14	0.62
2-2 Dimethylpropane	72.15	0.00	0.00	0.00	0.00	0.00	0.00
Iso-pentane	72.149	0.37	0.27	1.21	1.26	0.04	0.16
N-pentane	72.149	0.37	0.27	1.21	1.26	0.04	0.16
2-2 Dimethylbutane	86.18	0.01	0.00	0.02	0.02	<0.01	<0.01
Cyclopentane	70.1	0.00	0.00	0.00	0.00	0.00	0.00
2-3 Dimethylbutane	86.18	0.03	0.03	0.13	0.14	<0.01	0.02
2 Methylpentane	86.18	0.08	0.07	0.32	0.33	<0.01	0.04
3 Methylpentane	86.18	0.04	0.04	0.17	0.18	<0.01	0.02
n-Hexane	86.175	0.11	0.09	0.42	0.44	0.01	0.06
Methylcyclopentane	84.16	0.05	0.04	0.17	0.18	<0.01	0.02
Benzene	78.114	0.01	0.01	0.04	0.04	<0.01	<0.01
Cyclohexane	84.16	0.04	0.03	0.15	0.16	<0.01	0.02
2-Methylhexane	100.2	0.01	0.01	0.06	0.06	<0.01	<0.01
3-Methylhexane	100.2	0.01	0.01	0.06	0.06	<0.01	<0.01
2,2,4 Trimethylpentane	114.23	0.00	0.00	0.00	0.00	0.00	0.00
Other Heptanes	100.202	0.03	0.03	0.14	0.14	<0.01	0.02
n-Heptane	100.202	0.02	0.02	0.11	0.11	<0.01	0.01
Methylcyclohexane	98.19	0.03	0.03	0.15	0.16	<0.01	0.02
Toluene	92.141	0.01	0.01	0.05	0.05	<0.01	<0.01
Other C-8's	128.2	0.02	0.02	0.10	0.12	<0.01	0.02
n-Octane	128.2	0.01	0.01	0.03	0.04	<0.01	<0.01
Ethylbenzene	106.167	0.00	0.00	0.00	0.00	0.00	0.00
M&P Xylene	106.5	0.00	0.00	0.01	0.02	<0.01	<0.01
O-Xylene	106.5	0.00	0.00	0.01	0.01	<0.01	<0.01
Other C-9's	128.259	0.01	0.01	0.03	0.03	<0.01	<0.01
n-Nonane	128.259	0.00	0.00	0.01	0.01	<0.01	<0.01
Other C10s	142.29	0.00	0.00	0.00	0.00	0.00	0.00
n-Decane	142.29	0.00	0.00	0.00	0.00	0.00	0.00
Undecanes Plus	156.31	0.00	0.00	0.00	0.00	0.00	0.00
	Totals	**100.00**	**22.05**	**100.00**	**100.00**		
	Total VOC	**10.36**	**5.37**	**24.34**	**25.50**	**0.76**	**3.33**
	Total HAP	**0.1320**	**0.1144**	**0.5180**	**0.5433**	**0.02**	**0.07**
	Total Hydrocarbon		**21.06**			**2.98**	**13.05**

[1] Stream composition obtained from Gas Analysis for Combs Ranch 29-33-70 C SX 7H - Analysis dated August 06, 2014.

[2] Uncontrolled hourly emission rate (lb/hr) = Component Weight % (%) x Uncontrolled Hourly Total Emission Rate (lb/hr).

$$\text{Gas Service Propane Emission Rate (lb/hr)} = 13.87\% \times \frac{2.98 \text{ lb}}{\text{hr}} = \frac{0.41 \text{ lb}}{\text{hr}}$$

[3] Uncontrolled annual emission rate (tpy) = Uncontrolled hourly emission rate (lb/hr) x (8,760 hr/yr) / (2,000 lb/ton).

$$\text{Gas Service Propane Emission Rate (tpy)} = \frac{0.41 \text{ lb}}{\text{hr}} \times \frac{8{,}760 \text{ hr}}{\text{yr}} \times \frac{1 \text{ ton}}{2{,}000 \text{ lb}} = \frac{1.81 \text{ ton}}{\text{yr}}$$

FUGITIVE EMISSION CALCULATIONS - SPECIATED LIQUID VOC EMISSIONS

Speciated Liquid Analysis for Fugitives (VOC and HAP) [1]

Component	Mol Wt	Mol %	Weight (lb/lbmole Gas)	Wt%	Corrected Wt%	Uncontrolled lb/hr [2]	Uncontrolled tons/yr [3]
Nitrogen	28.0134	0.03	0.01	0.01	-	-	-
Carbon Dioxide	44.01	0.30	0.13	0.11	-	-	-
Methane	16.042	5.81	0.93	0.75	0.92	<0.01	0.03
Ethane	30.069	4.66	1.40	1.13	1.38	0.01	0.05
Propane	44.096	7.68	3.39	2.73	3.34	0.03	0.13
Iso-butane	58.122	1.88	1.09	0.88	1.08	<0.01	0.04
N-butane	58.122	6.11	3.55	2.86	3.50	0.03	0.13
2-2 Dimethylpropane	72.15	0.10	0.07	0.06	0.07	<0.01	<0.01
Iso-pentane	72.149	3.06	2.21	1.78	2.18	0.02	0.08
N-pentane	72.149	3.83	2.77	2.23	2.73	0.02	0.10
2-2 Dimethylbutane	86.18	0.06	0.05	0.04	0.05	<0.01	<0.01
Cyclopentane	70.1	0.00	0.00	0.00	0.00	0.00	0.00
2-3 Dimethylbutane	86.18	0.33	0.28	0.23	0.28	<0.01	0.01
2 Methylpentane	86.18	1.74	1.50	1.21	1.48	0.01	0.06
3 Methylpentane	86.18	0.95	0.82	0.66	0.80	<0.01	0.03
n-Hexane	86.175	2.86	2.46	1.98	2.43	0.02	0.09
Methylcyclopentane	84.16	1.76	1.48	1.19	1.46	0.01	0.06
Benzene	78.114	0.36	0.28	0.23	0.28	<0.01	0.01
Cyclohexane	84.16	1.87	1.58	1.27	1.55	0.01	0.06
2-Methylhexane	100.2	1.04	1.04	0.84	1.02	<0.01	0.04
3-Methylhexane	100.2	0.84	0.84	0.68	0.83	<0.01	0.03
2,2,4 Trimethylpentane	114.23	0.00	0.00	0.00	0.00	0.00	0.00
Other Heptanes	100.202	1.31	1.31	1.05	1.30	0.01	0.05
n-Heptane	100.202	2.32	2.32	1.87	2.29	0.02	0.09
Methylcyclohexane	98.19	3.66	3.59	2.89	3.54	0.03	0.13
Toluene	92.141	1.30	1.20	0.97	1.18	0.01	0.04
Other C-8's	128.2	4.31	5.53	3.83	5.46	0.05	0.21
n-Octane	128.2	1.95	2.50	1.79	2.46	0.02	0.09
Ethylbenzene	106.167	0.28	0.30	0.24	0.29	<0.01	0.01
M&P Xylene	106.5	1.20	1.28	1.03	1.26	0.01	0.05
O-Xylene	106.5	0.40	0.42	0.34	0.41	<0.01	0.02
Other C-9's	128.259	3.91	5.01	3.98	4.95	0.04	0.19
n-Nonane	128.259	1.42	1.82	1.47	1.80	0.02	0.07
Other C10s	142.29	4.08	5.80	4.65	5.72	0.05	0.22
n-Decane	142.29	1.18	1.68	1.36	1.66	0.01	0.06
Undecanes Plus	156.31	27.44	42.89	53.69	42.31	0.37	1.60
	Totals	**100.00**	**101.52**	**100.00**	**100.00**		
	Total VOC	**89.20**	**99.05**	**98.01**	**97.70**	**0.84**	**3.70**
	Total HAP	**6.3840**	**5.9296**	**4.7770**	**5.8487**	**0.05**	**0.22**
	Total Hydrocarbon		**101.38**			**0.86**	**3.79**

[1] Stream composition obtained from seperator oil analysis for Combs Ranch 29-33-70 C SX 7H, Analysis Dated August 19, 2014

[1] Uncontrolled hourly emission rate (lb/hr) = Component Weight % (%) x Uncontrolled Hourly Total Emission Rate (lb/hr).

$$\text{Gas Service Propane Emission Rate (lb/hr)} = \frac{3.34\%}{} \left| \frac{2.98\ \text{lb}}{\text{hr}} \right. = \frac{0.03\ \text{lb}}{\text{hr}}$$

[2] Uncontrolled annual emission rate (tpy) = Uncontrolled hourly emission rate (lb/hr) x (8,760 hr/yr) / (2,000 lb/ton).

$$\text{Gas Service Propane Emission Rate (tpy)} = \frac{0.03\ \text{lb}}{\text{hr}} \left| \frac{8{,}760\ \text{hr}}{\text{yr}} \right| \frac{1\ \text{ton}}{2{,}000\ \text{lb}} = \frac{0.13\ \text{ton}}{\text{yr}}$$

NSR Application A0001056
SMITH CREEK 8-32-70 B PAD
F026720
June 22, 2015

If I am claiming any information in this submission is a trade secret, I hereby swear or affirm that the trade secret request meets the requirements of Wyoming Air Quality Standards and Regulations and that the justification submitted with the trade secret request sets forth the basis for claiming that the information should be considered a trade secret as defined in Wyoming Air Quality Standards and Regulations.

a) I am the Authorized Representative identified in applicable Wyoming Air Quality Standards and Regulations as authorized to sign this document; and
b) Based on information and belief formed after reasonable inquiry, I hereby affirm that all factual statements in this transmittal are true, accurate and complete to the best of my knowledge and that all judgments and estimates have been made in good faith.

Account: jgovenlock

Date/time submitted: Jun 22 2015, 13:55:02

Air Quality Division

Application for NSR Permit

- **NSR Application**

This information should be filled out for each New Source Review (NSR) application. An NSR permit is required for all air contaminant sources (emissions units) installed or modified after January 1, 1974. See the application instructions for additional information.

- **Purpose of Application**

Please summarize the reason this permit is being applied for.

NSR permit application for the Smith Creek 8-32-70 B Pad oil and gas production facility.

Has the facility changed location or is it a new/greenfield facility? Yes
Has a Land Use Planning document been included in this application? No
Does production at this facility contain H2S? No

- **Federal Rules Applicability - Facility Level**

Prevention of Significant Deterioration (PSD) Not affected
These rules are found under WAQSR Chapter 6, Section 4.

Non-Attainment New Source Review Not affected
These rules are found under WAQSR Chapter 6, Section 13.

- **Trade Secret Information** - One or more Emissions Units in this application contains trade secret information.

No

- **Permit Application Contact** - Newly created contacts and application contact changes will be saved when the application is saved.

Name	Title	Company
Melissa Hatfield-Atkinson	Supervisor - Air Permitting, Northern Division Business Unit	
Street Address	**City/Township, State**	**Zip Code**
414 Summers Street	Charleston, WV	25301
Phone	**Fax**	**E-mail**
(304)353-5118		northerndivisionairpermitting@chk.com

- **Modeling Section**

Ambient Air Quality Impact Analysis: WAQSR Chapter 6, Section 2(c)(ii) requires that permit applicants demonstrate that a proposed facility will not prevent the attainment or maintenance of any ambient air quality standard.

Has the applicant contacted AQD to determine if modeling is required? No
Is a modeling analysis part of this application? No
Is the proposed project subject to Prevention of Significant Deterioration (PSD) requirements? No

- **Application Attachments**

Required Attachment	Public Document Id	Attachment Type	Description
X	5435	Process Flow Diagram	Smith Creek 8-32-70 B Pad Process Flow Diagram
X	5436	Emissions Calculations	Smith Creek 8-32-70 B Pad Emission Calculations

X	5437	Cover Letter/Project Description	Smith Creek 8-32-70 B Pad Permit Application
X	5438	Equipment List	Smith Creek 8-32-70 B Pad Equipment List
X	5439	Facility Map	Smith Creek 8-32-70 B Pad Facility Maps

Section II - Specific Air Contaminant Source Information

AQD EU ID: FLR001

AQD EU description: two (2) smokeless emergency flares w/ autoignitors (produced gas and heater treater flash emission control during upset conditions)

Company EU ID: FL-1/FL-2

Company EU Description: Two smokeless standard flares w/ autoignitors (produced gas and heater treater flash emission control during upset conditions)

- **Source Installation or Modification Schedule** – Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

  Construction(greenfield/new facility)

  Date production began:

  After permit has been issued :Yes

- **Emission Unit Type Specific Information**

  Emission Unit Type : Flare
  Emergency Flare Only : No
  Btu Content (Btu/scf) : 1,156.00
  Assist Gas Utilized : No
  Waste Gas Volume : 0.01
  Installation Date :
  Continuously Monitored : Yes
  Describe Continuous Monitoring : Thermocouples

  Ignition Device Type : Pilot
  Smokeless Design : Yes

  Units : MMscf/hr

- **Potential Operating Schedule** – Provide the operating schedule for this emissions unit

  Hours/day : 24
  Hours/year : 8760

- **Emissions Information** "Potential to emit" means the maximum capacity of a source to emit any air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of a source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored or processed, shall be treated as part of its design if the limitation is enforceable by the EPA and the Division. This term does not alter or affect the use of this term for any other purposes under the Act, or the term "capacity factor" as used in Title IV of the Act or the regulations promulgated thereunder.

  Basis for Determination Options:

  - *Manufacturer Data*
  - *Test results for this source*
  - *Similar source test results*
  - *GRICalc*
  - *Tanks Program*

- *AP-42*
- *Other. If this is selected, attach a document with a description of the method used.*

Criteria Pollutants :

Pollutant	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
		Potential to Emit (PTE)*	Units*			
Particulate emissions (PE/PM) (formerly particulate matter, PM)	0	0		0	0	
PM # 10 microns in diameter (PE/PM10)	0	0		0	0	
PM # 2.5 microns in diameter (PE/PM2.5)	0	0		0	0	
Sulfur dioxide (SO2)	0	0		0	0	
Nitrogen oxides (NOx)	0	0		1.85	8.09	Other
Carbon monoxide (CO)	0	0		0.46	2.02	Other
Volatile organic compounds (VOC)	0	0		3.23	14.16	Other
Lead (Pb)	0	0		0	0	
Total Hazardous Air Pollutants (HAPs)	0	0		0	0	
Fluoride (F)	0	0		0	0	
Hydrogen Sulfide (H2S)	0	0		0	0	
Mercury (Hg)	0	0		0	0	
Total Reduced Sulfur (TRS)	0	0		0	0	
Sulfuric Acid Mist (SAM)	0	0		0	0	

Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants:

Pollutant	Pollutant Category	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
			Potential to Emit (PTE)*	Units*			
Toluene	VOC-HAP	0	0		0.0061	0.0267	Other
Hexane, N-	VOC-HAP	0	0		0.0555	0.243	Other
Xylenes (Isomers and Mixture)	VOC-HAP	0	0		0.00256	0.0112	Other
Benzene	VOC-HAP	0	0		0.0047	0.0206	Other

Greenhouse Gases (GHGs):

Pollutant	Pollutant Category	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
			Potential to Emit (PTE)*	Units*			

** Provide your calculations as an attachment and explain how all process variables and emissions factors were selected. Note the emission factor(s) employed and document origin. Example: AP-42, Table 4.4-3 (8/97); stack test, Method 5, 4/96; mass balance based on MSDS; etc.*

*** AQD Calculated - See 'Help' for more information.*

- **Best Available Control Technology (BACT)**

  Was a BACT Analysis completed for this unit? No

- **Lowest Achievable Emission Rate (LAER)**

  Was a LAER Analysis completed for this unit? No

- **Federal and State Rule Applicability**

  New Source Performance Standards (NSPS) Not affected
  New Source Performance Standards are listed under 40 CFR 60 - Standards of Performance for New Stationary Sources.

  National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61) Not affected
  National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).

  National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) Not affected
  National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63.

  Prevention of Significant Deterioration (PSD) Not Affected
  These rules are found under WAQSR Chapter 6, Section 4.

  Non-Attainment New Source Review Not Affected
  These rules are found under WAQSR Chapter 6, Section 13.

- **Emission Unit Attachments**

Required Attachment	Public Document Id	Attachment Type	Description

Section II - Specific Air Contaminant Source Information

AQD EU ID: FLR002
AQD EU description:
Company EU ID: AAF-1
Company EU Description: Air Assisted Flare

- **Source Installation or Modification Schedule** – Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

  Construction(greenfield/new facility)
  Date production began:
  After permit has been issued :Yes

- **Emission Unit Type Specific Information**

  Emission Unit Type : Flare
  Emergency Flare Only : No
  Ignition Device Type : Pilot
  Btu Content (Btu/scf) : 2,175.00
  Smokeless Design : Yes
  Assist Gas Utilized : No
  Waste Gas Volume : 0.01
  Units : MMscf/hr
  Installation Date :
  Continuously Monitored : Yes
  Describe Continuous Monitoring : Thermocouples

- **Potential Operating Schedule** – Provide the operating schedule for this emissions unit

  Hours/day : 24
  Hours/year : 8760

- **Emissions Information** "Potential to emit" means the maximum capacity of a source to emit any air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of a source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored or processed, shall be treated as part of its design if the limitation is enforceable by the EPA and the Division. This term does not alter or affect the use of this term for any other purposes under the Act, or the term "capacity factor" as used in Title IV of the Act or the regulations promulgated thereunder.

  Basis for Determination Options:
  - *Manufacturer Data*
  - *Test results for this source*
  - *Similar source test results*
  - *GRICalc*
  - *Tanks Program*
  - *AP-42*
  - *Other. If this is selected, attach a document with a description of the method used.*

  Criteria Pollutants :

Pollutant	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
		Potential to Emit (PTE)*	Units*			
Particulate emissions (PE/PM) (formerly particulate matter,	0	0		0.09	0.04	AP-42

PM)						
PM # 10 microns in diameter (PE/PM10)	0	0		0	0	
PM # 2.5 microns in diameter (PE/PM2.5)	0	0		0	0	
Sulfur dioxide (SO2)	0	0		0.0072	0.0031	AP-42
Nitrogen oxides (NOx)	0	0		1.7	0.75	Other
Carbon monoxide (CO)	0	0		0.43	0.19	Other
Volatile organic compounds (VOC)	0	0		95.56	41.85	Other
Lead (Pb)	0	0		0	0	
Total Hazardous Air Pollutants (HAPs)	0	0		0	0	
Fluoride (F)	0	0		0	0	
Hydrogen Sulfide (H2S)	0	0		0	0	
Mercury (Hg)	0	0		0	0	
Total Reduced Sulfur (TRS)	0	0		0	0	
Sulfuric Acid Mist (SAM)	0	0		0	0	

Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants:

Pollutant	Pollutant Category	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
			Potential to Emit (PTE)*	Units*			
Toluene	VOC-HAP	0	0		0.000041	0.000018	AP-42
Hexane, N-	VOC-HAP	0	0		0.0215	0.00941	AP-42
Formaldehyde	VOC-HAP	0	0		0.000895	0.000392	AP-42
Benzene	VOC-HAP	0	0		0.000025	0.000011	AP-42

Greenhouse Gases (GHGs):

Pollutant	Pollutant Category	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
			Potential to Emit (PTE)*	Units*			

** Provide your calculations as an attachment and explain how all process variables and emissions factors were selected. Note the emission factor(s) employed and document origin. Example: AP-42, Table 4.4-3 (8/97); stack test, Method 5, 4/96; mass balance based on MSDS; etc.*

*** AQD Calculated - See 'Help' for more information.*

- **Best Available Control Technology (BACT)**

  Was a BACT Analysis completed for this unit? No

- **Lowest Achievable Emission Rate (LAER)**

  Was a LAER Analysis completed for this unit? No

- **Federal and State Rule Applicability**

  New Source Performance Standards (NSPS) Not affected
  New Source Performance Standards are listed under 40 CFR 60 - Standards of Performance for New Stationary

Sources.

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61)
National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).

Not affected

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63)
National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63.

Not affected

Prevention of Significant Deterioration (PSD)
These rules are found under WAQSR Chapter 6, Section 4.

Not Affected

Non-Attainment New Source Review
These rules are found under WAQSR Chapter 6, Section 13.

Not Affected

- **Emission Unit Attachments**

Required Attachment	Public Document Id	Attachment Type	Description

Section II - Specific Air Contaminant Source Information

AQD EU ID: FLR003
AQD EU description:
Company EU ID: CMB-1/CMB-2
Company EU Description: Enclosed combustors control emissions from condensate tanks, PW tanks, & truck loadout of condensate and PW with a DRE = 98%. Enclosed combustors have a capture efficiency of 98% for all storage tanks, 98.7% for LUD001 and 70% for LUD002.

- **Source Installation or Modification Schedule** – Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

  Construction(greenfield/new facility)
  Date production began:
  After permit has been issued :Yes

- **Emission Unit Type Specific Information**

  Emission Unit Type : Flare
  Emergency Flare Only : No
  Btu Content (Btu/scf) : 1,722.00
  Assist Gas Utilized : No
  Waste Gas Volume : 86,107.37
  Installation Date :
  Continuously Monitored : Yes
  Describe Continuous Monitoring : Thermocouples

  Ignition Device Type : Pilot
  Smokeless Design : Yes

  Units : scf/day

- **Potential Operating Schedule** – Provide the operating schedule for this emissions unit

  Hours/day : 24
  Hours/year : 8760

- **Emissions Information** "Potential to emit" means the maximum capacity of a source to emit any air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of a source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored or processed, shall be treated as part of its design if the limitation is enforceable by the EPA and the Division. This term does not alter or affect the use of this term for any other purposes under the Act, or the term "capacity factor" as used in Title IV of the Act or the regulations promulgated thereunder.

  Basis for Determination Options:
  - *Manufacturer Data*
  - *Test results for this source*
  - *Similar source test results*
  - *GRICalc*

- *Tanks Program*
- *AP-42*
- *Other. If this is selected, attach a document with a description of the method used.*

Criteria Pollutants :

Pollutant	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
		Potential to Emit (PTE)*	Units*			
Particulate emissions (PE/PM) (formerly particulate matter, PM)	0	0		0.05	0.21	Other
PM # 10 microns in diameter (PE/PM10)	0	0		0.04	0.15	Other
PM # 2.5 microns in diameter (PE/PM2.5)	0	0		0.04	0.15	Other
Sulfur dioxide (SO2)	0	0		0.0037	0.0162	AP-42
Nitrogen oxides (NOx)	0	0		0.88	3.86	Other
Carbon monoxide (CO)	0	0		0.22	0.96	Other
Volatile organic compounds (VOC)	0	0		4.02	17.6	Other
Lead (Pb)	0	0		0	0	
Total Hazardous Air Pollutants (HAPs)	0	0		0.2	0.89	Other
Fluoride (F)	0	0		0	0	
Hydrogen Sulfide (H2S)	0	0		0	0	
Mercury (Hg)	0	0		0	0	
Total Reduced Sulfur (TRS)	0	0		0	0	
Sulfuric Acid Mist (SAM)	0	0		0	0	

Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants:

Pollutant	Pollutant Category	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
			Potential to Emit (PTE)*	Units*			
Ethyl Benzene	VOC-HAP	0	0		0.01	0.04	Other
Toluene	VOC-HAP	0	0		0.04	0.17	Other
Hexane, N-	VOC-HAP	0	0		0.09	0.4	Other
Xylenes (Isomers and Mixture)	VOC-HAP	0	0		0.05	0.24	Other
Formaldehyde	VOC-HAP	0	0		0.000483	0.00212	Other
Benzene	VOC-HAP	0	0		0.00909	0.04	Other

Greenhouse Gases (GHGs):

Pollutant	Pollutant Category	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
			Potential to Emit (PTE)*	Units*			

** Provide your calculations as an attachment and explain how all process variables and emissions factors were selected.*

Note the emission factor(s) employed and document origin. Example: AP-42, Table 4.4-3 (8/97); stack test, Method 5, 4/96; mass balance based on MSDS; etc.

*** AQD Calculated - See 'Help' for more information.*

- **Best Available Control Technology (BACT)**

  Was a BACT Analysis completed for this unit? No

- **Lowest Achievable Emission Rate (LAER)**

  Was a LAER Analysis completed for this unit? No

- **Federal and State Rule Applicability**

  New Source Performance Standards (NSPS) Not affected
  New Source Performance Standards are listed under 40 CFR 60 - Standards of Performance for New Stationary Sources.

  National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61) Not affected
  National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).

  National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) Not affected
  National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63.

  Prevention of Significant Deterioration (PSD) Not Affected
  These rules are found under WAQSR Chapter 6, Section 4.

  Non-Attainment New Source Review Not Affected
  These rules are found under WAQSR Chapter 6, Section 13.

- **Emission Unit Attachments**

Required Attachment	Public Document Id	Attachment Type	Description

Section II - Specific Air Contaminant Source Information

AQD EU ID: FUG001
AQD EU description: fugitives
Company EU ID: FUG
Company EU Description: Fugitives

- **Source Installation or Modification Schedule** – Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

  Construction(greenfield/new facility)
  Date production began:
  After permit has been issued :Yes

- **Emission Unit Type Specific Information**

  Emission Unit Type : Fugitive
  Type of Fugitive Emission : Fugitive Leaks at O&G

Equipment and Service Type	Number of Each Equipment Type	Leak Rate (ppm)	Percent VOC
Valve; Gas	253	0.99	
Flange; Gas	466	0.99	
Pump; Gas	2	0.99	
Connector; Gas	130	0.99	
Valve; Light Oil	134	0.99	
Valve; Heavy Oil	2	0.99	
Connector; Light Oil	9	0.99	
Pump; Water/Light Oil	2	0.99	
Flange; Light Oil	266	0.99	

- **Potential Operating Schedule** – Provide the operating schedule for this emissions unit

  Hours/day : 24
  Hours/year : 8760

- **Emissions Information** "Potential to emit" means the maximum capacity of a source to emit any air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of a source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored or processed, shall be treated as part of its design if the limitation is enforceable by the EPA and the Division. This term does not alter or affect the use of this term for any other purposes under the Act, or the term "capacity factor" as used in Title IV of the Act or the regulations promulgated thereunder.

  Basis for Determination Options:
  - *Manufacturer Data*
  - *Test results for this source*
  - *Similar source test results*
  - *GRICalc*
  - *Tanks Program*
  - *AP-42*
  - *Other. If this is selected, attach a document with a description of the method used.*

  Criteria Pollutants :

Pollutant	Pre-Controlled	Efficiency Standards	Potential to Emit (PTE)	Potential to Emit (PTE)	Basis for Determinatio

	Potential Emissions (tons/yr)	Potential to Emit (PTE)*	Units*	(lbs/hr)*	(tons/yr)*	n*
Particulate emissions (PE/PM) (formerly particulate matter, PM)	0	0		0	0	
PM # 10 microns in diameter (PE/PM10)	0	0		0	0	
PM # 2.5 microns in diameter (PE/PM2.5)	0	0		0	0	
Sulfur dioxide (SO2)	0	0		0	0	
Nitrogen oxides (NOx)	0	0		0	0	
Carbon monoxide (CO)	0	0		0	0	
Volatile organic compounds (VOC)	0	0		1.6	7.03	AP-42
Lead (Pb)	0	0		0	0	
Total Hazardous Air Pollutants (HAPs)	0	0		0	0	
Fluoride (F)	0	0		0	0	
Hydrogen Sulfide (H2S)	0	0		0	0	
Mercury (Hg)	0	0		0	0	
Total Reduced Sulfur (TRS)	0	0		0	0	
Sulfuric Acid Mist (SAM)	0	0		0	0	

Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants:

Pollutant	Pollutant Category	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
			Potential to Emit (PTE)*	Units*			
Ethyl Benzene	VOC-HAP	0	0		0.0025	0.0111	AP-42
Toluene	VOC-HAP	0	0		0.0116	0.051	AP-42
Hexane, N-	VOC-HAP	0	0		0.0338	0.149	AP-42
Xylenes (Isomers and Mixture)	VOC-HAP	0	0		0.0149	0.066	AP-42
Benzene	VOC-HAP	0	0		0.00347	0.0153	

Greenhouse Gases (GHGs):

Pollutant	Pollutant Category	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
			Potential to Emit (PTE)*	Units*			

** Provide your calculations as an attachment and explain how all process variables and emissions factors were selected. Note the emission factor(s) employed and document origin. Example: AP-42, Table 4.4-3 (8/97); stack test, Method 5, 4/96; mass balance based on MSDS; etc.*

*** AQD Calculated - See 'Help' for more information.*

- **Best Available Control Technology (BACT)**

Was a BACT Analysis completed for this unit? No

- **Lowest Achievable Emission Rate (LAER)**

  Was a LAER Analysis completed for this unit? No

- **Federal and State Rule Applicability**

  New Source Performance Standards (NSPS) Not affected
  New Source Performance Standards are listed under 40 CFR 60 - Standards of Performance for New Stationary Sources.

  National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61) Not affected
  National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).

  National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) Not affected
  National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63.

  Prevention of Significant Deterioration (PSD) Not Affected
  These rules are found under WAQSR Chapter 6, Section 4.

  Non-Attainment New Source Review Not Affected
  These rules are found under WAQSR Chapter 6, Section 13.

- **Emission Unit Attachments**

Required Attachment	Public Document Id	Attachment Type	Description

Section II - Specific Air Contaminant Source Information

AQD EU ID: HET001

AQD EU description: 0.5 MMBtu/hr heater treater heater

Company EU ID: HT-1

Company EU Description: 0.5 MMBtu/hr heater treater heater

- **Source Installation or Modification Schedule** – Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

  Construction(greenfield/new facility)

  Date production began:

  After permit has been issued :Yes

- **Emission Unit Type Specific Information**

  Emission Unit Type : Heater/Chiller

  Fuel Sulfur Content : Units :

- **Potential Operating Schedule** – Provide the operating schedule for this emissions unit

  Hours/day : 24

  Hours/year : 8760

- **Emissions Information** "Potential to emit" means the maximum capacity of a source to emit any air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of a source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored or processed, shall be treated as part of its design if the limitation is enforceable by the EPA and the Division. This term does not alter or affect the use of this term for any other purposes under the Act, or the term "capacity factor" as used in Title IV of the Act or the regulations promulgated thereunder.

  Basis for Determination Options:

  - *Manufacturer Data*
  - *Test results for this source*
  - *Similar source test results*
  - *GRICalc*
  - *Tanks Program*
  - *AP-42*
  - *Other. If this is selected, attach a document with a description of the method used.*

  Criteria Pollutants :

Pollutant	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
		Potential to Emit (PTE)*	Units*			
Particulate emissions (PE/PM) (formerly particulate matter, PM)	0	0		0.0037	0.02	AP-42
PM # 10 microns in diameter (PE/PM10)	0	0		0.0028	0.01	AP-42
PM # 2.5 microns in diameter (PE/PM2.5)	0	0		0.0028	0.01	AP-42

Sulfur dioxide (SO2)	0	0		0.0003	0.0013	AP-42
Nitrogen oxides (NOx)	0	0		0.05	0.21	AP-42
Carbon monoxide (CO)	0	0		0.04	0.18	AP-42
Volatile organic compounds (VOC)	0	0		0.0027	0.01	AP-42
Lead (Pb)	0	0		0	0	
Total Hazardous Air Pollutants (HAPs)	0	0		0.0009	0.004	AP-42
Fluoride (F)	0	0		0	0	
Hydrogen Sulfide (H2S)	0	0		0	0	
Mercury (Hg)	0	0		0	0	
Total Reduced Sulfur (TRS)	0	0		0	0	
Sulfuric Acid Mist (SAM)	0	0		0	0	

Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants:

Pollutant	Pollutant Category	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
			Potential to Emit (PTE)*	Units*			
Toluene	VOC-HAP	0	0		0.000002	0.000007	AP-42
Hexane, N-	VOC-HAP	0	0		0.000882	0.00386	AP-42
Formaldehyde	VOC-HAP	0	0		0.000037	0.000161	AP-42
Benzene	VOC-HAP	0	0		0.000001	0.000005	AP-42

Greenhouse Gases (GHGs):

Pollutant	Pollutant Category	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
			Potential to Emit (PTE)*	Units*			

** Provide your calculations as an attachment and explain how all process variables and emissions factors were selected. Note the emission factor(s) employed and document origin. Example: AP-42, Table 4.4-3 (8/97); stack test, Method 5, 4/96; mass balance based on MSDS; etc.*

*** AQD Calculated - See 'Help' for more information.*

- **Best Available Control Technology (BACT)**

  Was a BACT Analysis completed for this unit? No

- **Lowest Achievable Emission Rate (LAER)**

  Was a LAER Analysis completed for this unit? No

- **Federal and State Rule Applicability**

  New Source Performance Standards (NSPS) Not affected
  New Source Performance Standards are listed under 40 CFR 60 - Standards of Performance for New Stationary Sources.

  National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61) Not affected
  National Emissions Standards for Hazardous Air Pollutants

(NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) Not affected
National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63.

Prevention of Significant Deterioration (PSD) Not Affected
These rules are found under WAQSR Chapter 6, Section 4.

Non-Attainment New Source Review Not Affected
These rules are found under WAQSR Chapter 6, Section 13.

- **Emission Unit Attachments**

Required Attachment	Public Document Id	Attachment Type	Description

Section II - Specific Air Contaminant Source Information

AQD EU ID: HET002

AQD EU description: 0.5 MMBtu/hr heater treater heater

Company EU ID: HT-2

Company EU Description: 0.5 MMBtu/hr heater treater heater

- **Source Installation or Modification Schedule** – Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

  Construction(greenfield/new facility)

  Date production began:

  After permit has been issued :Yes

- **Emission Unit Type Specific Information**

  Emission Unit Type : Heater/Chiller

  Fuel Sulfur Content : Units :

- **Potential Operating Schedule** – Provide the operating schedule for this emissions unit

  Hours/day : 24

  Hours/year : 8760

- **Emissions Information** "Potential to emit" means the maximum capacity of a source to emit any air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of a source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored or processed, shall be treated as part of its design if the limitation is enforceable by the EPA and the Division. This term does not alter or affect the use of this term for any other purposes under the Act, or the term "capacity factor" as used in Title IV of the Act or the regulations promulgated thereunder.

  Basis for Determination Options:

  - *Manufacturer Data*
  - *Test results for this source*
  - *Similar source test results*
  - *GRICalc*
  - *Tanks Program*
  - *AP-42*
  - *Other. If this is selected, attach a document with a description of the method used.*

  Criteria Pollutants :

Pollutant	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
		Potential to Emit (PTE)*	Units*			
Particulate emissions (PE/PM) (formerly particulate matter, PM)	0	0		0.0037	0.02	AP-42
PM # 10 microns in diameter (PE/PM10)	0	0		0.0028	0.01	AP-42
PM # 2.5 microns in diameter (PE/PM2.5)	0	0		0.0028	0.01	AP-42

Sulfur dioxide (SO2)	0	0		0.0003	0.0013	AP-42
Nitrogen oxides (NOx)	0	0		0.05	0.21	AP-42
Carbon monoxide (CO)	0	0		0.04	0.18	AP-42
Volatile organic compounds (VOC)	0	0		0.0027	0.01	AP-42
Lead (Pb)	0	0		0	0	
Total Hazardous Air Pollutants (HAPs)	0	0		0.0009	0.004	AP-42
Fluoride (F)	0	0		0	0	
Hydrogen Sulfide (H2S)	0	0		0	0	
Mercury (Hg)	0	0		0	0	
Total Reduced Sulfur (TRS)	0	0		0	0	
Sulfuric Acid Mist (SAM)	0	0		0	0	

Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants:

Pollutant	Pollutant Category	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
			Potential to Emit (PTE)*	Units*			
Toluene	VOC-HAP	0	0		0.000002	0.000007	AP-42
Hexane, N-	VOC-HAP	0	0		0.000882	0.00386	AP-42
Formaldehyde	VOC-HAP	0	0		0.000037	0.000161	AP-42
Benzene	VOC-HAP	0	0		0.000001	0.000005	AP-42

Greenhouse Gases (GHGs):

Pollutant	Pollutant Category	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
			Potential to Emit (PTE)*	Units*			

** Provide your calculations as an attachment and explain how all process variables and emissions factors were selected. Note the emission factor(s) employed and document origin. Example: AP-42, Table 4.4-3 (8/97); stack test, Method 5, 4/96; mass balance based on MSDS; etc.*

*** AQD Calculated - See 'Help' for more information.*

- **Best Available Control Technology (BACT)**

  Was a BACT Analysis completed for this unit? No

- **Lowest Achievable Emission Rate (LAER)**

  Was a LAER Analysis completed for this unit? No

- **Federal and State Rule Applicability**

  New Source Performance Standards (NSPS) Not affected
  New Source Performance Standards are listed under 40 CFR 60 - Standards of Performance for New Stationary Sources.

  National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61) Not affected
  National Emissions Standards for Hazardous Air Pollutants

(NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) Not affected
National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63.

Prevention of Significant Deterioration (PSD) Not Affected
These rules are found under WAQSR Chapter 6, Section 4.

Non-Attainment New Source Review Not Affected
These rules are found under WAQSR Chapter 6, Section 13.

- **Emission Unit Attachments**

Required Attachment	Public Document Id	Attachment Type	Description

Section II - Specific Air Contaminant Source Information

AQD EU ID: HET003
AQD EU description:
Company EU ID: HT-3
Company EU Description: 0.5 MMBtu/hr heater treater heater

- **Source Installation or Modification Schedule** – Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

  Construction(greenfield/new facility)
  Date production began:
  After permit has been issued :Yes

- **Emission Unit Type Specific Information**

  Emission Unit Type : Heater/Chiller
  Fuel Sulfur Content : Units :

- **Potential Operating Schedule** – Provide the operating schedule for this emissions unit

  Hours/day : 24
  Hours/year : 8760

- **Emissions Information** "Potential to emit" means the maximum capacity of a source to emit any air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of a source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored or processed, shall be treated as part of its design if the limitation is enforceable by the EPA and the Division. This term does not alter or affect the use of this term for any other purposes under the Act, or the term "capacity factor" as used in Title IV of the Act or the regulations promulgated thereunder.

  Basis for Determination Options:
  - *Manufacturer Data*
  - *Test results for this source*
  - *Similar source test results*
  - *GRICalc*
  - *Tanks Program*
  - *AP-42*
  - *Other. If this is selected, attach a document with a description of the method used.*

  Criteria Pollutants :

Pollutant	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
		Potential to Emit (PTE)*	Units*			
Particulate emissions (PE/PM) (formerly particulate matter, PM)	0	0		0.0037	0.02	AP-42
PM # 10 microns in diameter (PE/PM10)	0	0		0.0028	0.01	AP-42
PM # 2.5 microns in diameter (PE/PM2.5)	0	0		0.0028	0.01	AP-42
Sulfur dioxide (SO2)	0	0		0.0003	0.0013	AP-42

Nitrogen oxides (NOx)	0	0		0.05	0.21	AP-42
Carbon monoxide (CO)	0	0		0.04	0.18	AP-42
Volatile organic compounds (VOC)	0	0		0.0027	0.01	AP-42
Lead (Pb)	0	0		0	0	
Total Hazardous Air Pollutants (HAPs)	0	0		0.0009	0.004	AP-42
Fluoride (F)	0	0		0	0	
Hydrogen Sulfide (H2S)	0	0		0	0	
Mercury (Hg)	0	0		0	0	
Total Reduced Sulfur (TRS)	0	0		0	0	
Sulfuric Acid Mist (SAM)	0	0		0	0	

Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants:

Pollutant	Pollutant Category	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
			Potential to Emit (PTE)*	Units*			
Toluene	VOC-HAP	0	0		0.000002	0.000007	AP-42
Hexane, N-	VOC-HAP	0	0		0.000882	0.00386	AP-42
Formaldehyde	VOC-HAP	0	0		0.000037	0.000161	AP-42
Benzene	VOC-HAP	0	0		0.000001	0.000005	AP-42

Greenhouse Gases (GHGs):

Pollutant	Pollutant Category	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
			Potential to Emit (PTE)*	Units*			

** Provide your calculations as an attachment and explain how all process variables and emissions factors were selected. Note the emission factor(s) employed and document origin. Example: AP-42, Table 4.4-3 (8/97); stack test, Method 5, 4/96; mass balance based on MSDS; etc.*

*** AQD Calculated - See 'Help' for more information.*

- **Best Available Control Technology (BACT)**

  Was a BACT Analysis completed for this unit? No

- **Lowest Achievable Emission Rate (LAER)**

  Was a LAER Analysis completed for this unit? No

- **Federal and State Rule Applicability**

New Source Performance Standards (NSPS) Not affected
New Source Performance Standards are listed under 40 CFR 60 - Standards of Performance for New Stationary Sources.

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61) Not affected
National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl

chloride).

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) Not affected
National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63.

Prevention of Significant Deterioration (PSD) Not Affected
These rules are found under WAQSR Chapter 6, Section 4.

Non-Attainment New Source Review Not Affected
These rules are found under WAQSR Chapter 6, Section 13.

- **Emission Unit Attachments**

Required Attachment	Public Document Id	Attachment Type	Description

Section II - Specific Air Contaminant Source Information

AQD EU ID: LUD001
AQD EU description: truck loading
Company EU ID: TL-1
Company EU Description: Condensate Truck Loading. Condensate Truck Loading has a capture efficiency of 98.7%.

- **Source Installation or Modification Schedule** – Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

  Construction(greenfield/new facility)
  Date production began:
  After permit has been issued :Yes

- **Emission Unit Type Specific Information**

  Emission Unit Type : Loading/Unloading/Dump
  Maximum Hourly Throughput : Units :
  Detailed Description of Loading/Unloading/Dump Source : Truck loading of condensate. Controlled by CMB-1/CMB-2 enclosed combustors with 98.7% capture efficiency and 98% DRE. VOC emission represent uncaptured emissions.

  **Provide detailed calculations documenting the potential emissions and emission factors used to calculate emissions from this source.*

- **Potential Operating Schedule** – Provide the operating schedule for this emissions unit

  Hours/day :
  Hours/year :

- **Emissions Information** "Potential to emit" means the maximum capacity of a source to emit any air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of a source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored or processed, shall be treated as part of its design if the limitation is enforceable by the EPA and the Division. This term does not alter or affect the use of this term for any other purposes under the Act, or the term "capacity factor" as used in Title IV of the Act or the regulations promulgated thereunder.

  Basis for Determination Options:
  - *Manufacturer Data*
  - *Test results for this source*
  - *Similar source test results*
  - *GRICalc*
  - *Tanks Program*
  - *AP-42*
  - *Other. If this is selected, attach a document with a description of the method used.*

  Criteria Pollutants :

Pollutant	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
		Potential to Emit (PTE)*	Units*			
Particulate emissions	0	0		0	0	

(PE/PM) (formerly particulate matter, PM)						
PM # 10 microns in diameter (PE/PM10)	0	0		0	0	
PM # 2.5 microns in diameter (PE/PM2.5)	0	0		0	0	
Sulfur dioxide (SO2)	0	0		0	0	
Nitrogen oxides (NOx)	0	0		0	0	
Carbon monoxide (CO)	0	0		0	0	
Volatile organic compounds (VOC)	501.31	0		1.49	6.52	AP-42
Lead (Pb)	0	0		0	0	
Total Hazardous Air Pollutants (HAPs)	0	0		0	0	
Fluoride (F)	0	0		0	0	
Hydrogen Sulfide (H2S)	0	0		0	0	
Mercury (Hg)	0	0		0	0	
Total Reduced Sulfur (TRS)	0	0		0	0	
Sulfuric Acid Mist (SAM)	0	0		0	0	

Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants:

Pollutant	Pollutant Category	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
			Potential to Emit (PTE)*	Units*			
Ethyl Benzene	VOC-HAP	0.27	1.2		0.00356	0.02	Other
Toluene	VOC-HAP	1.1	4.84		0.01	0.06	Other
Hexane, N-	VOC-HAP	2.27	9.94		0.03	0.13	Other
Xylenes (Isomers and Mixture)	VOC-HAP	1.56	6.84		0.02	0.09	Other
Benzene	VOC-HAP	0.26	1.13		0.00336	0.01	Other

Greenhouse Gases (GHGs):

Pollutant	Pollutant Category	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
			Potential to Emit (PTE)*	Units*			

** Provide your calculations as an attachment and explain how all process variables and emissions factors were selected. Note the emission factor(s) employed and document origin. Example: AP-42, Table 4.4-3 (8/97); stack test, Method 5, 4/96; mass balance based on MSDS; etc.*

*** AQD Calculated - See 'Help' for more information.*

- **Best Available Control Technology (BACT)**

  Was a BACT Analysis completed for this unit? No

- **Lowest Achievable Emission Rate (LAER)**

  Was a LAER Analysis completed for this unit? No

- **Federal and State Rule Applicability**

New Source Performance Standards (NSPS) Not affected
New Source Performance Standards are listed under 40 CFR 60 - Standards of Performance for New Stationary Sources.

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61) Not affected
National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) Not affected
National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63.

Prevention of Significant Deterioration (PSD) Not Affected
These rules are found under WAQSR Chapter 6, Section 4.

Non-Attainment New Source Review Not Affected
These rules are found under WAQSR Chapter 6, Section 13.

- **Emission Unit Attachments**

Required Attachment	Public Document Id	Attachment Type	Description

Section II - Specific Air Contaminant Source Information

AQD EU ID: LUD002
AQD EU description:
Company EU ID: TL-2
Company EU Description: Produced Water Truck Loading. Condensate Truck Loading has a capture efficiency of 70%.

- **Source Installation or Modification Schedule** – Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

  Construction(greenfield/new facility)
  Date production began:
  After permit has been issued :Yes

- **Emission Unit Type Specific Information**

  Emission Unit Type : Loading/Unloading/Dump
  Maximum Hourly Throughput : Units :
  Detailed Description of Loading/Unloading/Dump Source : Truck loading of produced water. Assume 1% of all loading PW will be equal to the emissions profile of condensate loading. Controlled by enclosed combustors CMB-1/CMB-2 with 70% vapor capture efficiency and 98% DRE. VOC emission represent uncaptured emissions.

  **Provide detailed calculations documenting the potential emissions and emission factors used to calculate emissions from this source.*

- **Potential Operating Schedule** – Provide the operating schedule for this emissions unit

  Hours/day :
  Hours/year :

- **Emissions Information** "Potential to emit" means the maximum capacity of a source to emit any air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of a source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored or processed, shall be treated as part of its design if the limitation is enforceable by the EPA and the Division. This term does not alter or affect the use of this term for any other purposes under the Act, or the term "capacity factor" as used in Title IV of the Act or the regulations promulgated thereunder.

  Basis for Determination Options:
  - *Manufacturer Data*
  - *Test results for this source*
  - *Similar source test results*
  - *GRICalc*
  - *Tanks Program*
  - *AP-42*
  - *Other. If this is selected, attach a document with a description of the method used.*

  Criteria Pollutants :

Pollutant	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
		Potential to Emit (PTE)*	Units*			

Particulate emissions (PE/PM) (formerly particulate matter, PM)	0	0		0	0	
PM # 10 microns in diameter (PE/PM10)	0	0		0	0	
PM # 2.5 microns in diameter (PE/PM2.5)	0	0		0	0	
Sulfur dioxide (SO2)	0	0		0	0	
Nitrogen oxides (NOx)	0	0		0	0	
Carbon monoxide (CO)	0	0		0	0	
Volatile organic compounds (VOC)	0.12	0		0.04	0.16	Other
Lead (Pb)	0	0		0	0	
Total Hazardous Air Pollutants (HAPs)	0	0		0	0	
Fluoride (F)	0	0		0	0	
Hydrogen Sulfide (H2S)	0	0		0	0	
Mercury (Hg)	0	0		0	0	
Total Reduced Sulfur (TRS)	0	0		0	0	
Sulfuric Acid Mist (SAM)	0	0		0	0	

Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants:

Pollutant	Pollutant Category	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
			Potential to Emit (PTE)*	Units*			
Ethyl Benzene	VOC-HAP	0.000298	0.00131		0.00009	0.000392	Other
Toluene	VOC-HAP	0.0012	0.00527		0.000361	0.00158	Other
Hexane, N-	VOC-HAP	0.00247	0.01		0.000742	0.00325	Other
Xylenes (Isomers and Mixture)	VOC-HAP	0.0017	0.00745		0.000511	0.00224	Other
Benzene	VOC-HAP	0.000282	0.00124		0.000085	0.000371	Other

Greenhouse Gases (GHGs):

Pollutant	Pollutant Category	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
			Potential to Emit (PTE)*	Units*			

** Provide your calculations as an attachment and explain how all process variables and emissions factors were selected. Note the emission factor(s) employed and document origin. Example: AP-42, Table 4.4-3 (8/97); stack test, Method 5, 4/96; mass balance based on MSDS; etc.*

*** AQD Calculated - See 'Help' for more information.*

- **Best Available Control Technology (BACT)**

  Was a BACT Analysis completed for this unit? No

- **Lowest Achievable Emission Rate (LAER)**

  Was a LAER Analysis completed for this unit? No

- **Federal and State Rule Applicability**

New Source Performance Standards (NSPS) Not affected
New Source Performance Standards are listed under 40 CFR 60 - Standards of Performance for New Stationary Sources.

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61) Not affected
National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) Not affected
National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63.

Prevention of Significant Deterioration (PSD) Not Affected
These rules are found under WAQSR Chapter 6, Section 4.

Non-Attainment New Source Review Not Affected
These rules are found under WAQSR Chapter 6, Section 13.

- **Emission Unit Attachments**

Required Attachment	Public Document Id	Attachment Type	Description

Section II - Specific Air Contaminant Source Information

AQD EU ID: TNK001

AQD EU description: ten (10) 400-bbl oil tanks

Company EU ID: OTK-1- OTK-8

Company EU Description: 8 (eight) 400-bbl condensate oil tank

- **Source Installation or Modification Schedule** – Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

  Construction(greenfield/new facility)

  Date production began:

  After permit has been issued :Yes

- **Emission Unit Type Specific Information**

  Emission Unit Type : Storage Tank/Silo

  Maximum Hourly Throughput : Units :

  Is Tank Heated : No

  Operating Pressure (psig) : 0.00 Vapor Pressure of Material Stored (psig) : 0.01

- **Potential Operating Schedule** – Provide the operating schedule for this emissions unit

  Hours/day : 24

  Hours/year : 8760

- **Emissions Information** "Potential to emit" means the maximum capacity of a source to emit any air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of a source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored or processed, shall be treated as part of its design if the limitation is enforceable by the EPA and the Division. This term does not alter or affect the use of this term for any other purposes under the Act, or the term "capacity factor" as used in Title IV of the Act or the regulations promulgated thereunder.

  Basis for Determination Options:

  - *Manufacturer Data*
  - *Test results for this source*
  - *Similar source test results*
  - *GRICalc*
  - *Tanks Program*
  - *AP-42*
  - *Other. If this is selected, attach a document with a description of the method used.*

  Criteria Pollutants :

Pollutant	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
		Potential to Emit (PTE)*	Units*			
Particulate emissions (PE/PM) (formerly particulate matter, PM)	0	0		0	0	
PM # 10 microns in	0	0		0	0	

diameter (PE/PM10)						
PM # 2.5 microns in diameter (PE/PM2.5)	0	0		0	0	
Sulfur dioxide (SO2)	0	0		0	0	
Nitrogen oxides (NOx)	0	0		0	0	
Carbon monoxide (CO)	0	0		0	0	
Volatile organic compounds (VOC)	387.93	0		1.77	7.76	Tanks Program
Lead (Pb)	0	0		0	0	
Total Hazardous Air Pollutants (HAPs)	0	0		0	0	
Fluoride (F)	0	0		0	0	
Hydrogen Sulfide (H2S)	0	0		0	0	
Mercury (Hg)	0	0		0	0	
Total Reduced Sulfur (TRS)	0	0		0	0	
Sulfuric Acid Mist (SAM)	0	0		0	0	

Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants:

Pollutant	Pollutant Category	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
			Potential to Emit (PTE)*	Units*			
Ethyl Benzene	VOC-HAP	0.21	0.93		0.00423	0.02	Other
Toluene	VOC-HAP	0.85	3.74		0.02	0.07	Other
Hexane, N-	VOC-HAP	1.76	7.69		0.04	0.15	Other
Xylenes (Isomers and Mixture)	VOC-HAP	1.21	5.29		0.02	0.11	Other
Benzene	VOC-HAP	0.2	0.88		0.004	0.02	Other

Greenhouse Gases (GHGs):

Pollutant	Pollutant Category	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
			Potential to Emit (PTE)*	Units*			

** Provide your calculations as an attachment and explain how all process variables and emissions factors were selected. Note the emission factor(s) employed and document origin. Example: AP-42, Table 4.4-3 (8/97); stack test, Method 5, 4/96; mass balance based on MSDS; etc.*

*** AQD Calculated - See 'Help' for more information.*

- **Best Available Control Technology (BACT)**

  Was a BACT Analysis completed for this unit? No

- **Lowest Achievable Emission Rate (LAER)**

  Was a LAER Analysis completed for this unit? No

- **Federal and State Rule Applicability**

  New Source Performance Standards (NSPS) Not affected
  New Source Performance Standards are listed under 40 CFR 60 - Standards of Performance for New Stationary

Sources.

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61)
National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).

Not affected

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63)
National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63.

Not affected

Prevention of Significant Deterioration (PSD)
These rules are found under WAQSR Chapter 6, Section 4.

Not Affected

Non-Attainment New Source Review
These rules are found under WAQSR Chapter 6, Section 13.

Not Affected

- **Emission Unit Attachments**

Required Attachment	Public Document Id	Attachment Type	Description

Section II - Specific Air Contaminant Source Information

AQD EU ID: TNK002

AQD EU description: two (2) 400-bbl produced water tanks

Company EU ID: WTK-1-WTK-4

Company EU Description: Four (4) 400-bbl produced water tanks

- **Source Installation or Modification Schedule** – Select reason(s) for this emissions unit being included in this application (must be completed regardless of date of installation or modification):

  Construction(greenfield/new facility)

  Date production began:

  After permit has been issued :Yes

- **Emission Unit Type Specific Information**

  Emission Unit Type : Storage Tank/Silo

  Maximum Hourly Throughput : Units :

  Is Tank Heated : No

  Operating Pressure (psig) : 0.00 Vapor Pressure of Material Stored (psig) : 4.96

- **Potential Operating Schedule** – Provide the operating schedule for this emissions unit

  Hours/day : 24

  Hours/year : 8760

- **Emissions Information** "Potential to emit" means the maximum capacity of a source to emit any air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of a source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored or processed, shall be treated as part of its design if the limitation is enforceable by the EPA and the Division. This term does not alter or affect the use of this term for any other purposes under the Act, or the term "capacity factor" as used in Title IV of the Act or the regulations promulgated thereunder.

  Basis for Determination Options:

  - *Manufacturer Data*
  - *Test results for this source*
  - *Similar source test results*
  - *GRICalc*
  - *Tanks Program*
  - *AP-42*
  - *Other. If this is selected, attach a document with a description of the method used.*

  Criteria Pollutants :

Pollutant	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
		Potential to Emit (PTE)*	Units*			
Particulate emissions (PE/PM) (formerly particulate matter, PM)	0	0		0	0	

PM # 10 microns in diameter (PE/PM10)	0	0		0	0	
PM # 2.5 microns in diameter (PE/PM2.5)	0	0		0	0	
Sulfur dioxide (SO2)	0	0		0	0	
Nitrogen oxides (NOx)	0	0		0	0	
Carbon monoxide (CO)	0	0		0	0	
Volatile organic compounds (VOC)	4.69	0		0.02	0.09	Tanks Program
Lead (Pb)	0	0		0	0	
Total Hazardous Air Pollutants (HAPs)	0	0		0	0	
Fluoride (F)	0	0		0	0	
Hydrogen Sulfide (H2S)	0	0		0	0	
Mercury (Hg)	0	0		0	0	
Total Reduced Sulfur (TRS)	0	0		0	0	
Sulfuric Acid Mist (SAM)	0	0		0	0	

Hazardous Air Pollutants (HAPs) and Toxic Air Contaminants:

Pollutant	Pollutant Category	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
			Potential to Emit (PTE)*	Units*			
Ethyl Benzene	VOC-HAP	0.01	0		0.000051	0.000224	Other
Toluene	VOC-HAP	0.05	0		0.000207	0.000904	Other
Hexane, N-	VOC-HAP	0.09	0		0.000424	0.00186	Other
Xylenes (Isomers and Mixture)	VOC-HAP	0.06	0		0.000292	0.00128	Other
Benzene	VOC-HAP	0.01			0.000048	0.000212	Other

Greenhouse Gases (GHGs):

Pollutant	Pollutant Category	Pre-Controlled Potential Emissions (tons/yr)	Efficiency Standards		Potential to Emit (PTE) (lbs/hr)*	Potential to Emit (PTE) (tons/yr)*	Basis for Determination*
			Potential to Emit (PTE)*	Units*			

** Provide your calculations as an attachment and explain how all process variables and emissions factors were selected. Note the emission factor(s) employed and document origin. Example: AP-42, Table 4.4-3 (8/97); stack test, Method 5, 4/96; mass balance based on MSDS; etc.*

*** AQD Calculated - See 'Help' for more information.*

- **Best Available Control Technology (BACT)**

  Was a BACT Analysis completed for this unit? No

- **Lowest Achievable Emission Rate (LAER)**

  Was a LAER Analysis completed for this unit? No

- **Federal and State Rule Applicability**

  New Source Performance Standards (NSPS) Not affected
  New Source Performance Standards are listed under 40

CFR 60 - Standards of Performance for New Stationary Sources.

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 61) Not affected
National Emissions Standards for Hazardous Air Pollutants (NESHAP Part 61) are listed under 40 CFR 61. (These include asbestos, benzene, beryllium, mercury, and vinyl chloride).

National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) Not affected
National Emission Standards for Hazardous Air Pollutants (NESHAP Part 63) standards are listed under 40 CFR 63.

Prevention of Significant Deterioration (PSD) Not Affected
These rules are found under WAQSR Chapter 6, Section 4.

Non-Attainment New Source Review Not Affected
These rules are found under WAQSR Chapter 6, Section 13.

- **Emission Unit Attachments**

Required Attachment	Public Document Id	Attachment Type	Description

Facility Detail Report
Facility Name: SMITH CREEK 8-32-70 B PAD
ID: F026720

Facility : F026720

Sep 8 2015, 07:16:17

- Facility Information

Facility ID: F026720
FacilityName: SMITH CREEK 8-32-70 B PAD
Facility Description:
Company Name: Chesapeake Operating LLC
Operating Status: Not Yet Installed
AFS:
Facility Class: Minor
Facility Type: Production Site
CERR Class: NON

- Location

Physical Address	City	County	Lat/Long	PLSS	Effective Date
Section 8, 32N, 70W	Converse County	Converse	42.76591/-105.28269	S8-T32N-R70W	02/27/2015

Location Detail For : Section 8, 32N, 70W

Latitude: 42.76591
Longitude: -105.28269
Quarter Quarter:
Quarter:
Section: 8
Township: 32N
Range: 70W
County: Converse
State: Wyoming
Distict: District 2
Physical Address 1: Section 8, 32N, 70W
Physical Address 2:
City: Converse County
Zip: 82633
Effective Date: 02/27/2015

- API

API
0929091
0929200
0929843

- Notes

User Name	Date	Note

- NAICS Codes

2111 Oil and Gas Extraction

- Contacts

Contact Type	Contact Person	Phone Number	Email	Start Date	End Date
Responsible Official	Govenlock, Jim	(405)935-8000	jim.govenlock@chk.com	11/24/2003	
Environmental contact	Hatfield-Atkinson, Melissa	(304)353-5118	northerndivisionairpermitting@chk.com	11/15/2005	
NSR Permitting contact	Hatfield-Atkinson, Melissa	(304)353-5118	northerndivisionairpermitting@chk.com	11/15/2005	

Contact Detail For : Govenlock, Jim

Prefix:	Mr.	First Name:	Jim
Middle Name:		Last Name:	Govenlock
Suffix:			
Company Title:		Contact's Company Name:	Chesapeake Operating LLC
Address 1:	Oklahoma		
Address 2:			
City:	Oklahoma	Zip Code:	73101
State:	Oklahoma		
Work Phone No:	(405)935-8000	Secondary Phone No.:	
Address 2:		Secondary Ext. No.:	
Mobile Phone No.:		Pager No.:	
Fax No:		Pager PIN No.:	
Email:	jim.govenlock@chk.com		
Email Pager Address:			

Contact Detail For : Hatfield-Atkinson, Melissa

Prefix:	Mrs.	First Name:	Melissa
Middle Name:		Last Name:	Hatfield-Atkinson
Suffix:			
Company Title:	Supervisor - Air Permitting, Northern Division Business Unit	Contact's Company Name:	Chesapeake Operating LLC
Address 1:	414 Summers Street		
Address 2:			
City:	Charleston	Zip Code:	25301
State:	West Virginia		
Work Phone No:	(304)353-5118	Secondary Phone No.:	
Address 2:	(304)380-3074	Secondary Ext. No.:	
Mobile Phone No.:		Pager No.:	
Fax No:		Pager PIN No.:	
Email:	northerndivisionairpermitting@chk.com		
Email Pager Address:			

- **Rules & Regs**

Subject to Part 60 NSPS:		Subject to 112(r) Accidental Release Prevention:	
Subject to Part 61 NESHAP:		Subject to non-attainment NSR:	
Subject Part 63 NESHAP:		Subject to PSD:	
Subject to Title IV Acid Rain:			

- **Attachments**

Description	Type	Modified By	Modified Date

- **Version**

Version ID	Version Start Date	Version End Date	Preserved
CURRENT	06/19/2015		x
29358	03/02/2015	06/19/2015	x

Emission Unit : FLR001

- Emission Unit Information

AQD Emissions Unit ID: FLR001

Emission Unit Type: Flare

Maximum Design Capacity: 560000.0 Units : scf/day

Minimum Design Capacity: 560000.0 Units : scf/day

Pilot Gas Volume (scf/min):

AQD Description: two (2) smokeless emergency flares w/ autoignitors (produced gas and heater treater flash emission control during upset conditions)

Company Equipment ID: FL-1/FL-2

Company Equipment Description: Two smokeless standard flares w/ autoignitors (produced gas and heater treater flash emission control during upset conditions)

Operating Status: Not Yet Installed

Initial Construction Commencement Date:

Initial Operation Commencement Date:

Most Recent Construction/Modification Commencement Date:

Most Recent Operation Commencement Date:

- Permitted Emissions

Pollutant	Potential Emissions (Lbs/hour)	Potential Emissions (Tons/Year)	Allowable Emissions (Lbs/Hour)	Allowable Emissions (Tons/Year	Comments

- Processes

- Emission Process Information

Process ID: PRC001

Process Name: Standard flare

Company Process Description: Standard flare

Source Classification Code (SCC): 3-10-001-60

Release points(s) directly associated with this process

VER004

Emission Unit : FLR002

- Emission Unit Information

AQD Emissions Unit ID: FLR002
Emission Unit Type: Flare
Maximum Design Capacity: 0.02 Units : MMscf/hr
Minimum Design Capacity: 0.02 Units : MMscf/hr
Pilot Gas Volume (scf/min):
AQD Description:
Company Equipment ID: AAF-1
Company Equipment Description: Air Assisted Flare
Operating Status: Not Yet Installed

Initial Construction Commencement Date:
Initial Operation Commencement Date:
Most Recent Construction/Modification Commencement Date:
Most Recent Operation Commencement Date:

- Permitted Emissions

Pollutant	Potential Emissions (Lbs/hour)	Potential Emissions (Tons/Year)	Allowable Emissions (Lbs/Hour)	Allowable Emissions (Tons/Year	Comments

- Processes

- Emission Process Information

Process ID: PRC011
Process Name: Air Assisted Flare
Company Process Description: Air Assisted Flare
Source Classification Code (SCC): 3-10-001-60

Release points(s) directly associated with this process

VER006

Emission Unit : FLR003

- Emission Unit Information

AQD Emissions Unit ID: FLR003

Emission Unit Type: Flare

Maximum Design Capacity: 0.01 Units : MMscf/hr

Minimum Design Capacity: 0.01 Units : MMscf/hr

Pilot Gas Volume (scf/min):

AQD Description:

Company Equipment ID: CMB-1/CMB-2

Company Equipment Description: Enclosed combustors control emissions from condensate tanks, PW tanks, & truck loadout of condensate and PW with a DRE = 98%. Enclosed combustors have a capture efficiency of 98% for all storage tanks, 98.7% for LUD001 and 70% for LUD002.

Operating Status: Not Yet Installed

Initial Construction Commencement Date:

Initial Operation Commencement Date:

Most Recent Construction/Modification Commencement Date:

Most Recent Operation Commencement Date:

- Permitted Emissions

Pollutant	Potential Emissions (Lbs/hour)	Potential Emissions (Tons/Year)	Allowable Emissions (Lbs/Hour)	Allowable Emissions (Tons/Year	Comments

- Processes

- Emission Process Information

Process ID: PRC012

Process Name: Enclosed Combustors

Company Process Description: Enclosed Combustors

Source Classification Code (SCC): 3-10-001-60

Emission Unit : FUG001

- **Emission Unit Information**

AQD Emissions Unit ID: FUG001
Emission Unit Type: Fugitive
AQD Description: fugitives
Company Equipment ID: FUG
Company Equipment Description: Fugitives
Operating Status: Not Yet Installed
Initial Construction Commencement Date:
Initial Operation Commencement Date:
Most Recent Construction/Modification Commencement Date:
Most Recent Operation Commencement Date:

- **Permitted Emissions**

Pollutant	Potential Emissions (Lbs/hour)	Potential Emissions (Tons/Year)	Allowable Emissions (Lbs/Hour)	Allowable Emissions (Tons/Year	Comments

- **Processes**
  - **Emission Process Information**

Process ID: PRC002
Process Name: fugitives
Company Process Description: fugitives
Source Classification Code (SCC): 3-10-001-01

Release points(s) directly associated with this process

AVL001

Emission Unit : HET001

- Emission Unit Information

AQD Emissions Unit ID: HET001
Emission Unit Type: Heater/Chiller
Firing Type: Direct
Heat Input Rating: 0.5 Units: MMBtu/hr
Primary Fuel Type: Field Gas Secondary Fuel Type: Field Gas
Heat Content of Fuel (BTU/scf): 1359
AQD Description: 0.5 MMBtu/hr heater treater heater
Company Equipment ID: HT-1
Company Equipment Description: 0.5 MMBtu/hr heater treater heater
Operating Status: Not Yet Installed

Initial Construction Commencement Date:

Initial Operation Commencement Date:

Most Recent Construction/Modification Commencement Date:

Most Recent Operation Commencement Date:

- Permitted Emissions

Pollutant	Potential Emissions (Lbs/hour)	Potential Emissions (Tons/Year)	Allowable Emissions (Lbs/Hour)	Allowable Emissions (Tons/Year	Comments

- Processes

- Emission Process Information

Process ID: PRC003
Process Name: heater
Company Process Description: heater
Source Classification Code (SCC): 3-10-004-05

Release points(s) directly associated with this process

VER002

Emission Unit : HET002

- Emission Unit Information

AQD Emissions Unit ID: HET002
Emission Unit Type: Heater/Chiller
Firing Type: Direct
Heat Input Rating: 0.5
Units: MMBtu/hr
Primary Fuel Type: Field Gas
Secondary Fuel Type: Field Gas
Heat Content of Fuel (BTU/scf): 1359
AQD Description: 0.5 MMBtu/hr heater treater heater
Company Equipment ID: HT-2
Company Equipment Description: 0.5 MMBtu/hr heater treater heater
Operating Status: Not Yet Installed

Initial Construction Commencement Date:

Initial Operation Commencement Date:

Most Recent Construction/Modification Commencement Date:

Most Recent Operation Commencement Date:

- Permitted Emissions

Pollutant	Potential Emissions (Lbs/hour)	Potential Emissions (Tons/Year)	Allowable Emissions (Lbs/Hour)	Allowable Emissions (Tons/Year	Comments

- Processes

- Emission Process Information

Process ID: PRC004
Process Name: heater
Company Process Description: heater
Source Classification Code (SCC): 3-10-004-05

Release points(s) directly associated with this process

VER003

Emission Unit : HET003

- Emission Unit Information

AQD Emissions Unit ID: HET003

Emission Unit Type: Heater/Chiller

Firing Type: Direct

Heat Input Rating: 0.5 Units: MMBtu/hr

Primary Fuel Type: Field Gas Secondary Fuel Type: Field Gas

Heat Content of Fuel (BTU/scf): 1359

AQD Description:

Company Equipment ID: HT-3

Company Equipment Description: 0.5 MMBtu/hr heater treater heater

Operating Status: Not Yet Installed

Initial Construction Commencement Date:

Initial Operation Commencement Date:

Most Recent Construction/Modification Commencement Date:

Most Recent Operation Commencement Date:

- Permitted Emissions

Pollutant	Potential Emissions (Lbs/hour)	Potential Emissions (Tons/Year)	Allowable Emissions (Lbs/Hour)	Allowable Emissions (Tons/Year	Comments

- Processes

- Emission Process Information

Process ID: PRC009

Process Name: Heater Treater

Company Process Description: Heater Treater

Source Classification Code (SCC): 3-10-004-05

Release points(s) directly associated with this process

VER005

Emission Unit : LUD001

- Emission Unit Information

AQD Emissions Unit ID: LUD001

Emission Unit Type: Loading/Unloading/Dump

Type of Material: liquid

Material Description: Condensate.

Maximum Annual Throughput: 210940800 Units: gallons/yr

AQD Description: truck loading

Company Equipment ID: TL-1

Company Equipment Description: Condensate Truck Loading. Condensate Truck Loading has a capture efficiency of 98.7%.

Operating Status: Not Yet Installed

Initial Construction Commencement Date:

Initial Operation Commencement Date:

Most Recent Construction/Modification Commencement Date:

Most Recent Operation Commencement Date:

- Permitted Emissions

Pollutant	Potential Emissions (Lbs/hour)	Potential Emissions (Tons/Year)	Allowable Emissions (Lbs/Hour)	Allowable Emissions (Tons/Year	Comments

- Processes

- Emission Process Information

Process ID: PRC005

Process Name: truck loading

Company Process Description: truck loading

Source Classification Code (SCC): 4-06-001-42

Control equipment(s) directly associated with this process

FLA001

Release points(s) directly associated with this process

AVL002

Emission Unit : LUD002

- Emission Unit Information

AQD Emissions Unit ID: LUD002

Emission Unit Type: Loading/Unloading/Dump

Type of Material: liquid

Material Description: Produced Water

Maximum Annual Throughput: 22995000 Units: gallons/yr

AQD Description:

Company Equipment ID: TL-2

Company Equipment Description: Produced Water Truck Loading. Condensate Truck Loading has a capture efficiency of 70%.

Operating Status: Not Yet Installed

Initial Construction Commencement Date:

Initial Operation Commencement Date:

Most Recent Construction/Modification Commencement Date:

Most Recent Operation Commencement Date:

- Permitted Emissions

Pollutant	Potential Emissions (Lbs/hour)	Potential Emissions (Tons/Year)	Allowable Emissions (Lbs/Hour)	Allowable Emissions (Tons/Year	Comments

- Processes

- Emission Process Information

Process ID: PRC010

Process Name: PW Truck Loadout

Company Process Description: PW Truck Loadout

Source Classification Code (SCC): 4-06-001-42

Control equipment(s) directly associated with this process

FLA001

Release points(s) directly associated with this process

AVL003

Emission Unit : TNK001

- Emission Unit Information

AQD Emissions Unit ID: TNK001

Emission Unit Type: Storage Tank/Silo

Material Type: Liquid

Description of Material Stored: Condensate. Maximum throughput shown below is total throughput for all condensate tanks.

Capacity: 400 Units: barrels

Maximum Throughput: 210940800.0000 Units: gallons/yr

AQD Description: ten (10) 400-bbl oil tanks

Company Equipment ID: OTK-1- OTK-8

Company Equipment Description: 8 (eight) 400-bbl condensate oil tank

Operating Status: Not Yet Installed

Initial Construction Commencement Date:

Initial Operation Commencement Date:

Most Recent Construction/Modification Commencement Date:

Most Recent Operation Commencement Date:

- Permitted Emissions

Pollutant	Potential Emissions (Lbs/hour)	Potential Emissions (Tons/Year)	Allowable Emissions (Lbs/Hour)	Allowable Emissions (Tons/Year	Comments

- Processes

- Emission Process Information

Process ID: PRC007

Process Name: oil tanks

Company Process Description: oil tanks

Source Classification Code (SCC): 4-04-003-11

Control equipment(s) directly associated with this process

FLA001

Release points(s) directly associated with this process

AVL004

Emission Unit : TNK002

- Emission Unit Information

AQD Emissions Unit ID: TNK002

Emission Unit Type: Storage Tank/Silo

Material Type: Liquid

Description of Material Stored: Produced water. Maximum throughput shown below is total for all PW tanks.

Capacity: 400 Units: barrels

Maximum Throughput: 22995000.0000 Units: gallons/yr

AQD Description: two (2) 400-bbl produced water tanks

Company Equipment ID: WTK-1-WTK-4

Company Equipment Description: Four (4) 400-bbl produced water tanks

Operating Status: Not Yet Installed

Initial Construction Commencement Date:

Initial Operation Commencement Date:

Most Recent Construction/Modification Commencement Date:

Most Recent Operation Commencement Date:

- Permitted Emissions

Pollutant	Potential Emissions (Lbs/hour)	Potential Emissions (Tons/Year)	Allowable Emissions (Lbs/Hour)	Allowable Emissions (Tons/Year	Comments

- Processes

- Emission Process Information

Process ID: PRC008

Process Name: water tanks

Company Process Description: water tanks

Source Classification Code (SCC): 4-04-003-15

Control equipment(s) directly associated with this process

FLA001

Release points(s) directly associated with this process

AVL005

Control Equipment : FLA001

- Control Equipment Information

Equipment Type: Flare

Control Equipment ID: FLA001

AQD Description: two (2) smokeless combustion devices w/ continuous pilot monitoring systems (oil tank, active produced water tank and truck loadout emissions control)

Company Control Equipment ID: CMB-1/CMB-2

Company Control Equipment Description: Two (2) smokeless combustion devices w/ continuous pilot monitoring systems (oil tank, produced water tank and truck loadout emissions control)

Operating Status: Not Operating

Initial Installation Date:

Manufacturer:

Model:

- Specific Equipment Type information

Flare Type: Enclosed

Elevated Flare Type: Non-Assisted

Ignition Device: Yes

Flame Presence Sensor: Yes

Inlet Gas Temp:

Flame Presence Type: Thermocouple

Gas Flow Rate:

Sec. Outlet Gas Temp:

- Pollutants Controlled

Pollutant	Design Control Efficiency(%)	Operating Control Efficiency(%)	Capture Efficiency(%)	Total Capture Control(%)
Total HAP Pollutants	98	98	98.7	96.726
VOC - Volatile Organic Compounds	98	98	98.7	96.726

- Associated Control Equipments And Release Points

Release points(s) directly associated with this control equipment

VER001

Release Point : VER006

Sep 8 2015, 07:16:18

- Release Point Information

Release Point ID: VER006
Release Type: Vertical
AQD Description:
Company Release Point ID: AAF-1
Company Release Point Description: Air Assisted Flare
Operating Status: Not Operating
Base Elevation (ft): 5100.0

- Stack Details

Stack Height (ft): 20.0
Stack Diameter (ft): 0.99
Exit Gas Velocity (ft/s): 0.99
Exit Gas Flow Rate (acfm): 0.99
Exit Gas Temp (F): 0.99

- Release Latitude and Longitude

Latitude: 42.76591
Longitude: -105.28269

- CEM Data

Description	H2S	SO2	NOX	CO	THC	HCL	HFL	O	TRS	CO2	FLOW	OPACITY	PM

Release Point : VER001

- Release Point Information

Release Point ID: VER001

Release Type: Vertical

AQD Description: two (2) smokeless combustion devices w/ continuous pilot monitoring systems (oil tank, active produced water tank and truck loadout emissions control)

Company Release Point ID: CMB-1/CMB-2

Company Release Point Description: two (2) smokeless combustion devices w/ continuous pilot monitoring systems (oil tank, produced water tank and truck loadout emissions control)

Operating Status: Not Operating

Base Elevation (ft): 5100.0

- Stack Details

Stack Height (ft): 25.0

Stack Diameter (ft): 4.0

Exit Gas Velocity (ft/s): 0.99

Exit Gas Flow Rate (acfm): 0.99

Exit Gas Temp (F): 0.99

- Release Latitude and Longitude

Latitude: 42.76591

Longitude: -105.28269

- CEM Data

Description	H2S	SO2	NOX	CO	THC	HCL	HFL	O	TRS	CO2	FLOW	OPACITY	PM

Release Point : VER004

Sep 8 2015, 07:16:18

- Release Point Information

Release Point ID: VER004

Release Type: Vertical

AQD Description:

Company Release Point ID: FL-1

Company Release Point Description: Flare

Operating Status: Not Operating

Base Elevation (ft): 5100.0

- Stack Details

Stack Height (ft): 22.0

Stack Diameter (ft): 2.0

Exit Gas Velocity (ft/s): 0.99

Exit Gas Flow Rate (acfm): 0.99

Exit Gas Temp (F): 0.99

- Release Latitude and Longitude

Latitude: 42.76591

Longitude: -105.28269

- CEM Data

Description	H2S	SO2	NOX	CO	THC	HCL	HFL	O	TRS	CO2	FLOW	OPACITY	PM

Release Point : AVL001

- Release Point Information

Release Point ID: AVL001
Release Type: Fugitive (Area, Volume, Line)
AQD Description: fugitives
Company Release Point ID: FUG
Company Release Point Description: Fugitives
Operating Status: Not Operating
Release Height (ft): 10.0

- Release Latitude and Longitude

Latitude: 42.76591 Longitude: -105.28269

- CEM Data

Description	H2S	SO2	NOX	CO	THC	HCL	HFL	O	TRS	CO2	FLOW	OPACITY	PM

Release Point : VER002

Sep 8 2015, 07:16:18

- Release Point Information

Release Point ID: VER002

Release Type: Vertical

AQD Description: 0.5 MMBtu/hr heater treater heater

Company Release Point ID: HT-1

Company Release Point Description: 0.5 MMBtu/hr heater treater heater

Operating Status: Not Operating

Base Elevation (ft): 5100.0

- Stack Details

Stack Height (ft): 25.0

Stack Diameter (ft): 0.75

Exit Gas Velocity (ft/s): 0.99

Exit Gas Flow Rate (acfm): 0.99

Exit Gas Temp (F): 0.99

- Release Latitude and Longitude

Latitude: 42.76591

Longitude: -105.28269

- CEM Data

Description	H2S	SO2	NOX	CO	THC	HCL	HFL	O	TRS	CO2	FLOW	OPACITY	PM

Release Point : VER003

- Release Point Information

Release Point ID: VER003
Release Type: Vertical
AQD Description: 0.5 MMBtu/hr heater treater heater
Company Release Point ID: HT-2
Company Release Point Description: 0.5 MMBtu/hr heater treater heater
Operating Status: Not Operating
Base Elevation (ft): 5100.0

- Stack Details

Stack Height (ft): 25.0
Stack Diameter (ft): 0.75
Exit Gas Velocity (ft/s): 0.99
Exit Gas Flow Rate (acfm): 0.99
Exit Gas Temp (F): 0.99

- Release Latitude and Longitude

Latitude: 42.76591
Longitude: -105.28269

- CEM Data

Description	H2S	SO2	NOX	CO	THC	HCL	HFL	O	TRS	CO2	FLOW	OPACITY	PM

Release Point : VER005

Sep 8 2015, 07:16:18

- Release Point Information

Release Point ID: VER005

Release Type: Vertical

AQD Description:

Company Release Point ID: HT-3

Company Release Point Description: 0.5 MMBtu/hr heater treater heater

Operating Status: Not Operating

Base Elevation (ft): 5100.0

- Stack Details

Stack Height (ft): 25.0

Stack Diameter (ft): 0.75

Exit Gas Velocity (ft/s): 0.99

Exit Gas Flow Rate (acfm): 0.99

Exit Gas Temp (F): 0.99

- Release Latitude and Longitude

Latitude: 42.76591

Longitude: -105.28269

- CEM Data

Description	H2S	SO2	NOX	CO	THC	HCL	HFL	O	TRS	CO2	FLOW	OPACITY	PM

Release Point : AVL004

Sep 8 2015, 07:16:18

- Release Point Information

Release Point ID: AVL004

Release Type: Fugitive (Area, Volume, Line)

AQD Description:

Company Release Point ID: OTK-1 -OTK-8

Company Release Point Description: Uncaptured vapors from condensate tanks that are controlled by enclosed combustors. Enclosed combustors have a capture efficiency of 98%. Therefore, the uncaptured emissions are 2% of the uncontrolled emissions.

Operating Status: Not Operating

Release Height (ft):

- Release Latitude and Longitude

Latitude: 42.76591 Longitude: -105.28269

- CEM Data

Description	H2S	SO2	NOX	CO	THC	HCL	HFL	O	TRS	CO2	FLOW	OPACITY	PM

Release Point : AVL002

Sep 8 2015, 07:16:18

- Release Point Information

Release Point ID: AVL002

Release Type: Fugitive (Area, Volume, Line)

AQD Description: truck loading vapors not captured and routed to combustor (30%)

Company Release Point ID: TL-1

Company Release Point Description: Truck loading condensate vapors not captured and routed to combustor (1.3%)

Operating Status: Not Operating

Release Height (ft): 10.0

- Release Latitude and Longitude

Latitude: 42.76591 Longitude: -105.28269

- CEM Data

Description	H2S	SO2	NOX	CO	THC	HCL	HFL	O	TRS	CO2	FLOW	OPACITY	PM

Release Point : AVL003

- Release Point Information

Release Point ID: AVL003

Release Type: Fugitive (Area, Volume, Line)

AQD Description:

Company Release Point ID: TL-2

Company Release Point Description: Truck loading produced water vapors not captured and routed to the combustor (30%)

Operating Status: Not Operating

Release Height (ft): 10.0

- Release Latitude and Longitude

Latitude: 42.76591 Longitude: -105.28269

- CEM Data

Description	H2S	SO2	NOX	CO	THC	HCL	HFL	O	TRS	CO2	FLOW	OPACITY	PM

Release Point : AVL005

Sep 8 2015, 07:16:18

- Release Point Information

Release Point ID: AVL005

Release Type: Fugitive (Area, Volume, Line)

AQD Description:

Company Release Point ID: WTK-1- WTK-4

Company Release Point Description: Uncaptured vapors from PW tanks that are controlled by enclosed combustors. Enclosed combustors have a capture efficiency of 98%. Therefore, the uncaptured emissions are 2% of the uncontrolled emissions.

Operating Status: Not Operating

Release Height (ft):

- Release Latitude and Longitude

Latitude: 42.76591 Longitude: -105.28269

- CEM Data

Description	H2S	SO2	NOX	CO	THC	HCL	HFL	O	TRS	CO2	FLOW	OPACITY	PM