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Marathon Oil Company
1501 Stampede Avenue
Cody, Wyoming 82414
Telephone: 307-587-4961
Fax: 307-587-2139

Marathon Oil

JUL 2014
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July 21, 2014

Mr. Cole Anderson
Wyoming Department of Environmental Quality
Air Quality Division
Herschler Building
122 West 25th Street
Cheyenne, Wyoming 82002

via Certified Mail Number:
(7013 1090 0002 2506 8703)

Re: **Gooseberry Battery B**
Modification to Permit Waiver
AP-8519

Dear Mr. Anderson:

Marathon Oil Company (Marathon) is respectfully submitting this Chapter 6, Section 2 air permit application for the Gooseberry Battery B located in the SE ¼ SW ¼ of Section 22, Township 47 North, Range 100 West, in Park County, Wyoming. We acquired the Gooseberry A and B Batteries (A C6S2 application for Battery A is submitted under separate cover) from Encore Operating, LP on May 1, 2014 and became the operator effective July 7, 2014. Thus, Change of Ownership forms are also included in this application package. The following forms reflect minor updates to the equipment list and requests an increase to the permitted throughput limits.

Table 1, attached, shows the current uncontrolled emissions. These emissions are based on the most recent and representative gas analysis (May and July 2014). Once Marathon takes over operations of these fields/batteries, we plan to control VOCs and H_2S currently emitted from Battery B with a flare. Table 2 shows the flare-controlled emissions for the proposed throughputs. As shown in these two tables, even with an increase in throughputs, the VOC emissions will be reduced by 55 percent.

The tables below summarize the current emissions and the proposed controlled emissions.

TABLE 1: Uncontrolled Current Gooseberry Battery B Emissions (TPY) - 4 MCFD

Emission Source	VOCs	Total HAPs	NO_X	CO	SO_2	H_2S
Treater Flashing Emissions	26.95	0.50	-	-	-	1.51
Crude Tanks (S/W/B)	0.60	0.01	-	-	-	0.03
Produced Water Tanks (S/W/B)	1.22	0.02	-	-	-	0.07
(2) 0.5 MMBtu/hr, (1) 1.5 MMBtu/hr, (1) 1.0 MMBtu/hr propane-fired burners	8.95	0.00	1.53	0.38	-	-
Fugitives	0.01	0.00	-	-	-	-
TOTALS	**37.73**	**0.53**	**1.53**	**0.38**	**0.00**	**1.61**

Marathon Oil

TABLE 2: Controlled Proposed Gooseberry Battery B Emissions (TPY) - 61 MCFD						
Emission Source	VOCs	Total HAPs	NO_X	CO	SO_2	H_2S
Treater Flashing Emissions	7.56	0.14	1.65	-	38.91	0.46
Crude Tanks (S/W/B)	0.02	0.00	-	-	0.11	0.06
Produced Water Tanks (S/W/B)	0.41	0.01	-	-	2.25	1.12
(2) 0.5 MMBtu/hr, (1) 1.5 MMBtu/hr, (1) 1.0 MMBtu/hr propane-fired burners	8.95	0.00	1.53	0.38	-	-
Fugitives	0.01	0.00	-	-	-	-
Flare Pilot Emissions	-	-	0.17	0.04	-	-
TOTALS	**16.94**	**0.14**	**3.35**	**0.43**	**41.27**	**1.64**

The number of wells has not changed since they were last permitted, in 2008. A list is included with this application package, for completeness.

Because there is still some uncertainty of how the field/reservoirs will react to operational changes Marathon is planning, we have presented our best engineering estimates for the next 2 to 3 years. After changes have been made and production has stabilized, Marathon will revise our permits as necessary. We will also, revise as necessary, if additional controls or emissions change significantly.

Further, we would like to request that flaring 90 at least percent of the hours in the year (with an estimated 10 percent downtime) be considered BACT for this field at this time. Currently, there is no water discharge and there is no economically feasible option of gas injection.

Please feel free to contact me at (307) 527-2145 or rdoyle@marathonoil.com if you have questions regarding the enclosed application or require additional information.

Sincerely,

Regina Doyle

Regina Doyle
Adv. Environmental Professional

Encl: Permit Application

Cc: G. Meeker, District Engineer, Lander, WY (7013 1090 0002 2506 8697)
HES Files
L. Taylor
T. Moore
P. Moore

DESCRIPTIONS

Gooseberry Battery B
Emission Description

Currently there are no controls at the Gooseberry Battery B. The air permit was last updated in 2008.

Controlled and uncontrolled emissions represented in this application are based on a current gas analysis collected in May and July 2014. This gas analysis is representative of what is currently being vented to the atmosphere (i.e. including the additional propane). Marathon proposes to control emissions from the heater/treater/testers, oil tanks, and water tanks with a flare for at least 90% of the production throughputs. The application provides the controlled and uncontrolled (10%) emission in Tables 2 and 2a respectively.

Propane is used for fuel for equipment burners. Compressed air is used to operate pneumatic devices. Miscellaneous pumps for circulating wet oil and water are electric.

Gooseberry Battery B
Process Description

Oil and water from 7 wells is routed to one of the heater/treater/testers. Oil is then routed to the oil/production tanks before being shipped via pipeline. The water is routed to two 400 bbl water tanks before being re-injected. Some water from A Battery is routed to the B battery for re-injection, however, these emissions have been accounted for in the A Battery. There is no water discharge at this site.

WDEQ-AQD OIL AND GAS FORMS

STATE OF WYOMING

Department of Environmental Quality - Air Quality Division

Oil & Gas Production Facilities

Checklist for Complete Application

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INDUSTRY		DEQ-AQD
X	Company Name/Contact Information	
X	Well/Facility Name and API #	
X	Legal Locations	
X	Existing Permit/Waiver #'s	
X	List of Equipment Onsite	
X	Plot Plan	
X	Process Description	
X	Current Production Rates	
X	Gas/Condensate Analyses	
X	All Pertinent Dates (date of first production, control installation date)	
X	Emission Models (Input/Output)	
X	Other Calculations (heaters, pneumatic equipment, truck loading, etc.)	
X	All Applicable Application Forms	
X	DEQ Application Cover Sheet	
X	Facility Location Specify: STATEWIDE	
SCENARIO 1 SCENARIO 2 NA	Dehydration Unit Presumptive BACT check appropriate box	SCENARIO 1 SCENARIO 2 NA

Form AQD-OG00

Completeness Checklist September 2013

STATE OF WYOMING

Department of Environmental Quality - Air Quality Division

Oil & Gas Production Facilities C6 S2 Permit Application

Company Name: Marathon Oil Company

Facility Name: B Tank Battery (Gooseberry Field)

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To Be Completed by WDEQ-AQD

Reviewer _____

Copy to _____

D.E. _____

File: _____

Form AQD-OG0

Application September 2013

STATE OF WYOMING
Department of Environmental Quality - Air Quality Division
Oil and Gas Production Facilities C6-S2 Permit Application
Application Cover Sheet

JUL 2014 RECEIVED AIR QUALITY DIVISION

submit (1) one signed original copy AND (1) one electronic copy of the application OR (3) paper copies, one w/ original signature

Company Name	Marathon Oil Company
Facility Name	Gooseberry B Tank Battery
API Number	

For more than one well, list additional wells & associated API numbers on Form AQD-OG8.

OFFICIAL CONTACT PERSON

Name	Regina Doyle	Title	Adv. HES Professional
Address	1501 Stampede Ave		
Telephone	307-527-2145	Fax 307-527-2139	E-mail rdoyle@marathonoil.com

LOCATION

County	Park County							
Legal Description	1/4 1/4	SE SW	Section	22	T	47N	R	100W
Latitude	44.0307		Longitude	-108.8534				

FACILITY INFORMATION

Type of Facility:	Single Well		PAD		Central Tank Battery	X
Type of Application:	New Construction		Modified Facility	X
	First Date of Production	1950	Date of Modification	
	Producing Field Name	Gooseberry Field		
	Producing Formation(s)	Tensleep Phosphoria		
Existing Air Quality Permit / Waiver Numbers		AP-8519		
Pending Air Quality Permit Application Numbers		None		

I, Keith F. Mingus (**Responsible Official**) RMO Operations Manager (**Title**)

state that I have knowledge of the facts herein set forth and that the same are true and correct to the best of my knowledge and belief. I further certify that the emission rates listed on this certification reflect the anticipated emissions due to the operation of this facility. The facility will operate in compliance with all Wyoming Air Quality Standards and Regulations.

Signature [signature] Date 7/22/14

Signature Required

FORM AQD-OG1

Application Coversheet September 2013

STATE OF WYOMING
Department of Environmental Quality - Air Quality Division
Oil and Gas Production Facilities C6 S2 Permit Application

Equipment List

Company Name	Marathon Oil Company
Facility Name	Gooseberry Battery B

List all production equipment at the site including all pressurized vessels with the potential for flash emissions, all hydrocarbon liquids and produced water storage tanks, all dehydration units, all pneumatic pumps, all natural gas-fired burners and heaters and all emission control equipment and devices. Pressurized vessels with the potential for flash emissions are all vessels that vent vapors to the atmosphere during times other than upset or emergency conditions (water knockouts, 2-phase and 3-phase separators, heater treaters, gun barrels, scrubber pots, etc). Provide design ratings for dehys (MMCFD), process heaters, burners and pilots (MMBtu/hr, SCFH). Provide size of production & water storage tanks (BPD). For dehydration units indicate if the unit includes a glycol flash separator and/or reboiler still vent condenser. For emission control combustors/flares indicate design rating (MMBtu/hr, SCFD) and combustor/flare height (ft). Provide pneumatic pump motive gas useage (SCFH).

If more space is required, continue on page 2 of this sheet.

PROVIDE INSTALLATION DATES OF ALL EMISSION CONTROL EQUIPMENT & MONITORING DEVICES/SYSTEMS !!!

(1) 6' x 20' Vertical Tester w/ 0.5 million Btu per hour (MMBtu/hr) heater

(1) 8' x 25' Horizontal Treater w/ 1.5 MMBtu/hr heater

(1) 6' x 20' Horizontal Treater w/ 0.5 MMBtu/hr heater

(1) 6' x 20' Horizontal Treater w/1.0 MMBtu/hr heater

(4) 400-bbl oil tanks (two recently replaced the 1000 bbl tank listed in AP-8519)

(2) 400-bbl produced water tanks

(1) Continuous flame pilot flare (to be installed)

(1) 10' X 30' Free Water Knock Out (FWKO) (to be installed)

Example:

1 2-phase high pressure separator (unheated)

1 3-phase low pressure separator w/ 0.5 MMBtu/hr heater

2 0.5 MMBtu/hr line heaters

1 5 MMCFD TEG dehydration unit w/ 0.5 MMBtu/hr reboiler heater, glycol flash separator(0.5 MMBtu/hr heater) and overheads condenser

2 400-bbl condensate tanks

1 400-bbl produced water tank

1 30-ft enclosed combustor (3.0 MMBtu/hr, 5 MCFD) for flashing & reboiler vent/glycol flash separator emissions control installed 1/1/2007

STATE OF WYOMING

Department of Environmental Quality - Air Quality Division
Oil and Gas Production Facilities C6 S2 Permit Application
Storage Tanks, Pressurized Vessels & Pneumatic Pumps

Use as many copies of this form as necessary to include all tanks, vessels and pumps.

Company Name Marathon Oil Company

Facility Name Gooseberry Battery B

STORAGE TANKS

Below, list all atmospheric tanks used to store liquids transferred from an upstream vessel or wellhead. Upstream vessels include separators, treaters, flash tanks, FWKOs, gun barrels, tanks, etc. If more than one tank of the same size is used for the same purpose, receiving fluids from the same upstream vessel, those tanks may be combined on one line.

E X A M P L E S				
2-400	condensate	100	2-phase separator	600
1-1000	produced water, skim oil	1000 water, 5 oil	treater	30
1-300	bad oil tank	5 oil	run tank	atmospheric
size (bbl)	use (condensate / oil / H_2O)	total throughput (bpd)	upstream vessel	upstream vessel pressure (psig)
4-400 (bbl)	Oil Tanks	656 (proposed bpd)	Vertical Treater	10 psig
2-400 bbl	Produced Water Tank	18711 (proposed bpd)	Wellhead	10 psig

PRESSURIZED VESSELS List each vessel separately.

Pressurized vessels include FWKO's, heater-treaters, separators (2-phase & 3-phase), gas boots, gun barrels, flash tanks, etc...

E X A M P L E S			
HP 2-phase separator	600	well	1000
LP 3-phase separator	300	HP separator	600
3-phase heater treater	30	well	40
vessel	operating pressure (psig)	upstream vessel	upstream vessel pressure (psig)
(1) - 8' x 25' Horizontal Treater	10	10	Wellhead (FWKO after installed)
(1) 6' x 20' Horizontal Treater w/0.5 MMBtu/hr heater	10	10	Wellhead (FWKO after installed)
(1) 6' x 20' Horizontal Treater w/1.0 MMBtu/hr heater	10	10	Wellhead (FWKO after installed)
(1) 6' x 20' Vertical Tester w/0.5 MMBtu/hr heater	10	10	Wellhead
(1) Free Water Knockout (Proposed)	10	10	Wellhead

What is the API gravity of the SALES oil or condensate at this facility? 19.9

Does this facility handle sour oil / gas? YES X NO ____

EMISSION CONTROL DEVICES & SYSTEMS for FLASH VAPORS & PRESSURE VESSEL PROCESS STREAMS

Identify each emission control system or device and the date(s) of installation for each.

E X A M P L E: 30-foot ACME smokeless combustor for tank vapor emissions control, installed 1/1/2008

(1) Continous-Flame Pilot Flare (to be Installed)

Combustion Device Emission Controls (if applicable)

Date of Installation: TBD

Manufacturer: TBD

Smokeless Design? Yes X No ____

Excess Oxygen (%) ____

VOC Destruction Effeciency (%) ____ HAP Destruction Efficiency (%) 98

Maximum Design Throughput (SCFD) ____ Minimum Design throughput (SCFD) ____

Actual Waste Gas Volume (SCFD) ____ Waste Gas Heat Content (Btu/SCF) ____

Burner Rating (MMBtu/hr) ____

Ignition System: Pilot X Electric Spark ____ Other ____

Continuous Pilot? Yes X No ____

Pilot Gas Volume (SCFM) ~4

Is the Combustion Device Monitored? Yes X No ____ How? Fire eye

PNEUMATIC PUMPS

Describe each pneumatic pump using natural gas as the motive gas. Indicate where motive gas is vented (atmosphere or other).

E X A M P L E: 50 SCFH Acme brand heat trace circulation pump operated w/ produced gas, vented to gas collection system.

None

Form AQD-OG3

STATE OF WYOMING

Department of Environmental Quality - Air Quality Division
Oil and Gas Production Facilities C6 S2 Permit Application

EMISSION SUMMARY

Company Name Marathon Oil Company

Facility Name Gooseberry Battery B

This form must be completed for each emission source at the facility. A list of the emission sources which must be considered is found in Appendix B of the C6 S2 O&G Production Facilities Permitting Guidance.

UNCONTROLLED EMISSIONS (Tons Per Year)

These are the total uncontrolled, potential emissions from each source.

EMISSION SOURCE (i.e., tank, natural gas-fired heater, reboiler still vent, glycol flash separator, pneumatic pump, separator gas vent, water knockout vent, etc.)	VOCs	total HAPs	NO_X	CO	SO_2	H_2S
Treater Flashing Emissions	419.87	7.59	-	-	-	23.03
Crude Tanks (S/W/B)	1.03	0.02	-	-	-	0.06
Produced Water Tanks (S/W/B)	20.48	0.37	-	-	-	1.12
(2) 0.5 MMBtu/hr, (1) 1.5 MMBtu/hr, (1) 1.0 MMBtu/hr propane-fired burners	8.95	insig.	1.53	0.38	-	-
Fugitives	0.01	insig.	-	-	-	-

CONTROLLED EMISSIONS (Tons Per Year)

These are the total emissions from each source. Include controlled emissions from each controlled source and uncontrolled emissions from each source which does not require control, such as process equipment burners.

EMISSION SOURCE	VOCs	total HAPs	NO_X	CO	SO_2	H_2S
Treater Flashing Emissions	7.56	0.14	1.65	-	38.91	0.46
Crude Tanks (S/W/B)	0.02	insig.	-	-	0.11	0.06
Produced Water Tanks (S/W/B)	0.41	insig.	-	-	2.25	1.12
(2) 0.5 MMBtu/hr, (1) 1.5 MMBtu/hr, (1) 1.0 MMBtu/hr propane-fired burners	8.95	insig.	1.53	0.38	-	-
Fugitives	0.01	insig.	-	-	-	-
Flare Pilot Emissions	-	-	0.17	0.04	-	-

HAZARDOUS AIR POLLUTANT SUMMARY (Tons Per Year)

Complete this section for each emissions source if TOTAL HAPs from that source are 9 TPY or greater.

SOURCE	Benzene	Toluene	Ethyl-Benzene	Xylenes	Other

EMISSION CALCULATIONS

TABLE 1: Uncontrolled Current Gooseberry Battery B Emissions (TPY) - 4 MCFD						
Emission Source	**VOCs**	**Total HAPs**	**NO_X**	**CO**	**SO_2**	**H_2S**
Treater Flashing Emissions	26.95	0.50	-	-	-	1.51
Crude Tanks (S/W/B)	0.60	0.01	-	-	-	0.03
Produced Water Tanks (S/W/B)	1.22	0.02	-	-	-	0.07
(2) 0.5 MMBtu/hr, (1) 1.5 MMBtu/hr, (1) 1.0 MMBtu/hr propane-fired burners	8.95	0.00	1.53	0.38	-	-
Fugitives	0.01	0.00	-	-	-	-
TOTALS	**37.73**	**0.53**	**1.53**	**0.38**	**0.00**	**1.61**

TABLE 2a: Uncontrolled Proposed Gooseberry Battery B Emissions (TPY) - 61 MCFD						
Emission Source	VOCs	Total HAPs	NO_X	CO	SO_2	H_2S
Treater Flashing Emissions	419.87	7.59	-	-	-	23.03
Crude Tanks (S/W/B)	1.03	0.02	-	-	-	0.06
Produced Water Tanks (S/W/B)	20.48	0.37	-	-	-	1.12
(2) 0.5 MMBtu/hr, (1) 1.5 MMBtu/hr, (1) 1.0 MMBtu/hr propane-fired burners	8.95	0.00	1.53	0.38	-	-
Fugitives	0.01	0.00	-	-	-	-
TOTALS	**450.34**	**7.98**	**1.53**	**0.38**	**0.00**	**24.20**

TABLE 2: Controlled Proposed Gooseberry Battery B Emissions (TPY) - 61 MCFD						
Emission Source	VOCs	Total HAPs	NO_X	CO	SO_2	H_2S
Treater Flashing Emissions	7.56	0.14	1.65	-	38.91	0.46
Crude Tanks (S/W/B)	0.02	0.00	-	-	0.11	0.06
Produced Water Tanks (S/W/B)	0.41	0.01	-	-	2.25	1.12
(2) 0.5 MMBtu/hr, (1) 1.5 MMBtu/hr, (1) 1.0 MMBtu/hr propane-fired burners	8.95	0.00	1.53	0.38	-	-
Fugitives	0.01	0.00	-	-	-	-
Flare Pilot Emissions	-	-	0.17	0.04	-	-
TOTALS	**16.94**	**0.14**	**3.35**	**0.43**	**41.27**	**1.64**

TABLE 3: Gooseberry Battery B Marathon Oil Company Current Venting Emissions (4 mcfd*)		
Basis		Units
Waste Gas*	166.67	scf/hr
Fuel Heat Content (HHV)	1174.96	BTU/scf
Pilot Supply Rate*	6.32	Mscfd
NOx Emission Factor**	0.14	lb/MMBtu
CO Emission Factor**	0.035	lb/MMBtu
Hours of Operation	8760	hrs
H_2S weight %	1.95	
H_2S mole %	2.30	
Tank Vapor MW	40.10	lb/lbmol
SO_2 MW	64	lb/lbmol
VOC weight %	35.65	
HAP weight %	0.64	
VOC weight fraction	0.35	
HAP weight fraction	0.01	
Emissions:	lb/hr	tpy
NOX	0.03	0.12
Unflared H_2S Emissions	0.34	1.51
Flared H_2S Emissions	0.01	0.03
SO_2 Emissions	0.65	2.84
VOCs Uncontrolled	6.15	26.95
VOCs Controlled (90%/98%)[3]	0.11	0.49
HAPs Uncontrolled	0.11	0.50
HAPs Controlled (90%/98%)[3]	0.00	0.01

* Provided by Marathon Engineering

** From Chapter 6 Section 2 Permitting Guidance Appendix B

TABLE 4: Gooseberry Battery B Marathon Oil Company Proposed Flaring Emissions (61 mcfd*)		
Basis		Units
Waste Gas[1]	2541.67	scf/hr
Fuel Heat Content (HHV)	1174.96	BTU/scf
Pilot Supply Rate[1]	6.32	Mscfd
NOx Emission Factor[2]	0.14	lb/MMBtu
CO Emission Factor[2]	0.035	lb/MMBtu
Hours of Operation	7884	hrs
H_2S weight %	1.95	
H_2S mole %	2.30	
Tank Vapor MW	40.10	lb/lbmol
SO_2 MW	64	lb/lbmol
VOC weight %	35.65	
HAP weight %	0.64	
VOC weight fraction	0.36	
HAP weight fraction	0.01	
Emissions:	lb/hr	tpy
NOX	0.38	1.65
Unflared H_2S Emissions	5.26	23.03
Flared H_2S Emissions	0.11	0.46
SO_2 Emissions	8.88	38.91
VOCs Uncontrolled	95.86	419.87
VOCs Controlled (90%/98%)[3]	1.73	7.56
HAPs Uncontrolled	1.73	7.59
HAPs Controlled (90%/98%)[3]	0.03	0.14

[1] Provided by Marathon Engineering

[2] From Chapter 6 Section 2 Permitting Guidance Appendix B

[3] Based on 90% Flaring at 98% VOC destruction

TABLE 5: Gooseberry Battery B Oil Tank Standing/Working/Breathing Losses Current Throughput: 246 BOPD Marathon Oil Company		
Basis	Value	Units
Tank 4.09d Emission Output	3350.92	lb/yr
	1.68	tpy
	0.38	lb/hr
VOC weight %	35.65	%
HAP weight %	0.64	%
VOC weight fraction	0.36	-
HAP weight fraction	0.01	-
H_2S weight %	1.95	%
H_2S mole %	2.30	%
Emissions:	lb/hr	tpy
H_2S Emissions	0.01	0.03
VOC Uncontrolled	0.14	0.60
VOC Controlled	0.00	0.01
HAPs Uncontrolled	0.00	0.01
HAPs Controlled	0.00	0.00

TABLE 6: Gooseberry Battery B Oil Tank Standing/Working/Breathing Losses Proposed Throughput: 656 BOPD Marathon Oil Company		
Basis	Value	Units
Tank 4.09d Emission Output	5772.81	lb/yr
	2.89	tpy
	0.66	lb/hr
VOC weight %	35.65	%
HAP weight %	0.64	%
VOC weight fraction	0.36	-
HAP weight fraction	0.01	-
H_2S weight %	1.95	%
H_2S mole %	2.30	%
Emissions:	lb/hr	tpy
H_2S Emissions	0.01	0.06
Unflared H_2S Emissions*	0.00	0.00
SO_2 Emissions**	0.03	0.11
VOC Uncontrolled	0.23	1.03
VOC Controlled	0.00	0.02
HAPs Uncontrolled	0.00	0.02
HAPs Controlled	0.00	0.00

**Assume 100% conversion of H_2S to SO_2

TABLE 7: Gooseberry Battery B Water Tank Standing/Working/Breathing Losses Current Throughput: 825 BWPD Marathon Oil Company		
Basis	Value	Units
Tank 4.09d Emission Output (Based on Oil)	6848.36	lb/yr
	3.42	tpy
	0.78	lb/hr
VOC weight %	35.65	%
HAP weight %	0.64	%
VOC weight fraction	0.36	-
HAP weight fraction	0.01	-
H_2S weight %	1.95	%
H_2S mole %	2.30	%
Oil Fraction	1	%
SO2 MW	64	lb/lbmol
Emissions:	lb/hr	tpy
H_2S Emissions	0.02	0.07
Unflared H_2S Emissions	0.02	0.00
VOC Uncontrolled	0.28	1.22
HAPs Uncontrolled	0.01	0.02

TABLE 8: Gooseberry Battery B Water Tank Standing/Working/Breathing Losses Proposed Throughput: 18,711 BWPD Marathon Oil Company		
Basis	Value	Units
Tank 4.09d Emission Output (Based on Oil)	114888.42	lb/yr
	57.44	tpy
	13.12	lb/hr
VOC weight %	35.65	%
HAP weight %	0.64	%
VOC weight fraction	0.36	-
HAP weight fraction	0.01	-
H_2S weight %	1.95	%
H_2S mole %	2.30	%
Oil Fraction	1	%
SO2 MW	64	lb/lbmol
Emissions:	lb/hr	tpy
H_2S Emissions	0.26	1.12
Unflared H_2S Emissions	0.26	0.02
SO_2 Emissions*	0.51	2.25
VOC Uncontrolled	4.68	20.48
VOC Controlled	0.09	0.41
HAPs Uncontrolled	0.08	0.37
HAPs Controlled	0.00	0.01

*Assume 100% conversion of H_2S to SO_2

TABLE 9: Gooseberry Battery B Marathon Oil Company Flaring Emissions - Pilot Flame		
Basis		**Units**
scf/h	263.33	scf/hr
Fuel Heat Content (HHV)	1050.00	BTU/scf
Pilot Supply Rate*	4.39	scf/min
NOx Emission Factor**	0.14	lb/MMBtu
CO Emission Factor**	0.04	lb/MMBtu
Hours of Operation	7884	hrs
Sweet Gas MW	31.52	lb/lbmol
VOC weight %	0.01	
HAP weight %	0.00	
Emissions	**lb/hr**	**tpy**
NOx	0.04	0.17
CO	0.01	0.04
VOCs	0.00	0.00
HAPs	0.00	0.00

* Provided by Marathon Engineering

** From Chapter 6 Section 2 Permitting Guidance Appendix B

TABLE 10: Gooseberry Battery B Marathon Oil Company Heater/Tester Burner Emissions - Pilot Flame		
Basis		**Units**
scf/h	263.33	scf/hr
Fuel Heat Content (HHV)	2371.00	BTU/scf
Pilot Supply Rate*	4.39	scf/min
NOx Emission Factor**	0.14	lb/MMBtu
CO Emission Factor**	0.04	lb/MMBtu
Hours of Operation	8760	hrs
Propane MW	44.10	lb/lbmol
VOC weight %	100.00	%
HAP weight %	0.00	%
Emissions - per Pilot	**lb/hr**	**tpy**
NOx	0.09	0.38
CO	0.02	0.10
VOCs	0.51	2.24
HAPs	0.00	0.00
Emissions - Total (3 pilots)	lb/hr	tpy
NOx	0.35	1.53
CO	0.09	0.38
VOCs	2.04	8.95
HAPs	0.00	0.00

* Provided by Marathon Engineering

** From Chapter 6 Section 2 Permitting Guidance Appendix B

TABLE 11: Gooseberry Battery B Fugitives				
Equipment Type	Emission Factor[1,2] (lb/component-day)	Counts[3]	VOCs[1] (tpy)	Total HAPs (BTEX)[1] (tpy)
Connector	0.0004	68	0.0014495	7.6942E-06
Flange	0.000021	68	7.61E-05	4.03946E-07
Open Ended Line	0.0074	7	0.0027604	1.46529E-05
Other[4]	0.0017	30	0.0027178	1.44266E-05
Pump	0	0	0	0
Valve	0.00044	38	0.000891	4.72967E-06
Total			**0.0078948**	**4.19074E-05**

[1] EF from WDAQ C4 S2 O&G Production Facilities Permitting Guidance

[2] EF based on "Heavy Oil"

[3] Equipment type counts are estimated using 40 CFR Part 98 Subpart W, except "other" (ba diagram)

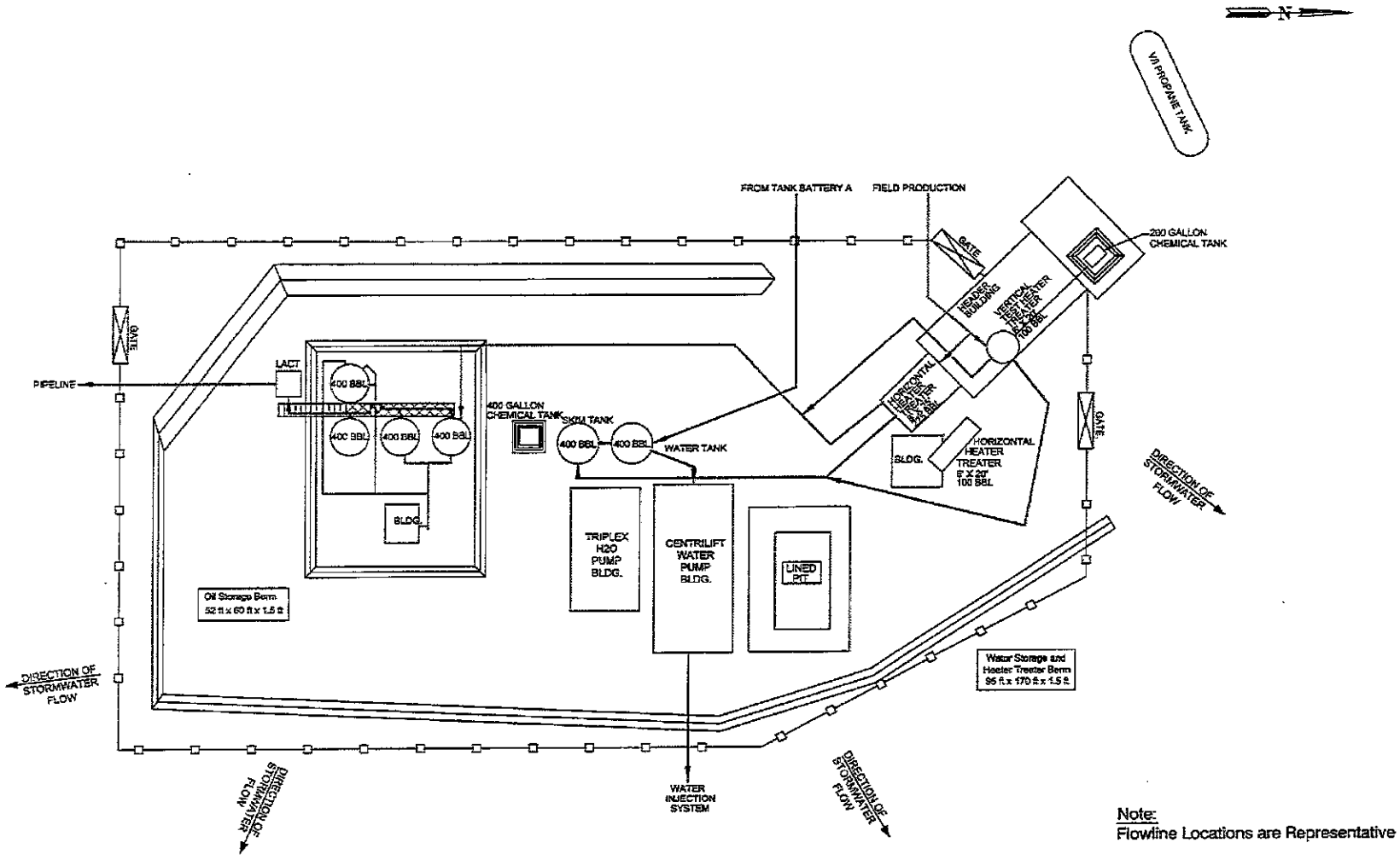
[4] Other includes compressor, PRV, diaphragms, drains, dump arms, hatches, instruments, n polished rods and vents.

WELL INFORMATION

Well Information
Gooseberry Battery B
Marathon Oil Company

Name	1/4 1/4	Section	T	R	Latitude	Longitude	Startup
Gooseberry B T1-22G	NW NW	22	47N	100W	44.03349	108.85341	6/18/1955
Gooseberry 11-22	NW NW	22	47N	100W	44.02913	108.85402	7/18/1996
Gooseberry B F41X-21G	NE NE	21	47N	100W	44.03264	108.85719	4/4/1991
Gooseberry B T78-16S	SE SE	16	47N	100W	44.03491	108.85805	7/1/1956
Goosebery B 18-15	SW SE	16	47N	100W	44.03622	108.85997	6/1/2003
Gooseberry B 72-21	SE NE	21	47N	100W	44.02866	108.85681	11/26/2008
Goosberry B 32-22	NW NW	22	47N	100W	44.03248	108.85332	10/30/2008

PLOT PLAN



Note:
Flowline Locations are Representative

LEGEND
- OIL
- WATER
- NATURAL GAS
- INLET OIL / WATER / NATURAL GAS

Cameron-Cole
5777 CENTRAL AVENUE, SUITE 200
BOULDER, COLORADO 80301
PHONE: (303) 938-5500
FAX: (303) 938-5520
http://www.cameron-cole.com

ENCORE OPERATING L.P.

GOOSEBERRY TANK BATTERY B
SESW, SEC. 22, T47N, R100W
PARK COUNTY, WYOMING

SCALE:	DATE:	PROJECT NO.
NOT TO SCALE	7/29/10	1826

GAS ANALYSES

PRECISION ANALYSIS GAS MEASUREMENT EMISSIONS TESTING LABORATORY

307.856.0866
www.precision-labs.com

Client:	MARATHON	**Analysis Date:**	7/1/2014
Sample ID:	GOOSEBERRY TREATER B	**Date Sampled:**	7/1/2014
Unique #:	N/A	**Purpose:**	SPECIAL REQ
Sample Temperature:	102 DEG F	**Sample Pressure:**	9 PSI
Sampled By:	JACOB MCKERCHIE	**Type Sample:**	ON SITE
County:	PARK	Witnessed By: Clay Shumway	

Components	Mole %	Weight %	Liq. Vol. %
Carbon Dioxide.....	39.2715	42.9550	31.2606
Hydrogen Sulfide.....	2.3309	1.9744	1.4698
Nitrogen.....	5.0367	3.5067	2.5846
Methane.....	17.4466	6.9562	13.7959
Ethane.....	11.1606	8.3406	13.9219
Propane.....	10.4858	11.4918	13.4746
iso-Butane.....	1.8470	2.6681	2.8191
n-Butane.....	4.7654	6.8839	7.0075
iso-Pentane.....	1.9894	3.5673	3.3935
n-Pentane.....	2.4461	4.3863	4.1358
Cyclopentane.....	0.0489	0.0852	0.0675
n-Hexane.....	0.8989	1.9252	1.7241
Cyclohexane.....	0.3872	0.8099	0.6143
Other Hexanes	0.6367	1.3637	1.2213
Heptanes.....	0.5949	1.4815	1.2802
Methylcyclohexane.....	0.1112	0.2714	0.2084
2,2,4-Trimethylpentane...	0.0000	0.0000	0.0000
Benzene.....	0.1647	0.3198	0.2148
Toluene.....	0.0971	0.2224	0.1516
Ethylbenzene.....	0.0083	0.0219	0.0149
Xylenes.....	0.0183	0.0483	0.0330
C8+ Heavies.....	0.2538	0.7205	0.6065
Totals	100.0000	100.0000	100.0000

ADDITIONAL BETX DATA

Components	Mole %	Weight %	Liq. Vol. %
Cyclopentane	0.0489	0.0852	0.0675
Cyclohexane	0.3872	0.8099	0.6143
2-Methylpentane	0.4008	0.8583	0.7687
3-Methylpentane	0.2360	0.5054	0.4526
n-Hexane	0.8989	1.9252	1.7241
Methylcyclohexane	0.1112	0.2714	0.2084
2,2,4-Trimethylpentane	0.0000	0.0000	0.0000
Benzene	0.1647	0.3198	0.2148
Toluene	0.0971	0.2224	0.1516
Ethylbenzene	0.0083	0.0219	0.0149
m-Xylene	0.0029	0.0077	0.0052
p-Xylene	0.0124	0.0327	0.0224
o-Xylene	0.0030	0.0079	0.0054

SPECIFIC GRAVITY @ 60/60 F, calculated	1.3892
TOTAL GPM (Ethane Inclusive)	10.880
CALCULATED BTU / REAL CF @ 14.73 PSIA, dry basis	1213.767
CALCULATED BTU / REAL CF @ 14.73 PSIA, wet basis	1193.406
AVERAGE MOLECULAR WEIGHT	40.236
MOLAR MASS RATIO	1.3892
RELATIVE DENSITY (G x Z (Air) / Z), calculated	1.4024
IDEAL GROSS HEATING VALUE, BTU / IDEAL CF @ 14.696 PSIA	1199.604
COMPRESSIBILITY FACTOR (Z)	0.99060

PROPANE GPM	2.8814
BUTANE GPM	2.1014
GASOLINE GPM (PENTANE AND HEAVIER)	2.9203

TOTAL ACID GAS MOLE %	41.6024
H2S MOLE %	2.3309
H2S PPM	23309

VOC WEIGHT FRACTION	0.363

NOTATION: ALL CALCULATIONS PERFORMED USING PHYSICAL CONSTANTS FROM GPA 2145-09, THE TABLES OF PHYSICAL CONSTANTS FOR HYDROCARBONS AND OTHER COMPOUNDS OF INTEREST TO THE NATURAL GAS INDUSTRY.

PRECISION ANALYSIS GAS MEASUREMENT EMISSIONS TESTING LABORATORY

307.856.0866
www.precision-labs.com

Client:	MARATHON	**Analysis Date:**	7/1/2014
Sample ID:	GOOSEBERRY TREATER B 2	**Date Sampled:**	7/1/2014
Unique #:	N/A	**Purpose:**	SPECIAL REQ
Sample Temperature:	102 DEG F	**Sample Pressure:**	9 PSI
Sampled By:	JACOB MCKERCHIE	**Type Sample:**	ON SITE
County:	PARK	Witnessed By: Clay Shumway	

Components	Mole %	Weight %	Liq. Vol. %
Carbon Dioxide.....	39.3253	43.0909	31.3534
Hydrogen Sulfide.....	2.3137	1.9633	1.4613
Nitrogen.....	5.0884	3.5491	2.6153
Methane.....	17.5499	7.0099	13.8997
Ethane.....	11.1738	8.3654	13.9606
Propane.....	10.4481	11.4710	13.4476
iso-Butane.....	1.8384	2.6604	2.8104
n-Butane.....	4.7311	6.8465	6.9682
iso-Pentane.....	1.9565	3.5146	3.3427
n-Pentane.....	2.3916	4.2962	4.0501
Cyclopentane.....	0.0470	0.0821	0.0650
n-Hexane.....	0.8574	1.8396	1.6472
Cyclohexane.....	0.3776	0.7912	0.6001
Other Hexanes	0.6112	1.3114	1.1742
Heptanes.....	0.5864	1.4630	1.2639
Methylcyclohexane.....	0.1146	0.2802	0.2151
2,2,4-Trimethylpentane...	0.0000	0.0000	0.0000
Benzene.....	0.1612	0.3135	0.2106
Toluene.....	0.1044	0.2395	0.1632
Ethylbenzene.....	0.0192	0.0508	0.0346
Xylenes.....	0.0189	0.0500	0.0342
C8+ Heavies.....	0.2853	0.8114	0.6828
Totals	100.0000	100.0000	100.0000

ADDITIONAL BETX DATA

Components	Mole %	Weight %	Liq. Vol. %
Cyclopentane	0.0470	0.0821	0.0650
Cyclohexane	0.3776	0.7912	0.6001
2-Methylpentane	0.3847	0.8254	0.7390
3-Methylpentane	0.2265	0.4860	0.4351
n-Hexane	0.8574	1.8396	1.6472
Methylcyclohexane	0.1146	0.2802	0.2151
2,2,4-Trimethylpentane	0.0000	0.0000	0.0000
Benzene	0.1612	0.3135	0.2106
Toluene	0.1044	0.2395	0.1632
Ethylbenzene	0.0192	0.0508	0.0346
m-Xylene	0.0030	0.0079	0.0054
p-Xylene	0.0128	0.0338	0.0231
o-Xylene	0.0031	0.0082	0.0056

SPECIFIC GRAVITY @ 60/60 F, calculated	1.3867
TOTAL GPM (Ethane Inclusive)	10.816
CALCULATED BTU / REAL CF @ 14.73 PSIA, dry basis	1207.811
CALCULATED BTU / REAL CF @ 14.73 PSIA, wet basis	1187.554
AVERAGE MOLECULAR WEIGHT	40.164
MOLAR MASS RATIO	1.3867
RELATIVE DENSITY (G x Z (Air) / Z), calculated	1.3998
IDEAL GROSS HEATING VALUE, BTU / IDEAL CF @ 14.696 PSIA	1193.785
COMPRESSIBILITY FACTOR (Z)	0.99066

PROPANE GPM	2.8711
BUTANE GPM	2.0878
GASOLINE GPM (PENTANE AND HEAVIER)	2.8768

TOTAL ACID GAS MOLE %	41.6390
H2S MOLE %	2.3137
H2S PPM	23137

VOC WEIGHT FRACTION	0.360

NOTATION: ALL CALCULATIONS PERFORMED USING PHYSICAL CONSTANTS FROM GPA 2145-09, THE TABLES OF PHYSICAL CONSTANTS FOR HYDROCARBONS AND OTHER COMPOUNDS OF INTEREST TO THE NATURAL GAS INDUSTRY.

PRECISION ANALYSIS GAS MEASUREMENT EMISSIONS TESTING LABORATORY

307.856.0866
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Client:	MARATHON	**Analysis Date:**	7/1/2014
Sample ID:	GOOSEBERRY TREATER B 3	**Date Sampled:**	7/1/2014
Unique #:	N/A	**Purpose:**	SPECIAL REQ
Sample Temperature:	102 DEG F	**Sample Pressure:**	9 PSI
Sampled By:	JACOB MCKERCHIE	**Type Sample:**	ON SITE
County:	PARK	Witnessed By: Clay Shumway	

Components	Mole %	Weight %	Liq. Vol. %
Carbon Dioxide.....	39.5243	43.5220	31.6405
Hydrogen Sulfide.....	2.3215	1.9796	1.4722
Nitrogen.....	5.1365	3.6002	2.6508
Methane.....	17.6650	7.0906	14.0479
Ethane.....	11.1687	8.4027	14.0111
Propane.....	10.4060	11.4809	13.4480
iso-Butane.....	1.8297	2.6608	2.8085
n-Butane.....	4.7124	6.8530	6.9689
iso-Pentane.....	1.9352	3.4934	3.3198
n-Pentane.....	2.3605	4.2612	4.0137
Cyclopentane.....	0.0461	0.0809	0.0640
n-Hexane.....	0.8379	1.8066	1.6163
Cyclohexane.....	0.3568	0.7513	0.5693
Other Hexanes	0.5987	1.2909	1.1549
Heptanes.....	0.5458	1.3684	1.1812
Methylcyclohexane.....	0.1021	0.2508	0.1924
2,2,4-Trimethylpentane...	0.0000	0.0000	0.0000
Benzene.....	0.1514	0.2959	0.1986
Toluene.....	0.0851	0.1962	0.1336
Ethylbenzene.....	0.0102	0.0271	0.0185
Xylenes.....	0.0090	0.0239	0.0163
C8+ Heavies.....	0.1971	0.5633	0.4737
Totals	100.0000	100.0000	100.0000

ADDITIONAL BETX DATA

Components	Mole %	Weight %	Liq. Vol. %
Cyclopentane	0.0461	0.0809	0.0640
Cyclohexane	0.3568	0.7513	0.5693
2-Methylpentane	0.3768	0.8125	0.7269
3-Methylpentane	0.2219	0.4784	0.4280
n-Hexane	0.8379	1.8066	1.6163
Methylcyclohexane	0.1021	0.2508	0.1924
2,2,4-Trimethylpentane	0.0000	0.0000	0.0000
Benzene	0.1514	0.2959	0.1986
Toluene	0.0851	0.1962	0.1336
Ethylbenzene	0.0102	0.0271	0.0185
m-Xylene	0.0014	0.0038	0.0026
p-Xylene	0.0061	0.0162	0.0111
o-Xylene	0.0015	0.0039	0.0027

SPECIFIC GRAVITY @ 60/60 F, calculated	1.3799
TOTAL GPM (Ethane Inclusive)	10.670
CALCULATED BTU / REAL CF @ 14.73 PSIA, dry basis	1191.629
CALCULATED BTU / REAL CF @ 14.73 PSIA, wet basis	1171.656
AVERAGE MOLECULAR WEIGHT	39.967
MOLAR MASS RATIO	1.3799
RELATIVE DENSITY (G x Z (Air) / Z), calculated	1.3927
IDEAL GROSS HEATING VALUE, BTU / IDEAL CF @ 14.696 PSIA	1178.009
COMPRESSIBILITY FACTOR (Z)	0.99084

PROPANE GPM	2.8595
BUTANE GPM	2.0791
GASOLINE GPM (PENTANE AND HEAVIER)	2.7522

TOTAL ACID GAS MOLE %	41.8458
H2S MOLE %	2.3215
H2S PPM	23215

VOC WEIGHT FRACTION	0.354

NOTATION: ALL CALCULATIONS PERFORMED USING PHYSICAL CONSTANTS FROM GPA 2145-09, THE TABLES OF PHYSICAL CONSTANTS FOR HYDROCARBONS AND OTHER COMPOUNDS OF INTEREST TO THE NATURAL GAS INDUSTRY.

PRECISION ANALYSIS GAS MEASUREMENT EMISSIONS TESTING LABORATORY

307.856.0866
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Client:	MARATHON	**Analysis Date:**	5/16/2014
Sample ID:	GOOSEBERRY TREATER B	**Date Sampled:**	5/16/2014
Unique #:	N/A	**Purpose:**	SPECIAL REQ
Sample Temperature:	89 DEG F	**Sample Pressure:**	10 PSI
Sampled By:	JACOB MCKERCHIE	**Type Sample:**	ON-SITE
County:	PARK	Witnessed by: Clay Shumway	

Components	Mole %	Weight %	Liq. Vol. %
Carbon Dioxide	39.0786	42.9757	31.5991
Hydrogen Sulfide	2.2341	1.9026	1.4310
Nitrogen	7.6546	5.3583	3.9901
Methane	16.4979	6.6136	13.2520
Ethane	10.9672	8.2405	13.8970
Propane	10.1047	11.1341	13.1903
iso-Butane	1.7116	2.4859	2.6538
n-Butane	4.3855	6.3694	6.5509
iso-Pentane	1.8802	3.3898	3.2580
n-Pentane	2.1632	3.9000	3.7153
Cyclopentane	0.0451	0.0790	0.0633
n-Hexane	0.8216	1.7692	1.6008
Cyclohexane	0.3996	0.8404	0.6440
Other Hexanes	0.5837	1.2569	1.1373
Heptanes	0.6327	1.5842	1.3831
Methylcyclohexane	0.1352	0.3317	0.2574
2,2,4-Trimethylpentane	0.0000	0.0000	0.0000
Benzene	0.1719	0.3355	0.2278
Toluene	0.1441	0.3318	0.2285
Ethylbenzene	0.0127	0.0337	0.0232
Xylenes	0.0254	0.0674	0.0466
C8+ Heavies	0.3504	1.0002	0.8505
Totals	100.0000	100.0000	100.0000

ADDITIONAL BETX DATA

Components	Mole %	Weight %	Liq. Vol. %
Cyclopentane	0.0451	0.0790	0.0633
Cyclohexane	0.3996	0.8404	0.6440
2-Methylpentane	0.3674	0.7911	0.7158
3-Methylpentane	0.2163	0.4658	0.4215
n-Hexane	0.8216	1.7692	1.6008
Methylcyclohexane	0.1352	0.3317	0.2574
2,2,4-Trimethylpentane	0.0000	0.0000	0.0000
Benzene	0.1719	0.3355	0.2278
Toluene	0.1441	0.3318	0.2285
Ethylbenzene	0.0127	0.0337	0.0232
m-Xylene	0.0040	0.0107	0.0074
p-Xylene	0.0172	0.0456	0.0315
o-Xylene	0.0042	0.0111	0.0076

SPECIFIC GRAVITY @ 60/60 F, calculated	1.3817
TOTAL GPM (Ethane Inclusive)	10.466
CALCULATED BTU / REAL CF @ 14.73 PSIA, dry basis	1163.487
CALCULATED BTU / REAL CF @ 14.73 PSIA, wet basis	1144.006
AVERAGE MOLECULAR WEIGHT	40.019
MOLAR MASS RATIO	1.3817
RELATIVE DENSITY (G x Z (Air) / Z), calculated	1.3942
IDEAL GROSS HEATING VALUE, BTU / IDEAL CF @ 14.696 PSIA	1150.389
COMPRESSIBILITY FACTOR (Z)	0.99102

PROPANE GPM	2.7767
BUTANE GPM	1.9377
GASOLINE GPM (PENTANE AND HEAVIER)	2.8265

TOTAL ACID GAS MOLE %	41.3127
H2S MOLE %	2.2341
H2S PPM	22341

VOC WEIGHT FRACTION	0.349

NOTATION: ALL CALCULATIONS PERFORMED USING PHYSICAL CONSTANTS FROM GPA 2145-09, THE TABLES OF PHYSICAL CONSTANTS FOR HYDROCARBONS AND OTHER COMPOUNDS OF INTEREST TO THE NATURAL GAS INDUSTRY.

TANKS 4.09 RUNS

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

Identification

User Identification:	GB B Oil Current Rate; 400 bbl Tank
City:	Cody
State:	Wyoming
Company:	Marathon Oil Corporation
Type of Tank:	Vertical Fixed Roof Tank
Description:	Tanks 4.09d run for 246 bopd throughput.

Tank Dimensions

Shell Height (ft):		20.00
Diameter (ft):		12.00
Liquid Height (ft) :		18.00
Avg. Liquid Height (ft):		9.00
Volume (gallons):		15,228.53
Turnovers:		247.64
Net Throughput(gal/yr):		3,771,180.00
Is Tank Heated (y/n):	N	

Paint Characteristics

Shell Color/Shade:	Gray/Medium
Shell Condition	Good
Roof Color/Shade:	Gray/Medium
Roof Condition:	Good

Roof Characteristics

Type:	Cone	
Height (ft)		1.50
Slope (ft/ft) (Cone Roof)		0.25

Breather Vent Settings

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

Meterological Data used in Emissions Calculations: Billings, Montana (Avg Atmospheric Pressure = 12.92 psia)

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

GB B Oil Current Rate; 400 bbl Tank - Vertical Fixed Roof Tank
Cody, Wyoming

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Crude oil (RVP 5)	All	55.79	45.49	66.10	50.11	2.6479	2.1465	3.2396	50.0000			207.00	Option 4: RVP=5

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

GB B Oil Current Rate; 400 bbl Tank - Vertical Fixed Roof Tank
Cody, Wyoming

Annual Emission Calcaulations	
Standing Losses (lb):	784.8725
Vapor Space Volume (cu ft):	1,300.6194
Vapor Density (lb/cu ft):	0.0239
Vapor Space Expansion Factor:	0.1806
Vented Vapor Saturation Factor:	0.3826
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	1,300.6194
Tank Diameter (ft):	12.0000
Vapor Space Outage (ft):	11.5000
Tank Shell Height (ft):	20.0000
Average Liquid Height (ft):	9.0000
Roof Outage (ft):	0.5000
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.5000
Roof Height (ft):	1.5000
Roof Slope (ft/ft):	0.2500
Shell Radius (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0239
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.6479
Daily Avg. Liquid Surface Temp. (deg. R):	515.4649
Daily Average Ambient Temp. (deg. F):	47.0333
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	509.7833
Tank Paint Solar Absorptance (Shell):	0.6800
Tank Paint Solar Absorptance (Roof):	0.6800
Daily Total Solar Insulation Factor (Btu/sqft day):	1,309.9021
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.1806
Daily Vapor Temperature Range (deg. R):	41.2245
Daily Vapor Pressure Range (psia):	1.0931
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.6479
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	2.1465
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	3.2396
Daily Avg. Liquid Surface Temp. (deg R):	515.4649
Daily Min. Liquid Surface Temp. (deg R):	505.1588
Daily Max. Liquid Surface Temp. (deg R):	525.7711
Daily Ambient Temp. Range (deg. R):	22.6167
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.3826
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	2.6479

Vapor Space Outage (ft):	11.5000
Working Losses (lb):	2,566.0486
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.6479
Annual Net Throughput (gal/yr.):	3,771,180.0000
Annual Turnovers:	247.6391
Turnover Factor:	0.2878
Maximum Liquid Volume (gal):	15,228.5332
Maximum Liquid Height (ft):	18.0000
Tank Diameter (ft):	12.0000
Working Loss Product Factor:	0.7500
Total Losses (lb):	3,350.9211

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

Emissions Report for: Annual

GB B Oil Current Rate; 400 bbl Tank - Vertical Fixed Roof Tank
Cody, Wyoming

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Crude oil (RVP 5)	2,566.05	784.87	3,350.92

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

Identification

User Identification:	GB B Oil Proposed Rate; 400 bbl Tank
City:	Cody
State:	Wyoming
Company:	Marathon Oil Corporation
Type of Tank:	Vertical Fixed Roof Tank
Description:	Tanks 4.09d run for 656 bopd throughput.

Tank Dimensions

Shell Height (ft):		20.00
Diameter (ft):		12.00
Liquid Height (ft) :		18.00
Avg. Liquid Height (ft):		9.00
Volume (gallons):		15,228.53
Turnovers:		695.60
Net Throughput(gal/yr):		10,056,480.00
Is Tank Heated (y/n):	N	

Paint Characteristics

Shell Color/Shade:	Gray/Medium
Shell Condition	Good
Roof Color/Shade:	Gray/Medium
Roof Condition:	Good

Roof Characteristics

Type:	Cone	
Height (ft)		1.50
Slope (ft/ft) (Cone Roof)		0.25

Breather Vent Settings

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

Meterological Data used in Emissions Calculations: Billings, Montana (Avg Atmospheric Pressure = 12.92 psia)

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

GB B Oil Proposed Rate; 400 bbl Tank - Vertical Fixed Roof Tank
Cody, Wyoming

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Crude oil (RVP 5)	All	55.79	45.49	66.10	50.11	2.6479	2.1465	3.2396	50.0000			207.00	Option 4: RVP=5

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

GB B Oil Proposed Rate; 400 bbl Tank - Vertical Fixed Roof Tank
Cody, Wyoming

Annual Emission Calcaulations	
Standing Losses (lb):	784.8725
Vapor Space Volume (cu ft):	1,300.6194
Vapor Density (lb/cu ft):	0.0239
Vapor Space Expansion Factor:	0.1806
Vented Vapor Saturation Factor:	0.3826
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	1,300.6194
Tank Diameter (ft):	12.0000
Vapor Space Outage (ft):	11.5000
Tank Shell Height (ft):	20.0000
Average Liquid Height (ft):	9.0000
Roof Outage (ft):	0.5000
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.5000
Roof Height (ft):	1.5000
Roof Slope (ft/ft):	0.2500
Shell Radius (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0239
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.6479
Daily Avg. Liquid Surface Temp. (deg. R):	515.4649
Daily Average Ambient Temp. (deg. F):	47.0333
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	509.7833
Tank Paint Solar Absorptance (Shell):	0.6800
Tank Paint Solar Absorptance (Roof):	0.6800
Daily Total Solar Insulation Factor (Btu/sqft day):	1,309.9021
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.1806
Daily Vapor Temperature Range (deg. R):	41.2245
Daily Vapor Pressure Range (psia):	1.0931
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.6479
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	2.1465
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	3.2396
Daily Avg. Liquid Surface Temp. (deg R):	515.4649
Daily Min. Liquid Surface Temp. (deg R):	505.1588
Daily Max. Liquid Surface Temp. (deg R):	525.7711
Daily Ambient Temp. Range (deg. R):	22.6167
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.3826
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	2.6479

Vapor Space Outage (ft):	11.5000
Working Losses (lb):	4,987.9382
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.6479
Annual Net Throughput (gal/yr.):	10,056,480.0000
Annual Turnovers:	695.6041
Turnover Factor:	0.2098
Maximum Liquid Volume (gal):	15,228.5332
Maximum Liquid Height (ft):	18.0000
Tank Diameter (ft):	12.0000
Working Loss Product Factor:	0.7500
Total Losses (lb):	5,772.8107

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

Emissions Report for: Annual

GB B Oil Proposed Rate; 400 bbl Tank - Vertical Fixed Roof Tank
Cody, Wyoming

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Crude oil (RVP 5)	4,987.94	784.87	5,772.81

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

Identification

User Identification:	GB B H2O Proposed Rate; 400 bbl tank
City:	Cody
State:	Wyoming
Company:	Marathon Oil Corporation
Type of Tank:	Vertical Fixed Roof Tank
Description:	Tanks 4.09d run for 18,711 bwpd throughput.

Tank Dimensions

Shell Height (ft):		20.00
Diameter (ft):		12.00
Liquid Height (ft) :		18.00
Avg. Liquid Height (ft):		9.00
Volume (gallons):		15,228.53
Turnovers:		18,835.67
Net Throughput(gal/yr):		286,839,630.00
Is Tank Heated (y/n):	N	

Paint Characteristics

Shell Color/Shade:	Gray/Medium
Shell Condition	Good
Roof Color/Shade:	Gray/Medium
Roof Condition:	Good

Roof Characteristics

Type:	Cone	
Height (ft)		1.50
Slope (ft/ft) (Cone Roof)		0.25

Breather Vent Settings

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

Meterological Data used in Emissions Calculations: Billings, Montana (Avg Atmospheric Pressure = 12.92 psia)

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

GB B H2O Proposed Rate; 400 bbl tank - Vertical Fixed Roof Tank
Cody, Wyoming

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Crude oil (RVP 5)	All	55.79	45.49	66.10	50.11	2.6479	2.1465	3.2396	50.0000			207.00	Option 4: RVP=5

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

GB B H2O Proposed Rate; 400 bbl tank - Vertical Fixed Roof Tank
Cody, Wyoming

Annual Emission Calcaulations	
Standing Losses (lb):	784.8725
Vapor Space Volume (cu ft):	1,300.6194
Vapor Density (lb/cu ft):	0.0239
Vapor Space Expansion Factor:	0.1806
Vented Vapor Saturation Factor:	0.3826
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	1,300.6194
Tank Diameter (ft):	12.0000
Vapor Space Outage (ft):	11.5000
Tank Shell Height (ft):	20.0000
Average Liquid Height (ft):	9.0000
Roof Outage (ft):	0.5000
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.5000
Roof Height (ft):	1.5000
Roof Slope (ft/ft):	0.2500
Shell Radius (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0239
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.6479
Daily Avg. Liquid Surface Temp. (deg. R):	515.4649
Daily Average Ambient Temp. (deg. F):	47.0333
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	509.7833
Tank Paint Solar Absorptance (Shell):	0.6800
Tank Paint Solar Absorptance (Roof):	0.6800
Daily Total Solar Insulation Factor (Btu/sqft day):	1,309.9021
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.1806
Daily Vapor Temperature Range (deg. R):	41.2245
Daily Vapor Pressure Range (psia):	1.0931
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.6479
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	2.1465
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	3.2396
Daily Avg. Liquid Surface Temp. (deg R):	515.4649
Daily Min. Liquid Surface Temp. (deg R):	505.1588
Daily Max. Liquid Surface Temp. (deg R):	525.7711
Daily Ambient Temp. Range (deg. R):	22.6167
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.3826
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	2.6479

Vapor Space Outage (ft):	11.5000
Working Losses (lb):	114,103.5430
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.6479
Annual Net Throughput (gal/yr.):	286,839,630.0000
Annual Turnovers:	18,835.6702
Turnover Factor:	0.1683
Maximum Liquid Volume (gal):	15,228.5332
Maximum Liquid Height (ft):	18.0000
Tank Diameter (ft):	12.0000
Working Loss Product Factor:	0.7500
Total Losses (lb):	114,888.4155

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

Emissions Report for: Annual

GB B H2O Proposed Rate; 400 bbl tank - Vertical Fixed Roof Tank
Cody, Wyoming

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Crude oil (RVP 5)	114,103.54	784.87	114,888.42

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

Identification

User Identification:	GB B H2O Current Rate; 400 bbl tank
City:	Cody
State:	Wyoming
Company:	Marathon Oil Corporation
Type of Tank:	Vertical Fixed Roof Tank
Description:	Tanks 4.09d run for 825 bwpd throughput.

Tank Dimensions

Shell Height (ft):		20.00
Diameter (ft):		12.00
Liquid Height (ft) :		18.00
Avg. Liquid Height (ft):		9.00
Volume (gallons):		15,228.53
Turnovers:		830.50
Net Throughput(gal/yr):		12,647,250.00
Is Tank Heated (y/n):	N	

Paint Characteristics

Shell Color/Shade:	Gray/Medium
Shell Condition	Good
Roof Color/Shade:	Gray/Medium
Roof Condition:	Good

Roof Characteristics

Type:	Cone	
Height (ft)		1.50
Slope (ft/ft) (Cone Roof)		0.25

Breather Vent Settings

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

Meterological Data used in Emissions Calculations: Billings, Montana (Avg Atmospheric Pressure = 12.92 psia)

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

GB B H2O Current Rate; 400 bbl tank - Vertical Fixed Roof Tank
Cody, Wyoming

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Crude oil (RVP 5)	All	55.79	45.49	66.10	50.11	2.6479	2.1465	3.2396	50.0000			207.00	Option 4: RVP=5

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

GB B H2O Current Rate; 400 bbl tank - Vertical Fixed Roof Tank
Cody, Wyoming

Annual Emission Calcaulations	
Standing Losses (lb):	784.8725
Vapor Space Volume (cu ft):	1,300.6194
Vapor Density (lb/cu ft):	0.0239
Vapor Space Expansion Factor:	0.1806
Vented Vapor Saturation Factor:	0.3826
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	1,300.6194
Tank Diameter (ft):	12.0000
Vapor Space Outage (ft):	11.5000
Tank Shell Height (ft):	20.0000
Average Liquid Height (ft):	9.0000
Roof Outage (ft):	0.5000
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.5000
Roof Height (ft):	1.5000
Roof Slope (ft/ft):	0.2500
Shell Radius (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0239
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.6479
Daily Avg. Liquid Surface Temp. (deg. R):	515.4649
Daily Average Ambient Temp. (deg. F):	47.0333
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	509.7833
Tank Paint Solar Absorptance (Shell):	0.6800
Tank Paint Solar Absorptance (Roof):	0.6800
Daily Total Solar Insulation Factor (Btu/sqft day):	1,309.9021
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.1806
Daily Vapor Temperature Range (deg. R):	41.2245
Daily Vapor Pressure Range (psia):	1.0931
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.6479
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	2.1465
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	3.2396
Daily Avg. Liquid Surface Temp. (deg R):	515.4649
Daily Min. Liquid Surface Temp. (deg R):	505.1588
Daily Max. Liquid Surface Temp. (deg R):	525.7711
Daily Ambient Temp. Range (deg. R):	22.6167
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.3826
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	2.6479

Vapor Space Outage (ft):	11.5000
Working Losses (lb):	6,063.4875
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.6479
Annual Net Throughput (gal/yr.):	12,647,250.0000
Annual Turnovers:	830.4969
Turnover Factor:	0.2028
Maximum Liquid Volume (gal):	15,228.5332
Maximum Liquid Height (ft):	18.0000
Tank Diameter (ft):	12.0000
Working Loss Product Factor:	0.7500
Total Losses (lb):	6,848.3600

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

Emissions Report for: Annual

GB B H2O Current Rate; 400 bbl tank - Vertical Fixed Roof Tank
Cody, Wyoming

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Crude oil (RVP 5)	6,063.49	784.87	6,848.36