

From: efilingmail@tylerhost.net
To: [Hamre, John G.](#)
Subject: Filing Accepted for Case: 08-2018-CV-02937; Environmental Law and Policy Center, et al. vs. North Dakota Public Service Commission, et al.; Envelope Number: 3293121
Date: Friday, February 01, 2019 8:24:29 AM

CAUTION: This email originated from an outside source. Do not click links or open attachments unless you know they are safe.

Filing Accepted

Envelope Number: 3293121
Case Number: 08-2018-CV-02937
Case Style: Environmental Law and Policy Center, et al. vs. North Dakota Public Service Commission, et al.



The filing below was reviewed and has been accepted by the clerk's office. You may access the file stamped copy of the document filed by clicking on the below link.

Filing Details	
Court	Burleigh County - South Central District
Case Number	08-2018-CV-02937
Case Style	Environmental Law and Policy Center, et al. vs. North Dakota Public Service Commission, et al.
Date/Time Submitted	1/31/2019 4:53 PM CST
Date/Time Accepted	2/1/2019 8:23 AM CST
Accepted Comments	
Filing Type	Exhibit
Filing Description	CR Exhibit 1 Supporting Exhibit B, part 5 of 6
Activity Requested	EFileAndServe
Filed By	John Hamre
Filing Attorney	Illona Jeffcoat-Sacco

Document Details	
Lead Document	CR Exhibit 1 Supporting Exhibit B, part 5 of 6.pdf
Lead Document Page Count	150
File Stamped Copy	View Stamped Document

This link is active for 30 days. If the link above is not accessible, copy this URL into your browser's address bar to view the document:

<https://northdakota.tylerhost.net/ViewDocuments.aspx?FID=5c60e5c7-7e94-41c1-b434-87bb3cfd14ce>

For technical assistance, contact your service provider or
North Dakota Court's Information Technology Department 701-328-4218
Please do not reply to this email. It was automatically generated.


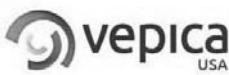
	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: 6 OF 35	

Table 2: Summary of changes in gas fired furnaces of heaters and boilers

Unit Number	Original Unit	Current Unit	Main change
101	Atmospheric Distillation Unit #1	Atmospheric Distillation Unit #1	Increased process heating capacity from 72 MMBTU to 82.13 MMBTU.
102	Atmospheric Distillation Unit #2	Atmospheric Distillation Unit #2	Increased process heating capacity from 72 MMBTU to 82.13 MMBTU.
103	Vacuum Distillation Unit	Vacuum Distillation Unit	Decreased capacity from 134.12 MMBTU (one of 76.47 MMBTU and one of 57.65 MMBTU) to only one heater of 75 MMBTU.
105	Naphtha Hydrotreater	Naphtha Hydrotreater	Increased overall capacity from 30 MMBTU to 35.8 MMBTU.
106	Catalytic Reformer Unit #2	Catalytic Reformer Unit	Substituted with two heaters of 136.9 MMBTU and 5.7 MMBTU, for a total capacity increase from 134.2 to 142.6 MMBTU.
107	Catalytic Reformer Unit #1	-	Eliminated.
110	Diesel Hydrotreater	Diesel Hydrotreater	Increased capacity from 16.25 MMBTU to 46.8 MMBTU.
112	FCC	Hydrocracker	The new unit has combined heater capacity of 77.5 MMBTU vs. the FCC unit which had heaters with 28.35 MMBTU capacity.
114	FCC Naphtha Hydrotreater	-	Eliminated.
117	Isomerization Unit s	-	Eliminated.
118	Alkylation Unit	-	Eliminated.
122	SRU Thermal Oxidizer	SRU Thermal Oxidizer	No changes.
125	Kerosene Hydrotreater	-	Eliminated.
202	Boilers	Boilers	Decreased overall total steam generation capacity from 3-60 MMBTU medium pressure steam boilers to 2-22 MMBTU high pressure steam boilers and 4-11.68 medium pressure boilers.



	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: 7 OF 35	



Table 3: Summary of changes to tankage

Product	Changes
Crude oil	Reduced number of tanks from 3 to 2
Gasoline	Reduced number of tanks from 3 to 2
Straight Run Diesel	Reduced number of tanks from 2 to 1
UVGO	Eliminated
FCC Naphtha	Eliminated
Alkylate	Eliminated
Diluent	Eliminated
Fuel Oil Tanks	Reduced tanks capacity from 64,996 BBL to 33,312 BBL ea. During Phase 1 both in Fuel Oil service. In Phase 2, one of them will be repurposed for VGO service.

3. DOCUMENT SCOPE

This emission inventory includes the estimation of annual atmospheric discharges of criteria pollutants and hazardous air pollutants (HAPs) from primary sources within the refinery. It presents both, the full build-out refinery configuration, as well as the initial facility to be constructed (referred to as Phase 1) as an alternative operating scenario. The primary sources included in this inventory are categorized as follows:



- Equipment Leaks
- Storage Tanks
- Stationary Combustion
- Process Vents
- Flares
- Wastewater Treatment Systems
- Cooling Towers
- Product Loading
- Fugitive Dust

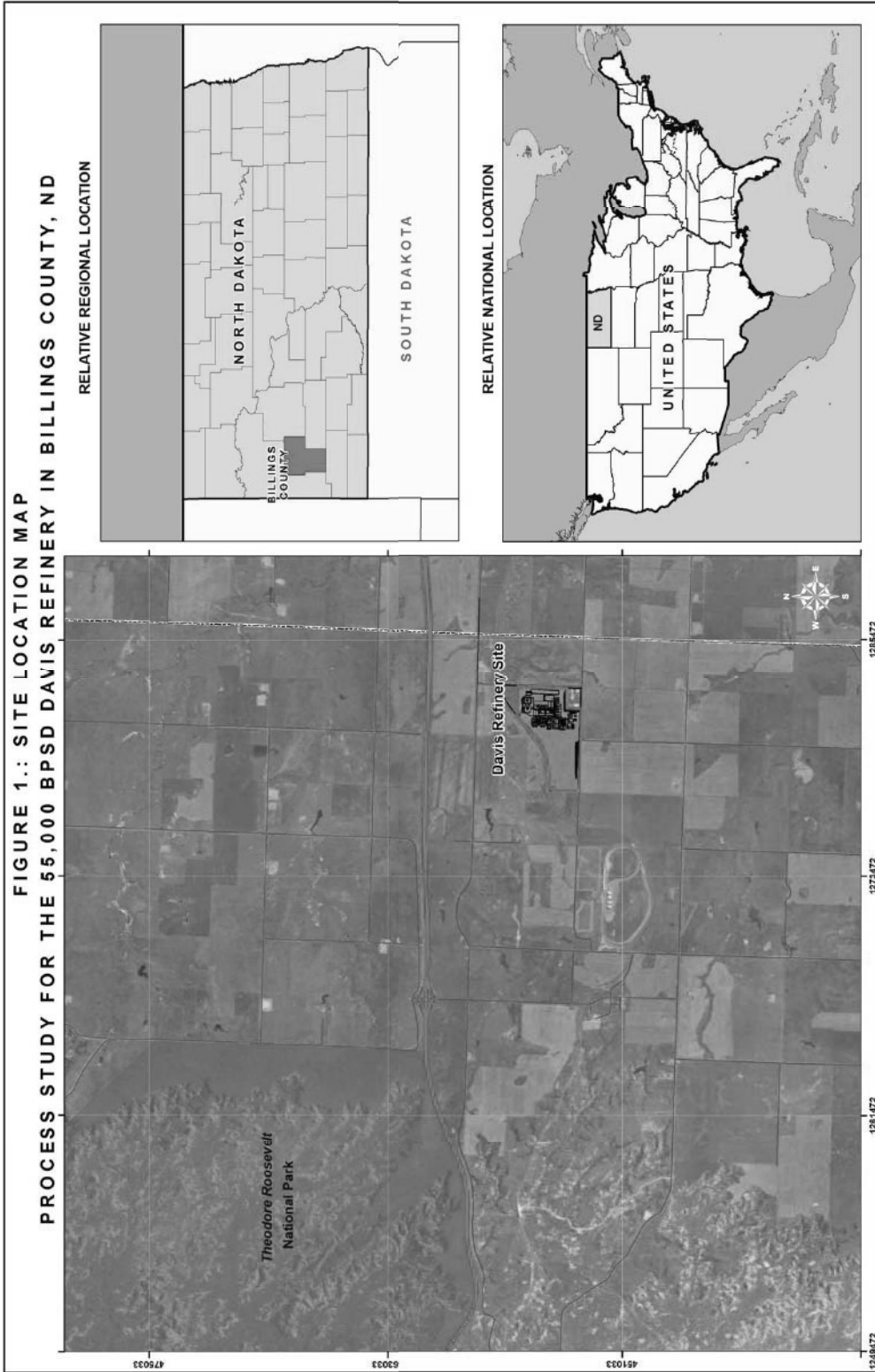
	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: 8 OF 35	



It is important to highlight that the estimations for New Source Review (NSR) regulated pollutants presented in this document comprise normal operating scenarios using the engineering, licensor and vendor data available to date. Additionally, Greenhouse Gas (GHG) emissions are not included as part of this inventory, since GHG are not “Regulated NSR pollutant”, in accordance NDAC 33-15-15 and 33-15-16. Regulated NSR pollutants for petroleum refineries include particulate matter (PM), particulate matter with a diameter of 10 microns or less (PM₁₀), particulate matter with a diameter of 2.5 microns or less (PM_{2.5}), sulfur dioxide (SO₂), nitrogen oxides (NO_x), carbon monoxide (CO), ozone (as VOCs), lead (Pb), hydrogen sulfide (H₂S) and reduced sulfur compounds.

4. LOCATION

The Davis Refinery will be located in Billings County, North Dakota. Figure 1 shows the proposed site layout and its geographical location.

	EMISSIONS INVENTORY		
	VEPICA CODE: P-5715043-01-001-18042-1001	COMPANY CODE: TBD	
	ISSUE: 1	DATE: 03/23/17	
	SHEET: 9	OF 35	



	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: 10 OF 35	

5. EMISSION INVENTORY METHODOLOGY

This section describes the methodology and main activities performed to prepare the detailed emissions inventory of the Emission Units associated with the refinery operations

5.1. Sources Identification



Identification of primary sources was made based on the review of engineering data of process units, specifically: block and process flow diagrams (BFD & PFDs), process descriptions and data sheets.

“Potential to emit” has the meaning given to it in NDAC 33-15-14-06: *“the maximum capacity of a stationary source to emit any air contaminant under its physical and operational design. Any physical or operational limitation on the capacity of a source to emit an air contaminant, 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 administrator of the United States environmental protection agency and the department.”* For a petroleum refinery, quantifiable fugitive emissions must also be included with point source emissions in the facility-wide PTE calculation.

“Emissions Unit” in accordance with NDAC 33-15-14-06 *“means any part or activity of a stationary source that emits or has the potential to emit any regulated air contaminant or any contaminant listed under section 112(b) of the Federal Clean Air Act.”*

The following list identifies emission point and area sources of criteria pollutants at the Davis Refinery:

1. Atmospheric Distillation Units (ADUs): furnaces.
2. Naphtha Hydrotreater (NHT) Unit: furnaces.
3. Catalytic Reforming Unit (CRU): furnaces and catalyst regenerator vent. During initial phase, this unit will have a semi-regenerative configuration.
4. Benzene Saturation Unit (BSU): none.
5. Distillates Hydrotreater (DHT) Unit: furnaces.
6. Vacuum Distillation Unit (VDU): furnaces.
7. Hydrocracking (HYK) Unit: furnaces.

	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: 11 OF 35	

8. Sour Water Unit (SWU): none.
9. Sulfur Recovery Unit (SRU): thermal oxidizer.
10. Tank Farm (IFR and fixed roof, through relief valves and fittings in each tank), including crude oil (feed), intermediate products and final products.
11. Flare System: flare pilots.
12. Cooling Water System: drift loss in cooling tower.
13. Boilers: gas fired furnaces.
14. Product Loading Operations: truck loading stations
15. Fuel Gas System: no direct discharges, emissions are accounted for via fuel gas users
16. Fire water system: diesel engine driven back-up firewater pumps
17. Emergency Generator: internal combustion diesel engine.
18. Waste Water Treatment System.
19. Fugitives: these are accounted for each operating unit based on the number of equipment components including valves, flanges, pumps, and will be minimized through a Leak Detection and Repair Program ("LDAR")

The emission sources identified for each unit of the refinery are listed in Table 4 below. Figures 2 and Figure 3 depict simplified block flow diagrams for the full refinery and the Phase 1 configurations, respectively







	EMISSIONS INVENTORY		VEPICA CODE: P-5715043-01-001-18042-1001	
			COMPANY CODE: TBD	
	ISSUE: 1	DATE: 03/23/17		
			SHEET: 12 OF 35	

Table 4: Davis Refinery Emission Sources



Unit Number	Unit Description	Emission Unit Description	TAG	Point ID	Point Number	Air Pollution Control Equipment
101	Atmospheric Distillation Unit #1	Feed Heater rated 82.13 MMBTU/h and fired on refinery fuel gas	101-H-0101	101H0101	1	Best combustion practices. Ultra Low NOx Burner Design
102	Atmospheric Distillation Unit #2	Feed Heater rated 82.13 MMBTU/h and fired on refinery fuel gas	102-H-0201	102H0201	2	Best combustion practices. Ultra Low NOx Burner Design
103	Vacuum Distillation Unit	Feed Heater rated 75.00 MMBTU/h and fired on refinery fuel gas	103-H-0301	103H0301	3	Best combustion practices. Ultra Low NOx Burner Design
105	Naphtha Hydrotreater Unit	Reactor Feed Heater rated 8.60 MMBTU/h and fired on refinery fuel gas	105-H-0501	105H0501	4	Best combustion practices. Ultra Low NOx Burner Design
		Stabilizer Reboiler rated 9.30 MMBTU/h and fired on refinery fuel gas	105-H-0502		5	Best combustion practices. Ultra Low NOx Burner Design
		Splitter Reboiler rated 17.90 MMBTU/h and fired on refinery fuel gas	105-H-0503	105H0502	6	Best combustion practices. Ultra Low NOx Burner Design

	EMISSIONS INVENTORY		VEPICA CODE: P-5715043-01-001-18042-1001 COMPANY CODE: TBD ISSUE: 1 DATE: 03/23/17 SHEET: 13 OF 35	



Unit Number	Unit Description	Emission Unit Description	TAG	Point ID	Point Number	Air Pollution Control Equipment
106	Catalytic Reformer Unit	Reactor heaters #1/2/3 with a combined rating of 136.90 MMBTU/h and fired on refinery fuel gas	106-H-0601	106H0601	7	Best combustion practices. Ultra Low NOx Burner Design
		Stabilizer Reboiler with a rating of 5.70 MMBTU/h and fired on refinery fuel gas	106-H-0605	106H0605	8	Best combustion practices. Ultra Low NOx Burner Design
		Regenerator vent	106-VS-0601	106VS0601	9	Cooling and Scrubbing (wash drum)
110	Distillates Hydrotreater Unit	Reactor Feed Heater rated 19.50 MMBTU/h and fired on refinery fuel gas	110-H-1001	110H1001	10	Best combustion practices. Ultra Low NOx Burner Design
		DHT Splitter heater rated 27.30 MMBTU/h and fired on refinery fuel gas	110-H-1002	110H1002	11	Best combustion practices. Ultra Low NOx Burner Design
112	Hydrocracker Unit	HYK Reactor Feed heater rated 37.16 MMBTU/h and fired on refinery fuel gas	112-H-1201	112H1201	12	Best combustion practices. Ultra Low NOx Burner Design
		HYK Fractionator heater rated 40.34 MMBTU/h and fired on refinery fuel gas	112-H-1202	112H1202	13	Best combustion practices. Ultra Low NOx Burner Design
122	Sulfur Recovery Unit / Thermal Oxidizer	Thermal Oxidizer with a rated capacity of 1.58 MMBTU/h	122-H-2201	122H2201	14	Emissions from this SRU will be routed to a Thermal Oxidizer.

	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-1001 COMPANY CODE: TBD ISSUE: 1 DATE: 03/23/17 SHEET: 14 OF 35	
---	----------------------------	--	---



Unit Number	Unit Description	Emission Unit Description	TAG	Point ID	Point Number	Air Pollution Control Equipment
202	High Pressure Steam Boiler 1	HP Boiler with a rated capacity of 22.00 MMBTU	202-B-0202A	202B0202A	15	Best combustion practices.
202	High Pressure Steam Boiler 2	HP Boiler with a rated capacity of 22.00 MMBTU	202-B-0202B	202B0202B	16	
202	High Pressure Steam Boiler 3	HP Boiler with a rated capacity of 22.00 MMBTU	202-B-0202C	202B0202C	17	
202	Medium Pressure Steam Boiler 1	MP Boiler with a rated capacity of 11.68 MMBTU	202-B-0201A	202B0201A	18	
202	Medium Pressure Steam Boiler 2	MP Boiler with a rated capacity of 11.68 MMBTU	202-B-0201B	202B0201B	19	
202	Medium Pressure Steam Boiler 3	MP Boiler with a rated capacity of 11.68 MMBTU	202-B-0201C	202B0201C	20	
202	Medium Pressure Steam Boiler 4	MP Boiler with a rated capacity of 11.68 MMBTU	202-B-0201D	202B0201D	21	
203	Crude oil Tank #1	Crude Oil Storage Tank #1 with a nominal 110,999 bbl capacity	203-T-0301	203T0301	22	Cone with IFR (Internal Floating Roof) and Submerged Fill Pipe
203	Crude oil Tank #2	Crude Oil Storage Tank #2 with a nominal 110,999 bbl capacity	203-T-0302	203T0302	23	Cone with IFR (Internal Floating Roof) and Submerged Fill Pipe
203	Desulfurized Heavy Naphtha Tank	Heavy Naphtha Storage Tank with a nominal 64,996 bbl capacity	203-T-0305	203T0305	24	Cone with IFR (Internal Floating Roof) and Submerged Fill Pipe
203	Reformate Tank #1	Reformate Storage Tank #1 with a nominal 33,312 bbl capacity	203-T-0306	203T0306	25	Cone with IFR (Internal Floating Roof) and Submerged Fill Pipe

	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-1001	
COMPANY CODE: TBD			
ISSUE: 1 DATE: 03/23/17			
SHEET: 15 OF 35			



Unit Number	Unit Description	Emission Unit Description	TAG	Point ID	Point Number	Air Pollution Control Equipment
203	Reformate Tank #2	Reformate Storage Tank #2 with a nominal 33,312 bbl capacity	203-T-0307	203T0307	26	Cone with IFR (Internal Floating Roof) and Submerged Fill Pipe
203	Gasoline Tank #1	Regular Gasoline Tank #1 with a nominal 64,996 bbl capacity	203-T-0308	203T0308	27	Cone with IFR (Internal Floating Roof) and Submerged Fill Pipe
203	Gasoline Tank #2	Regular Gasoline Tank #2 with a nominal 64,996 bbl capacity	203-T-0309	203T0309	28	Cone with IFR (Internal Floating Roof) and Submerged Fill Pipe
203	Jet Fuel Tank #1	Jet Fuel Tank #1 with a nominal 33,312 bbl capacity	203-T-0311	203T0311	29	Cone with IFR (Internal Floating Roof) and Submerged Fill Pipe
203	Jet Fuel Tank #2	Jet Fuel Tank #2 with a nominal 33,312 bbl capacity	203-T-0312	203T0312	30	Cone with IFR (Internal Floating Roof) and Submerged Fill Pipe
203	Straight Run Diesel Tank #1	SR Diesel Storage Tank #1 with a nominal 33,312 bbl capacity	203-T-0313	203T0313	31	Conic Roof, Submerged Fill Pipe
203	Ultra Low Sulfur Diesel Tank #1	ULSD Storage Tank #1 with a nominal 64,996 bbl capacity	203-T-0015	203T0315	32	Conic Roof, Submerged Fill Pipe
203	Ultra Low Sulfur Diesel Tank #2	ULSD Storage Tank #2 with a nominal 64,996 bbl capacity	203-T-0016	203T0316	33	Conic Roof, Submerged Fill Pipe
203	Fuel Oil / Vacuum Gasoil Tank	Fuel Oil / VGO Storage Tank with a nominal 33,312 bbl capacity	203-T-0323	203T0323	34	Conic Roof, Submerged Fill Pipe
203	Fuel Oil Tank	Fuel Oil Storage Tank with a nominal 33,312 bbl capacity	203-T-0324	203T0324	35	Conic Roof, Submerged Fill Pipe
203	Light Naphtha Tank #1	Light Naphtha Storage Tank #1 with a nominal 33,312 bbl capacity	203-T-0331	203T0331	36	Cone with IFR (Internal Floating Roof) and Submerged Fill Pipe

	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-1001 COMPANY CODE: TBD ISSUE: 1 DATE: 03/23/17 SHEET: 16 OF 35	
---	----------------------------	--	---

Unit Number	Unit Description	Emission Unit Description	TAG	Point ID	Point Number	Air Pollution Control Equipment
203	Light Naphtha Tank #2	Light Naphtha Storage Tank #2 with a nominal 33,312 bbl capacity	203-T-0332	203T0332	37	Cone with IFR (Internal Floating Roof) and Submerged Fill Pipe
203	Light Slops Tank	Light Slops Tank with a nominal 2,620 bbl capacity	203-T-0327	203T0327	38	Cone with IFR (Internal Floating Roof) and Submerged Fill Pipe
203	Heavy Slops Tank	Heavy Slops Tank with a nominal 2,620 bbl capacity	203-T-0328	203T0328	39	Conic Roof, Submerged Fill Pipe
206	Wastewater Treatment Plan:	Oil/Separator Inlet from Benzene Waste Operations NESHAP (BWON) Compliant plant with a 200,000 gal/d**design capacity	-	206WWT	40	Wastewater treatment plant must comply with the design requirements of 40 CFR 60 Subpart QQQ
207	Enclosed HC Operating Flare	Enclosed Flare with pilots at 100 SCFH average of fuel gas, for handling up to 24.4 MMSCFD (including purges and fuel gas blowdown)	207-FL-1701	207FL1701	41	High temperature, optimal balance between air flow, gas/pollutant loading and low heating value
207	Acid Flare	Acid Gas Flare with pilots at 100 SCFH average of fuel gas, for handling up to 15.8 MMSCFD.	207-FL-1702	207FL1702	42	High temperature, optimal balance between air flow, gas/pollutant loading and low heating value
207	HC Emergency Flare #1	HC Emergency Flare with pilots at 100 SCFH average of fuel gas, for handling up to 74.6 MMSCFD of emergency reliefs.	207-FL-1703	207FL1703	43	High temperature, optimal balance between air flow, gas/pollutant loading and low heating value

	<p>EMISSIONS INVENTORY</p>	<p>VEPICA CODE: P-5715043-01-001-18042-1001</p>	
COMPANY CODE: TBD			
ISSUE: 1 DATE: 03/23/17			
SHEET: 17 OF 35			

Unit Number	Unit Description	Emission Unit Description	TAG	Point ID	Point Number	Air Pollution Control Equipment
207	HC Emergency Flare #2	HC Emergency Flare with pilots at 100 SCFH average of fuel gas, for handling up to 88.8 MMSCFD of emergency reliefs.	207-FL-1704	207FL1704	44	High temperature, optimal balance between air flow, gas/pollutant loading and low heating value
208	Truck Loading-Unloading System	Dedicated normal service of loading/unloading refinery products (Gasoline, Diesel / Jet and Fuel Oil).	-	208TL	45	Submerged Loading and dedicated service.
212	Firewater Pump Diesel Engine ***	Combustion gases (flue gas) from 350 HP diesel firewater pump.	212-P-1201	212P1201	46	Backup pump to the electric firewater pump. Operating for less than 100 hours per year
215	Cooling Towers	Five cells Induced draft - counter flow Cooling Tower. Design Cooling Water Circulation Rate: 2,500 gpm/each	215-CT-1501A	215CT1501A	47	Drift Eliminators (0.001% drift rate) Inherent to Design. Under normal operations 4 in service 1 in standby
			215-CT-1501B	215CT1501B	48	
			215-CT-1501C	215CT1501C	49	
			215-CT-1501D	215CT1501D	50	
			215-CT-1501E	215CT1501E	51	



	EMISSIONS INVENTORY			
	VEPICA CODE: P-5715043-01-001-18042-1001			
	COMPANY CODE: TBD			
	ISSUE: 1	DATE: 03/23/17		
SHEET: 18		OF 35		

Unit Number	Unit Description	Emission Unit Description	TAG	Point ID	Point Number	Air Pollution Control Equipment
216	Diesel-fired Emergency Power Generator Set (EPS)***	Combustion gases (flue gas) from 4700-HP emergency generator stack.	216-EG-1601	216EG1601	52	Operating for less than 100 hours per year. The engines shall be certified to emissions standards as outlined under 40 CFR 60, Subparts III and JJJ. The engines shall be manufactured with the appropriate control equipment to meet these emissions standards
FUGITIVE	Process equipment leaks in VOC and Natural Gas service	Fugitive (leaks) emissions from process equipment elements throughout the refinery	-	FUG-1	53	Leak Detection and Repair (LDAR) Program

* Single common stack for all three reactor heaters

** : Calculated based on waste water treatment plant design.

***: Estimated to operate less than 100 hours per year (emergency).

	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 0 DATE: 03/17/17	
		SHEET: 19 OF 35	

5.2. Emission Estimation – Basis and Assumptions

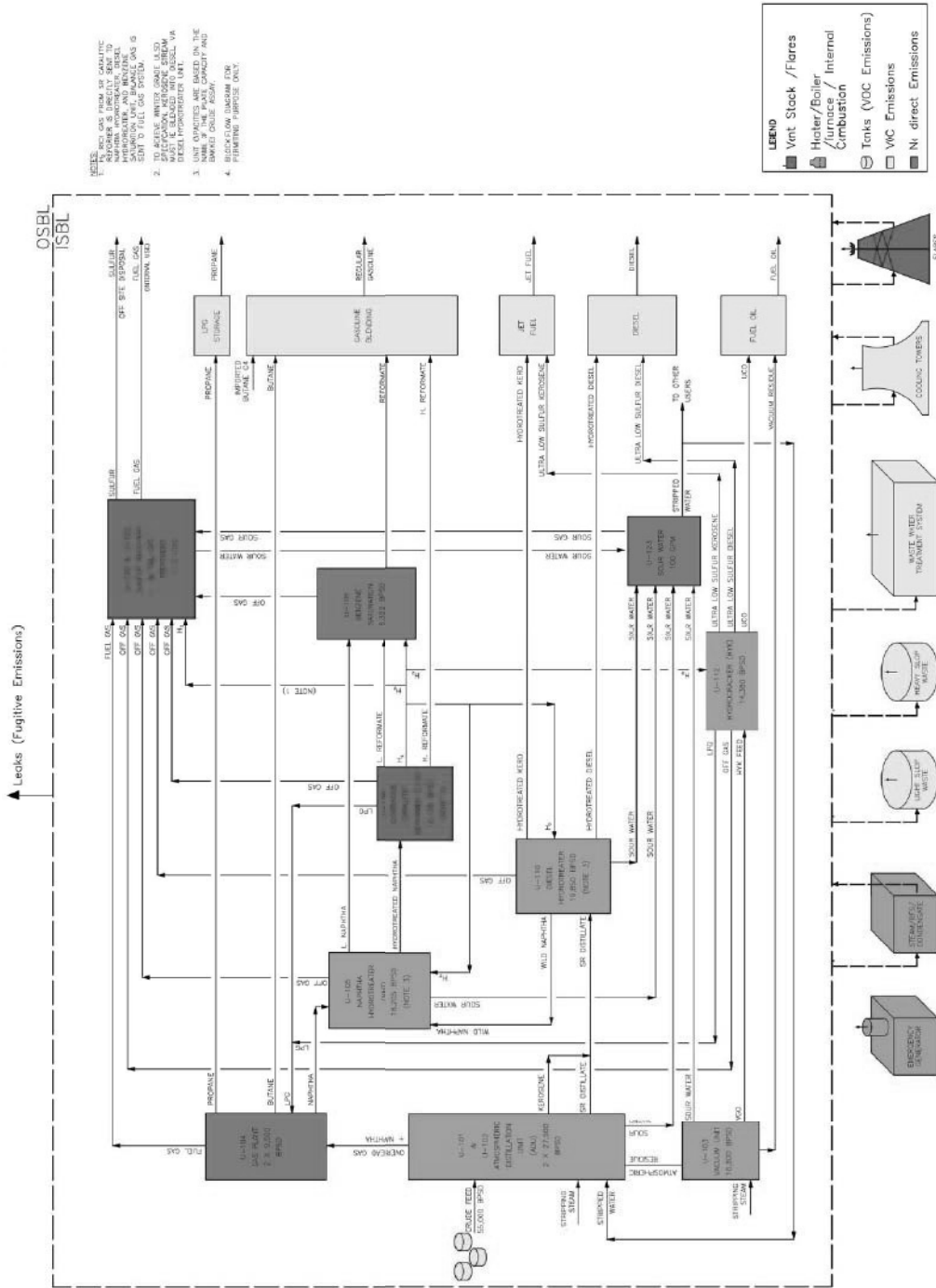
Emissions for criteria pollutants and HAPs were estimated using the Emission Factors presented in the EPA *Emissions Estimation Protocol for Petroleum Refineries* and engineering data, unless noted otherwise. When needed, EPA AP-42 *Compilation of Air Pollutant Emission Factors. Volume 1: Stationary Point and Area Sources*, Fifth Edition, was consulted for specific criteria pollutant emission factors.



When using the mentioned emission factors, the following basis and assumptions were considered:

- Since this is a new refinery, and site-specific measurement or test data are not available, default emission factors (Methodology Ranks 5, or 4, as applicable) were used to estimate criteria pollutant and HAPs emissions, unless noted otherwise. For new industrial sources with no actual monitoring or direct measurements, the methodology ranks above mentioned were used since they are based on typical refinery average stream concentrations and statistical default process compositions. Also, when available, actual engineering/licensor data or vendor guarantees were used as preferred emissions factors.
- When normalized emission factors for feed or throughput were used to determine PTE, maximum design capacity for applicable units/equipment was considered.
- For continuous operation process units, 8,760 hr/yr operating hours per year was considered to obtain annual mass emissions (tons per year or tpy). Depending on specific equipment, such as venting from regeneration units, these operating hours would in practice be less, in accordance with the process operation philosophy.
- For fugitive dust emissions from vehicular traffic, the base case is paving high traffic areas including employee parking areas and truck loading facilities. Actual emissions may be lower, since crude and/or products may be imported/dispatched via pipeline in the future.

	VEPICA CODE: P-5715043-01-001-18042-1001		
	COMPANY CODE: TBD		
	ISSUE: 1	DATE: 03/23/17	
	SHEET: 20	OF 35	

Figure 2: Identification of emission sources per main process units (full refinery scenario)



	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: 22 OF 35	

6. CALCULATION BASIS

This section describes the basis of the calculations made to estimate the emissions of pollutants from each main unit and equipment identified in section 4.1 of this document.



6.1. Equipment Leaks

Equipment leaks are small fugitive emissions that occur throughout the refinery from a broad variety of equipment components and connections that may develop leaks through normal wear and tear which allow volatile fluids to escape into the atmosphere.

To estimate VOCs and HAPs leak emissions, Methodology Rank 5 was used, based in default model process component counts. Equipment counts for large model processes (more than 50,000 BPSD) were selected from Table 2-5 *Median Equipment Leak Component Counts for Large Model Processes*,

For the base case emissions inventory a 10,000 ppmv leak definition, which is the highest detection threshold allowed by New Source Performance Standards (NSPS), was utilized to determine emission factors. Emission Factors were obtained from EPA's *Protocol for Equipment Leak Emission Estimates, Table 2-14 – 10,000 ppmv and 100,000 ppmv Screening Value Pegged Emission Rates for the Petroleum Industry*. Emissions reductions from implementing a Leak Detection and Repair (LDAR) program with a monthly monitoring interval at a 10,000 ppmv leak definition rate were taken from Table 4.1 – *Control effectiveness for an LDAR program at a chemical process unit and a refinery* – in EPA's Publication EPA-305-D-07-001, "*Leak Detection and Repair, A Best Practices Guide*".

However, in order to demonstrate compliance with 40 CFR 60 Subpart GGGa, applicable portions of Subpart VVa, and compliance with 40 CFR 61 Subparts J and V, Meridion has chosen to adopt a 500 ppmv leak definition which is the current EPA recommended value for implementation of monitoring rather than the previous regulatory level of 10,000 for NSPS. In addition, to minimize leaks, the design of the refinery will include pumps in VOC service with double mechanical seals, enhanced valve packing, no open ended lines and connection of pressure relief devices, sampling connecting systems, surge control vessels and bottoms receivers to closed-vent systems routed to fuel gas or flare. Meridion's facility integrity management system for the Davis Refinery will also include the use of advanced monitoring methods such as differential light absorption and ranging (DIAL) or optical gas imaging (OGI) technology that can visualize gas leaks using ultra-sensitive passive infrared sensing technology, as part of, and complementing, its proposed LDAR program to improve operational and safety practices so that leaks can be identified more efficiently and fixed soon as practicable.

	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: 23 OF 35	

Meridian's proposed LDAR program assumes monitoring and directed maintenance with a leak definition of 500 ppmv for all components other than compressors which are to be screened at 10,000 ppmv. To estimate potential fugitive emissions from refinery equipment leaks, emission Factors were obtained from *EPA's Protocol for Equipment Leak Emission Estimates, Table 2-10 - Petroleum Industry Leak Rate/Screening Value Correlations*, and from *Table 2-14 - 10,000 ppmv and 100,000 ppmv Screening Value Pegged Emission Rates for the Petroleum Industry* for compressors. Emissions reductions from implementing an LDAR program equivalent to Texas Commission on Environmental Quality (TCEQ) approved 28LAER program have been considered in the controlled emissions inventory. Results of this estimation is summarized in Section 1 of Appendix A.



6.2. Storage Tanks Emissions

For Storage Tank VOC Emission Estimates a Methodology Rank 2 *Tank-specific modeling* with EPA Tanks 4.09d software was used for all petroleum liquid storage tanks in the refinery, based on available engineering information such as tank type, tank dimensions, stored liquid properties, tank condition/fitting information, annual throughput. Results of this modeling for VOCs are shown in Section 2 of Appendix A.

For Storage Tank HAPs Emission Estimates, a Methodology Rank 3b *Default Tank Modeling* was used, which is applicable to common petroleum liquid storage tanks, and requires Crude throughput and production capacities. These default emissions factors consider assumptions regarding the typical fitting controls and the average composition of crude oil, gasoline, and other products at the refinery. Emission factors for VOCs were used from *Table 3-3 Default Emissions Factors for Petroleum Refinery Storage Tanks* of the protocol, based on crude oil processing capacity and production of various distillates, as noted in Section 2 of Appendix A.

These factors consider an estimation of distillates production as a fraction of crude oil processing capacity, subtracting the production of heavy distillates and aromatics. In the emissions inventory for the proposed Davis Refinery, such production was assumed zero since the heaviest product will be fuel oil which is considered part of the middle distillates pool. The HAP emissions were assumed then from:

- Gasoline and Other Light Distillates (such as desulfurized naphtha, reformates, butane) at 60% of the crude oil processing rate, and,
- Diesel Fuel and Other Middle Distillates (diesel, kerosenes, jet fuel, fuel oil), at 40% of crude oil processing rate.

	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: 24 OF 35	

6.3. Stationary Combustion Sources

Combustion sources of the proposed Davis Refinery include process heaters and utility boilers which will be fired by refinery fuel gas and the diesel engines of the emergency power generators and firewater pumps.

For the base case emissions inventory for criteria pollutants of process heaters and utility boilers, AP-42 emission factors based on heat input in MMBTU/hr were taken from Chapter 1 of the *Compilation of Air Pollutant Emission Factors. Volume 1: Stationary Point and Area Sources (External Combustion Sources, Tables 1.4-1 and 1.4-2)*. Manufacturer guaranteed emission rates for particulate matter (PM), nitrogen oxides (NO_x), and carbon monoxide (CO) were utilized to obtain the controlled emissions inventory process for process heaters and utility boilers. For emission estimates of SO₂ and VOC default AP-42 emission values were utilized. Further, as reflected in the controlled emissions inventory, flue stacks from fuel gas fired large process heaters will be equipped with Selective Catalytic Reduction (SCR) as add-on control to further reduce NO_x emissions.



HAPs emissions for process heaters and boilers were calculated based on fuel usage using Methodology Rank 4 and default emission factors in Table 4-3 *Summary of Emission Factors for Boilers and Process Heaters Firing Various Fuels*. A reduction of 75% Organic HAP emissions was applied based on good combustion operating practices.

In the case of criteria pollutants and HAPs from internal combustion engines, such as the emergency generator and firewater pump engines, emission factors based on power output (HP) and fuel input (MMBTU_h) were taken from AP-42 Chapter 3 Section 3.4. *Large Stationary Diesel And All Stationary Dual-fuel Engines, Table 3.4-1 to 3.4-3*. It should be noted that these emissions were not added to the total refinery emissions as it is expected that these emergency engines will not operate under normal conditions for more than 100 hours per year.

Emission factors used and emission estimations for stationary combustion equipment (heaters, boilers and internal combustion engines) are presented in Section 3 of Appendix A.

6.4. Process Vents

Emissions from process vents are those that can be released directly to the atmosphere through a vent stack. At the proposed Davis Refinery most of the process gases will be routed to the refinery's fuel gas system. Those not routed to the refinery's fuel system will be controlled using a flare, thermal incinerator, or other air pollution control technique. Process vent emissions from the proposed Davis Refinery that are not recovered into the refinery's fuel gas system are described in this section.

 Meridion Energy Group Inc.	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: 25 OF 35	

6.4.1. Catalytic Reforming Unit (CRU)

Meridion has opted to invest in a transformable catalytic reforming unit that will operate as a Semi-Regenerative (“SR”) Catalytic Reformer at a lower capital cost during the first phase of the Davis Refinery and will have the ability to be converted to Continuous Catalyst Regeneration (“CCR”) operation with increased Naphtha reforming capacity during Phase 2 in order stage their capital investment, and reformate and hydrogen yields.



During the initial phase of the Davis Refinery, the catalyst will be periodically regenerated by in situ high temperature oxidation about every 6 to 24 months to maintain catalyst activity. To account for these emissions, the inventory includes a maximum 672 hr/yr of operation in catalyst regeneration mode. During Phase 2, a closed loop catalyst-transfer equipment and special regenerator will be added to continuously transfer catalyst from the operating reactors to the regenerator and back to the reactors. Emissions from the CCR Unit are continuously discharged (8760 hr/yr) through a dedicated vent stack, after a scrubbing (wash drum) system.

To estimate emissions from catalyst regeneration, based on catalytic reforming unit process capacity, Methodology Rank 5 and AP-42 Default Emission Factors for VOCs, organic HAPs, dioxins, PCBs, inorganics and other pollutants of interest were taken from Table 5-6 *Emissions Factors for CRU Catalyst Regeneration Vent*. For estimation of HCl and Cl₂ emissions from the catalyst regeneration vent from the full refinery CCR, technology licensor guaranteed emissions rates (max. 1 ppmv) were used. CRU process vent emission calculations are summarized in Section 4 of Appendix A.

6.4.2. Sulfur Recovery Unit (SRU)

The sulfur recovery plant of the Davis Refinery will be based on Merichem’s LO-CAT® licensed technology. This patented liquid-redox system uses a proprietary chelated iron solution catalyst to convert H₂S to innocuous, elemental sulfur slurry inside an oxidizer vessel. The slurry passes through a sulfur filter to produce an elemental sulfur cake which is loaded onto trucks for offsite reuse or disposal. No hazardous waste byproducts are produced. The environmentally safe catalyst is continuously regenerated in the process. The LO-CAT process allows 100% turndown in gas flow and H₂S concentrations and has an H₂S Removal efficiency of 99.9 %. The process vents of the LO-CAT unit; an oxidizer vent and a flash drum vent, will be routed to a thermal oxidizer for the 99.9% destruction (oxidation) of any unconverted sulfur and residual organic volatiles.

Calculations for the emissions associated with SRU - Thermal Oxidizer were performed on the basis of engineering data provided by the licensor of the LO-CAT unit. These calculations are summarized in Section 4 of Appendix A.

	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: 26 OF 35	

6.4.3. Blowdown System

Blowdown systems are used during depressurization processes to recover liquids entrained in a process gas stream. The remaining uncondensed gases may be compressed and recovered for use as fuel gas or they may be vented to a thermal destruction device (thermal oxidizer or flare). Either of these scenarios is considered a “controlled” blowdown system. The design of the proposed Davis Refinery includes a vapor recovery system to capture vapors released by pressure control valves during normal operations and return to product/processes instead of releasing through stacks or via flaring.

To estimate yearly emissions from blowdown scenarios for the proposed Davis Refinery, the total refinery Fuel Gas production was considered as being routed to the Flare system for no more than 168 hours a year. Emissions estimations were performed based on the total refinery capacity using the AP-42 emission factors presented in *Table 5-12. Default Emissions Factors for Blowdown Systems*. These results are presented in Section 4 of Appendix A.

6.4.4. Vacuum Producing Systems



VOC emissions from the Vacuum Distillation Unit, are generated from the ejectors and condensers system. The design of the Vacuum Distillation Unit at the Davis Refinery considers recovery of uncondensed gases into the refinery’s fuel gas system. Therefore, there are no emissions associated to process vents from the vacuum distillation unit at the proposed Davis Refinery.

6.5. Flares

Emissions from flares consist of a fraction of the hydrocarbons in the flare gas (e.g., CH₄, CO, VOC, and specific organic HAP) that are not combusted in the flare; SO₂ resulting from the oxidation of sulfur compound impurities, such as H₂S, in the gas stream; and CO₂ from the combustion process. Flares are also expected to produce NO_x emissions and may produce PM (soot) if combustion conditions are not adequate.

To safely combust hydrocarbon relief flows during process upsets, and other times as needed during startups, shutdowns, or malfunctions the refinery will have a flare system comprised of a combination of an enclosed flare and elevated flares. A separate system with an elevated flare to handle acid gases in cases of SRU unavailability will be provided.

The proposed Davis Refinery will include four (4) flares; one main enclosed flare for normal operation, one acid gas flare and two elevated emergency flares. The enclosed flare is being designed to receive the streams of excess gas expected to be produced during purge and blowdown beyond the capacity of the refinery’s vapor recovery system. The elevated flares will only operate during emergency cases in

	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: 27 OF 35	

which the capacity of the enclosed flare is exceeded. Blowdown cases emission estimates are captured under Blowdown System in Section 5.4.4 and Section 4 of Appendix A.



Flaring at the proposed Davis Refinery will be on an intermittent and as-needed basis, since the refinery will operate a vapor recovery system to capture vapors and return to product/processes instead of releasing through stacks or via flaring during normal operations. Therefore, emissions estimates were calculated using Methodologies Ranks 5 and 6 based flare pilots capacity and the Lower Heating Value (LHV) of the gas stream routed to the pilots. AP-42 Table 6-4. Flare General Emission Factors were used to estimate HAP emissions associated to the normal operation of the flares. The AP-42 emission factors of Table 6-2. Flare Energy Consumption-Based Emission Factors and Table 6-3. Emission Factors for Soot from Flares were used to calculate emissions of VOCs, CO, NO_x and Soot (PM) based on the LHV of the gas stream being flared through the pilots under normal operations. Tables and Results of these calculations are presented in Section 5 of Appendix A.

6.6. Wastewater Treatment Systems

Methodology Rank 3 was utilized to estimate the VOC emissions associated to the WWTS. The mass flow through the WWTS was estimated based on the average throughput of Davis Refinery main units, considering that the main source of effluents is the desalter in the Atmospheric Distillation Units, and using the emissions factors from Table 7-8. Model Process Unit Characteristics for Petroleum Refinery Wastewater and Table 7-9. Refinery Wastewater Contaminant Concentrations as a Ratio to Benzene since the WWTS for the proposed Davis Refinery will be a Benzene Waste Operations NESHAP (BWON) Compliant plant. The estimation of the uncontrolled amount of the compounds emitted was calculated using AP-42 emission factors in Table 7-10. Default Mass Emission Factors for Refinery Wastewater Collection and Treatment Systems, the controlled estimate included a percentage of control as expected for a BWON compliant plant. The results of these calculations are presented in Section 5 of Appendix A.

6.7. Cooling Towers

The main emissions from cooling towers are VOC and particulate matter. Anticipated VOC emissions account for potential leaks that may occur in heat exchangers or condensers (product on the high-pressure side, leaks through cracks in the exchanger), which are picked up by flowing cooling water. During the mixing of the air with the warm water returning to the cooling tower, a very small fraction of the water will exit the towers as drift droplets. Anticipated emissions of particulate matter are the result dissolved or suspended solids contained in those drift droplets, which could become PM_{2.5} or PM₁₀ emissions when the water evaporates. To control drift loss, and minimize the visible water vapor plume typical of cooling tower systems, drift eliminators (0.001% drift rate) will built into the media.

	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: 28 OF 35	

The base case emission inventory calculations for the Cooling Towers were based on Cooling Water Circulation Rate, a default drift factor and AP-42 emission factors of *Table 8-5. Methodology Rank 5 Default Emission Factors*. Controlled emissions were estimated based on the proposed Davis Refinery cooling towers which are induced mechanical draft type with counter flow arrangement and drift eliminators (0.001% drift rate) built into the media, as specified by vendor. Results of these estimations are presented in Section 7 of Appendix A.

6.8. Product Loading

During loading/unloading operations of feedstock and refined products, vapors from the material previously transported and vapors from the material being loaded onto cargo trucks or railcars, are displaced and consequently emitted if left uncontrolled. HAPs and VOCs are the main gases to be emitted from truck/railcar loading operations.

For the Davis Refinery, crude feedstock will arrive to the Davis Refinery via pipeline, therefore no emissions are anticipated. During initial operations scenario, the refinery will also have island-type tanker truck loading/unloading racks to supply the local market with refined products, and accommodate raw material receipt from the nearby areas. By the time the refinery is fully operational, a product pipeline system is expected to be available to move the increased production into common carrier pipeline systems in the Midwest.



Based on the type of product and loading rates of the Davis Refinery (Gasoline, Diesel, Jet Fuel and Fuel Oil), the potential uncontrolled emissions were calculated using the AP-42 emission factors of *Table 5.2-5 Total Uncontrolled Organic Emission Factors for Petroleum Liquid Rail Tank Cars and Tank Trucks*, from Chapter 5 of the *AP-42 Compilation of Air Pollutant Emission Factors. Volume 1, Chapter 5: Transportation And Marketing Of Petroleum Liquids*.

Controlled emissions were estimated considering that a vapor recovery connection will be provided at each loading island for VOC control pursuant to compliance with the provisions of 40 CFR 63 Subpart BBBBBB. These results are presented in Section 8 of Appendix A.

6.9. Fugitive Dust

Fugitive dust from the proposed Davis Refinery comprises silt suspension from vehicular traffic. Results for these estimations are shown in Section 9 of Appendix A.

Emissions from vehicular traffic at the proposed Davis Refinery were estimated using expected truck traffic at loading facilities and employee vehicular traffic following AP-42 guidelines, and utilizing the silt loading factor for limited access roads in Chapter 13 of the *AP-42 Compilation of Air Pollutant Emission Factors. Volume 1, Chapter 13:*

	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: 29 OF 35	

Miscellaneous Sources. Section 13.2.1: Paved Roads. Primary control is paving of areas of routine vehicle traffic, and speed controls to limit vehicle speeds to less than 15 mph.

7. BASE CASE EMISSIONS INVENTORY

In the base case emissions inventory, emission factors that consider air pollution control systems were used, as applicable, only when these controls were inherent part of the equipment design (i.e. Ultra-Ultra Low NOx Burners, IFR tank design, etc.). A summary of the base case emissions inventory for the proposed Full Build-Out and Phase 1 Davis Refinery are presented in Tables 5 and 6, respectively.

8. PROPOSED DAVIS REFINERY POTENTIAL TO EMIT

A Controls Technology Review was conducted as part of determining the proposed Davis Refinery PTE, as defined in North Dakota's Air Pollution Control Rules (NDAC 33-15-14-06).

This review generally followed Best Available Control Technology (BACT) methods for identification of proposed controls and included a pollutant-by-pollutant analysis of technically feasible available control technologies that can be implemented for each emission unit. Based on the estimated controlled emissions for the facility, the source qualifies as a synthetic minor source under North Dakota Air Quality regulations, and therefore, a formal BACT analysis was not completed. The results of the Controls Technology Review is detailed in Exhibit C of the Permit Application, and a summary of the selected controls is listed in Table 7 below.

The proposed Davis Refinery PTE, under its physical and operational design and including the effect of add-on pollution control equipment, was calculated utilizing the same methodologies as in the "Base Case" or "uncontrolled" Emissions Inventory, this time applying the reduction efficiencies of the selected add-on control technologies. Tables 8 and 9 summarize the "Potential to Emit" of the proposed Full Build-Out and Phase 1 Davis Refinery, respectively.



	EMISSIONS INVENTORY		VEPICA CODE: P-5715043-01-001-18042-1001		
			COMPANY CODE: TBD		
	ISSUE: 1	DATE: 03/23/17			
	SHEET: 30	OF 35			

Table 5: Uncontrolled Emission Inventory Summary for the Full Build-Out Davis Refinery

Emissions Unit	Criteria Pollutants										Total HAPs	
	CO	Pb	PM<10	Filterable PM <10	PM <2.5	Filterable PM <2.5	Condensable PM	NOx (as NO ₂)	SO ₂	VOC		
Leaks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	195.29	29.26
Tanks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.43	14.95
Stationary Combustion Sources	76.16	1.33E-03	10.88	2.72	10.88	2.72	8.16	81.60	1.60	14.67	5.34	0.07
Catalytic Reforming Unit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71	0.00	0.00
Sulfur Recovery Plant	2.36	0.00	0.00	0.00	0.00	0.00	0.00	0.52	0.22	1.65	0.00	0.00
Vacuum Systems	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3,679.20	0.00	0.00
Blowdown System	0.83	0.00	0.01	0.01	0.01	0.01	0.00	3.66	5.20	0.15	0.00	0.00
Flares	0.25	4.38E-06	0.04	0.01	0.04	0.01	0.03	0.27	0.005	0.05	0.00	0.00
Wastewater	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	290.73	32.17	0.00
Cooling Towers	0.00	0.00	82.78	0.00	0.00	0.00	0.00	0.00	0.00	15.77	0.00	0.00
Truck Product Loading	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	826.96	0.00	0.00
Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total - US TPY (tons per year)	79.60	1.34E-03	93.71	2.73	10.92	2.73	8.19	86.04	7.02	5,032.62	81.78	



	EMISSIONS INVENTORY		VEPICA CODE: P-5715043-01-001-18042-1001		
			COMPANY CODE: TBD		
	ISSUE: 1	DATE: 03/23/17			
	SHEET: 31	OF 35			

Table 6: Uncontrolled Emission Inventory Summary for the Phase 1 Davis Refinery

Emissions Unit	Criteria Pollutants										HAPs
	CO	Pb	PM<10	Filterable PM <10	PM <2.5	Filterable PM <2.5	Condensable PM	NOx (as NO ₂)	SO ₂	VOC	Total HAPs
Leaks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	131.65	23.81
Tanks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.66	7.47
Stationary Combustion Sources	25.34	3.86E-04	3.15	0.79	3.15	0.79	2.37	23.65	0.46	4.25	1.55
Catalytic Reforming Unit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.01
Sulfur Recovery Plant	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.04	0.29	0.00
Vacuum Systems	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Blowdown System	0.41	0.00	0.00	0.00	0.00	0.00	0.00	1.83	2.60	0.08	0.00
Flares	0.29	3.72E-06	0.03	0.01	0.03	0.01	0.02	0.23	0.004	0.04	0.00
Wastewater	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	192.47	21.30
Cooling Towers	0.00	0.00	20.70	0.00	0.00	0.00	0.00	0.00	0.00	3.94	0.00
Truck Product Loading	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	349.79	0.00
Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total - US TPY (tons per year)	26.46	3.90E-04	23.89	0.80	3.19	0.80	2.39	25.80	3.11	689.22	54.13



	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: 32 OF 35	

Table 7: Summary of Proposed Control Technology for the Davis Refinery

Source/Unit	Target Pollutant	Pollution Control Technologies Used	Assumed % Control
Leaks (Fugitive Emissions)	VOC	LDAR (Leak, Detection and Repair) program with differential light absorption and ranging (DIAL) or optical gas imaging (OGI) technology.	97% (valves), 93% pumps, 97% flanges, 97% sample points, (30% heavies) Program baseline of 500 ppm
Tanks	VOC	IFRs with Double Seal and Wipers	NESHAP std
Stationary Combustion Sources (Process Unit Furnaces and Utility Boilers)	CO NOx Org. HAPs SO ₂	CO – Good Comb. Practices w/ Ultra Low NOx Burners NOx – SCR's w/ Ultra Low NOx Burners Org. HAPs – Good Comb. Practices w/ Ultra Low NOx Burners	CO – 96% NOx – 75% Org. HAPs – 75%
Catalytic Reforming Unit (Regeneration Vent)	HAPs	NA – minor emissions levels CCR will include a wash drum inherent to the design to scrub continuous catalyst regeneration off-gases prior to venting.	NA – de-minimus
Sulfur Recovery Plants	SO ₂	Lo-CAT with vent gases routed to thermal oxidizer. Other pollutants are considered minor.	SO ₂ - 99.9%
Blowdown System	CO NOx SO ₂	Vapor recovery to product capture and emergency flaring only for upsets	99.8%
Flares	CO NOx VOC HAPs	Lower heating value of feed gases, requirements specified by EPA and NDDoH regulations. Emergency flaring for upset conditions only.	98% +
Wastewater Treatment System	VOC HAPs	Covered API/CPI oil/water separators and induced/dissolved air flotation units Equalization tanks instead of open ponds. Vapor Recovery System	VOC – 95% HAPs – 55%
Product Loading	VOC	Vapor recovery to product recycle with upsets to emergency flares	98%
Fugitive (on-site vehicular) emissions	PM	Paving of areas of routine vehicle traffic. Maintain vehicle speeds to < 15 mph	PM _{2.5} - 0.00054 lb/vmt PM ₁₀ - 0.0022 lb/vmt Silt load = 2.15E-02
Spent Catalyst	PM	De-minimus	NA – de-minimus

Taken from report N° P-5715043-01-001-18035-I001. EMISSIONS INVENTORY – CONTROLS TECHNOLOGY REVIEW FOR DAVIS REFINERY. VEPICA, 2017.



	EMISSIONS INVENTORY		VEPICA CODE: P-5715043-01-001-18042-1001	
			COMPANY CODE: TBD	
	ISSUE: 1	DATE: 03/23/17		
	SHEET: 33	OF 35		

Table 8: Summary of proposed Full Built-Out Davis Refinery "Potential to Emit"

Emissions Unit	Criteria Pollutants										HAPs	
	CO	RP	PM<10	Filterable PM <10	PM <2.5	Filterable PM <2.5	Condensable PM	NO _x (as NO ₂)	SO ₂	VOC	Total HAPs	
Leaks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.70	1.51	
Tanks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.43	8.55	
Stationary Combustion Sources	76.16	1.33E-03	10.88	2.72	10.88	2.72	8.16	34.51	1.60	14.67	1.35	
Catalytic Reforming Unit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71	0.07	
Sulfur Recovery Plant	2.36	0.00	0.00	0.00	0.00	0.00	0.00	0.52	0.22	1.65	0.00	
Vacuum Systems	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Blowdown System	0.83	0.00	0.01	0.01	0.01	0.01	0.00	3.66	5.20	0.15	0.00	
Flares	0.25	4.38E-06	0.04	0.01	0.04	0.01	0.03	0.27	0.005	0.05	0.00	
Wastewater	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.54	0.72	
Cooling Towers	0.00	0.00	2.07	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	
Truck Product Loading	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.34	0.00	
Fugitive Dust	0.00	0.00	0.00	0.00	9.72E-04	0.00	0.00	0.00	0.00	0.00	0.00	
Total - US TPY (tons per year)	79.60	1.34E-03	12.99	2.73	10.92	2.73	8.19	38.95	7.02	61.63	12.21	




	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-1001 COMPANY CODE: TBD ISSUE: 1 DATE: 03/23/17 SHEET: 34 OF 35	
---	----------------------------	--	---

Table 9: Summary of proposed Phase 1 Davis Refinery “Potential to Emit”

Emissions Unit	Criteria Pollutants										HAPs	
	CO	Pb	PM<10	Filterable PM <10	PM <2.5	Filterable PM <2.5	Condensable PM	NOx (as NO ₂)	SO ₂	VOC		Total HAPs
Leaks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.27	1.20
Tanks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.66	8.55
Stationary Combustion Sources	25.34	3.86E-04	3.15	0.79	3.15	0.79	2.37	10.89	0.46	4.25	0.39	0.39
Catalytic Reforming Unit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	1.12	1.12
Sulfur Recovery Plant	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.04	0.29	0.00	0.00
Vacuum Systems	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Blowdown System	0.41	0.00	0.00	0.00	0.00	0.00	0.00	1.83	2.60	0.08	0.00	0.00
Flares	0.29	3.72E-06	0.03	0.01	0.03	0.01	0.02	0.23	0.004	0.04	0.00	0.00
Wastewater	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.62	0.48	0.48
Cooling Towers	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00
Truck Product Loading	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.34	0.00	0.00
Fugitive Dust	0.00	0.00	0.00	0.00	9.72E-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total - US TPY (tons per year)	26.46	3.90E-04	3.71	0.80	3.19	0.80	2.39	13.04	3.11	36.71	11.74	11.74

	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: 35 OF 35	

9. REFERENCES

- Vendor information, Engineering Documentation and Process calculations from VEPICA.
- Letcher, T.; Vallero, D. 2011. Waste: A Handbook for Management. Academic Press.
- RTI International, 2015. Emissions Estimation Protocol for Petroleum Refineries, Version 3. April 2015. Submitted to U.S. EPA Office of Air Quality Planning and Standards
- U.S. EPA (Environmental Protection Agency). 1995a. Compilation of Air Pollutant Emission Factors. Volume 1: Stationary Point and Area Sources. AP-42, Fifth Edition. Office of Air Quality Planning and Standards, Research Triangle Park, NC.

10. APPENDICES

APPENDIX A - EMISSION INVENTORY CALCULATION NOTES

Section 1: Calculations for Equipment Leaks

Section 2: Calculations for Storage Tanks

Section 3: Calculations for Stationary Combustion

Section 4: Calculations for Process Vents

Section 5: Calculations for Flares

Section 6: Calculations for Wastewater Treatment Systems

Section 7: Calculations for Cooling Towers



Section 8: Calculations for Product Loading

Section 9: Calculations for Fugitive Dust



APPENDIX B - TANS 4.09d RUNS

APPENDIX C - ENGINEERING DATA

APPENDIX D - VENDOR DATA

	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: OF	

APPENDIX A - EMISSIONS INVENTORY CALCULATION NOTES

	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-1 OF A-34	

SECTION 1: Results for Equipment Leaks



	EMISSIONS INVENTORY	
VEPICA CODE: P-5715043-01-001-18042-1001		
COMPANY CODE: TBD		
ISSUE: 1	DATE: 03/23/17	
SHEET: A-2	OF A-34	

Table A1-1 - Number of Equipment per Unit (Average for a large refinery) ^(a)

	Median Equipments Leak Components Count*	Number of Equipments (Average for a large refinery)*						
		Crude Distillation	Hydrocracker	Catalytic reforming	Hydrotreating/hydrorefining	Product blending	Sulfur plant	Vacuum distillation
Valves	Gas Light Liquid Heavy Liquid	204 440 498	290 651 308	310 383 84	224 253 200	75 419 186	100 125 110	229 108 447
Pumps	Light Liquid Heavy Liquid Compressors	15 14 2	22 12 2	12 2 3	7 6 2	10 10 2	8 3 1	2 12 1
Pressure Relief Valves	Gas	7	10	8	9	9	4	5
Flanges	Gas Light Liquid Heavy Liquid Open-Ended Lines Sampling Connections	549 982 1,046 75 9	418 1,361 507 329 28	653 842 132 48 9	439 581 481 49 8	227 664 473 24 8	280 460 179 22 7	473 136 1,072 0 7

*Process component counts as presented in EPA's document, Locating and Estimating Air Emissions from Sources of Benzene (U.S. EPA, 1998a), for refineries with crude capacities greater than 50,000 bbl/cd.

^(a) Adapted from Table 2-5 Median Equipment Leak Component Counts for Large Model Processes of Emissions Estimation Protocol for Petroleum Refineries, Version 3 (RTI, 2015).



	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-1001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-3 OF A-34	

Table A1-2 – Controlled Emissions from Leaking Equipment

	Median Equipments Leak Components Count	Screening Value (ppmv)**	Emission Factor (Kg/h)***	Emission Factor (lb/h)***	LDAR Program*	Controlled Leak Emissions (VOC) in lb/h								TOTAL
						Crude Distillation	Hydrocracker	Catalytic reforming	Hydrotreating/hydrorefining	Product blending	Sulfur plant	Vacuum distillation		
Valves	Gas	500	2,36E-04	5,21E-04	Yes	3.19E-03	4.53E-03	4.85E-03	3.50E-03	1.17E-03	1.56E-03	3.58E-03		
	Light Liquid	500	2,36E-04	5,21E-04	97%	6.88E-03	1.02E-02	5.99E-03	3.95E-03	6.55E-03	1.95E-03	1.69E-03		
	Heavy Liquid	500	2,36E-04	5,21E-04	0%	2.59E-01	1.60E-01	4.38E-02	1.04E-01	9.69E-02	5.73E-02	2.33E-01		
Pumps	Light Liquid	500	2,23E-03	4,92E-03	85%	1.11E-02	1.62E-02	8.85E-03	5.16E-03	7.37E-03	5.90E-03	1.47E-03		
	Heavy Liquid	500	2,23E-03	4,92E-03	85%	1.03E-02	8.85E-03	1.47E-03	4.42E-03	7.37E-03	2.21E-03	8.85E-03		
	Compressors	10,000	7,30E-02	1,61E-01	85%	4.83E-02	4.83E-02	7.25E-02	4.83E-02	4.83E-02	2.42E-02	2.42E-02		
Pressure Relief Valves	Gas	500	2,36E-04	5,21E-04	97%	1.09E-04	1.56E-04	1.25E-04	1.41E-04	1.41E-04	6.25E-05	7.82E-05		
Flanges	Gas	500	3,64E-04	8,03E-04	97%	1.32E-02	1.01E-02	1.57E-02	1.06E-02	5.47E-03	6.74E-03	1.14E-02		
	Light Liquid	500	3,64E-04	8,03E-04	97%	2.37E-02	3.28E-02	2.03E-02	1.40E-02	1.60E-02	1.11E-02	3.28E-03		
	Heavy Liquid	500	3,64E-04	8,03E-04	30%	5.88E-01	2.85E-01	7.42E-02	2.70E-01	2.66E-01	1.01E-01	6.03E-01		
Open-Ended Lines	0	0	0,00E+00	0,00E+00	97%	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00		
	500	500	5,29E-04	1,17E-03	97%	3.15E-04	9.80E-04	3.15E-04	2.80E-04	2.80E-04	2.45E-04	2.45E-04		
Total (lb/h)						0.96	0.58	0.25	0.46	0.46	0.21	0.89		
Total Controlled (STPY)						4.22	2.53	1.09	2.04	1.99	0.93	3.9		
TOTAL													3.81	
TOTAL													16.70	

Adapted from Table 2-6. Refinery and SOCM Average Component Emission Factors of Emissions Estimation Protocol for Petroleum Refineries, Version 3 (RTI, 2015). Emission factors used, based in a threshold of 50C ppmv for leak detection, with automated corrective action.

* LDAR program efficiency in reducing fugitive emissions equivalent to those achievable under the TCEQ 28LAER. LDAR assumes automated monitoring/directed maintenance.

**Table 2-2. Equipment Leak Rate for Petroleum and SOCM Equipment Components.

*** Emission factors used (correlation), based in a threshold of 500 ppmv for leak detection, with automated corrective action, and pegged emission factor for 10,000 ppm SV



	EMISSIONS INVENTORY		
	VEPICA CODE: P-5715043-01-001-18042-1001		
	COMPANY CODE: TBD		
	ISSUE: 1	DATE: 03/23/17	
SHEET: A-4 OF A-34			

Table A1-2 – Controlled Speciated VOC HAPs Emissions from Leaking Equipment

HAPs	Average Weight Percent of Compound in Process Unit Streams ¹							
	Crude Distillation	Hydrocracker	Catalytic reforming	Hydrotreating/hydrorefining	Product blending	Sulfur plant	Vacuum distillation	
1,3-Butadiene	0.01	0.03	0.009					
n-Hexane	4.3	1.9	2.3	1.9			0.01	
2,2,4-Trimethyl pentane	0.05	1	0.25				0.003	
Benzene	0.9	1.30	6.3	0.37			0.003	
Toluene	1.7	2.7	17.4	1.7			0.04	
Xylenes (total)	2.0	2.70	17.6	1.9			0.04	
Ethylbenzene	0.63	0.7	3.9	0.37			0.02	
Cumene	0.12	0.09	0.42	0.07				
1,2,4-trimethyl benzene	0.63	1.3	5.9	0.4			0.02	
Naphthalene	0.25	0.2	0.87	0.25			0.12	
Biphenyl	0.06			0.22			0.09	

1 - Table 2-7. Concentration of HAP in Refinery Process Unit Streams, Emissions Estimation Protocol for Petroleum Refineries, Version 3, RTI International.





	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-1001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-5 OF A-34	

Table A1-2 – Controlled Speciated VOC HAPs Emissions from Leaking Equipment (Cont.)

HAPs	Controlled Leak Emissions (HAP) in STPY										Total HAPs Controlled (lb/h)	
	Crude Distillation	Hydrocracker	Catalytic reforming	Hydrotreat/hydrorefining	Product blending	Sulfur plant	Vacuum distillation	Total Uncontrolled HAPs (STPY)				
1,3-Butadiene	4.22E-04	6.32E-04	9.79E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E-03	2.63E-04
n-Hexane	1.82E-01	4.81E-02	3.04E-02	3.87E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.90E-04	2.99E-01	6.83E-02
2,2,4-Trimethyl pentane	2.11E-03	2.53E-02	2.72E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-04	3.02E-02	6.90E-03
Benzene	3.80E-02	3.29E-02	6.84E-02	7.53E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.17E-04	1.47E-01	3.36E-02
Toluene	7.18E-02	6.83E-02	1.89E-01	3.46E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.56E-03	3.65E-01	8.34E-02
Xylenes (total)	8.45E-02	6.83E-02	1.91E-01	3.87E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.56E-03	3.84E-01	8.77E-02
Ethylbenzene	2.66E-02	1.77E-02	4.24E-02	7.53E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.80E-04	9.50E-02	2.17E-02
Cumene	5.07E-03	2.28E-03	4.56E-03	1.43E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.33E-02	3.04E-03
1,2,4-trimethyl benzene	2.66E-02	3.29E-02	6.41E-02	8.15E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.80E-04	1.33E-01	3.03E-02
Naphthalene	1.06E-02	5.06E-03	9.45E-03	5.09E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.68E-03	3.48E-02	7.95E-03
Biphenyl	2.53E-03	0.00E+00	0.00E+00	4.48E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.51E-03	1.05E-02	2.40E-03
	0.45	0.30	0.60	0.15	0.00	0.00	0.00	0.00	0.00	0.01	1.51	0.35

	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-6 OF A-34	

SECTION 2: Results for Storage Tanks



	EMISSIONS INVENTORY	
	VEPICA CODE: P-5715043-01-001-18042-1001	
	COMPANY CODE: TBD	
	ISSUE: 1 DATE: 03/23/17	
	SHEET: A-7 OF A-34	

Table A2-1 – Controlled VOC Emissions from Petroleum Refinery Storage Tanks

	Qty	Roof Type ->	Emissions per Tank (pounds/year)				Emissions per Tank (STPY)				Total VOC Tank Emissions (STPY)						
			IFR / External Self Supporting Roof	Fixed Cone Uncontrolled Emissions	Fixed Cone Not Connected to VRU	Fixed Cone connected to VRU ²	Self-Supported & Gasketed Penetrations	Fixed Cone not connected to VRU	Fixed Cone connected to VRU	Self-Supported & Gasketed Penetrations	Fixed Cone not connected to VRU	Fixed Cone connected to VRU	Self-Supported & Gasketed Penetrations	Fixed Cone not connected to VRU	Fixed Cone connected to VRU		
CRUDE OIL	2.00	1'5 ID X 60	2,449.39						1.22						2.45		
DESULPHURIZED HEAVY NAPHTHA	1.00	88 ID X 60	198.40						0.10						0.10		
GASOLINE	2.00	88 ID X 60	1,004.49						0.50						1.00		
REFORMATE	2.00	63 ID X 60	559.60						0.28						0.56		
LIGHT NAPHTHA	2.00	63 ID X 60	752.88						0.38						0.75		
JET FUEL	2.00	63 ID X 60	122.47						0.06						0.12		
ULSD	2.00	88 ID X 60		1,700.68	1,700.68										1.70E+00		
STRAGHT RUN DIESEL	1.00	63 ID X 60		804.84	804.84										4.02E-01		
VACUUM GASOIL	1.00	63 ID X 60		8.00	8.00										4.00E-03		
FUEL OIL	1.00	63 ID X 60		8.00	8.00										4.00E-03		
LIGHT SLOPS	1.00	25 ID X 30	629.91						0.31						0.31		
HEAVY SLOPS	1.00	25 ID X 30		41.46	41.46										2.07E-02		
															5.30		2.13
																	0.00

¹ Self-supported & gasketed penetrations - External Self-Supporting Roof, double seals and wipers, all gasketed tank fittings and fixed floating roof legs. Control effectiveness meets NSPS and NES-AP requirements for storage tanks in the petroleum industry.

² Emission Estimates from EPA Tanks 4.09d modeled runs



	EMISSIONS INVENTORY	
VEPICA CODE: P-5715043-01-001-18042-1001		
COMPANY CODE: TBD		
ISSUE: 1 DATE: 03/23/17		
SHEET: A-3 OF A-34		

Table A2-2 – Controlled HAPs Emissions from Petroleum Refinery Storage Tanks



Chemical Name	Emissions Factors for Petroleum Liquid Storage Tanks (lb/MMbbl)*			Emissions (lb/h)			STPY (Uncontrolled)			Control Efficiencies			STPY (Controlled)			TOTAL (lb/h)	TOTAL (STPY)			
	Crude Oil	Gasoline and Other Light Distillates	Diesel Fuel and Other Middle Distillates	Crude Oil	Gasoline and Other Light Distillates	Diesel Fuel and Other Middle Distillates	Crude Oil	Gasoline and Other Light Distillates	Diesel Fuel and Other Middle Distillates	Crude Oil	Gasoline and Other Light Distillates	Diesel Fuel and Other Middle Distillates	Crude Oil	Gasoline and Other Light Distillates	Diesel Fuel and Other Middle Distillates					
2-Methyl naphthalene	0	3.5	3.5	0.00E+00	4.81E-03	3.21E-03	0.00	2.11E-02	1.41E-02	0%	60%	0%	0.00E+00	0.008	0.014	2.25E-02	5.13E-03			
Anthracene	0	0.24	0.24	0.00E+00	3.30E-04	2.20E-04	0.00	1.45E-03	9.64E-04	0%	60%	0%	0.00E+00	0.001	0.001	1.54E-03	3.52E-04			
Benzene	10	70	54	2.29E-02	9.63E-02	4.95E-02	0.10	4.22E-01	2.17E-01	0%	60%	0%	4.02E-02	0.169	0.217	4.26E-01	9.72E-02			
Biphenyl	0.2	0.17	0	4.58E-04	2.34E-04	0.00E+00	0.00	1.02E-03	0.00E+00	0%	60%	0%	8.03E-04	0.000	0.000	1.21E-03	2.77E-04			
Chrysene	0	0.21	0.21	0.00E+00	2.89E-04	1.93E-04	0.00	1.26E-03	8.43E-04	0%	60%	0%	0.00E+00	0.001	0.001	1.35E-03	3.08E-04			
Cresol	0.6	13	0.19	1.38E-03	1.79E-02	1.74E-04	0.01	7.83E-02	7.63E-04	0%	60%	0%	2.41E-03	0.031	0.001	3.45E-02	7.87E-03			
Cumene	0.5	15	10	1.15E-03	2.06E-02	9.17E-03	0.01	9.03E-02	4.02E-02	0%	60%	0%	2.01E-03	0.036	0.040	7.83E-02	1.79E-02			
Ethylbenzene	1.6	31	18	3.37E-03	4.26E-02	1.65E-02	0.02	1.87E-01	7.23E-02	0%	60%	0%	6.42E-03	0.075	0.072	1.53E-01	3.50E-02			
Fluorene	0	0.36	0.36	0.00E+00	4.95E-04	3.30E-04	0.00	2.17E-03	1.45E-03	0%	60%	0%	0.00E+00	0.001	0.001	2.31E-03	5.28E-04			
Hexane	84	420	480	1.33E-01	5.78E-01	4.40E-01	0.84	2.53E+00	1.93E+00	0%	60%	0%	3.37E-01	1.012	1.927	3.28E+00	7.48E-01			
Methanol	0	3.8	3.8	0.00E+00	5.23E-03	3.48E-03	0.00	2.29E-02	1.53E-02	0%	60%	0%	0.00E+00	0.009	0.015	2.44E-02	5.57E-03			
Methyl isobutyl ketone	0	320	320	0.00E+00	4.40E-01	2.93E-01	0.00	1.93E+00	1.28E+00	0%	60%	0%	0.00E+00	0.771	1.285	2.06E+00	4.69E-01			
Methyl tertiary-butyl ether	0	310	0	0.00E+00	4.26E-01	0.00E+00	0.00	1.87E+00	0.00E+00	0%	60%	0%	0.00E+00	0.747	0.000	7.47E-01	1.71E-01			
Naphthalene	0.6	7.6	4	1.38E-03	1.05E-02	3.67E-03	0.01	4.58E-02	1.61E-02	0%	60%	0%	2.41E-03	0.018	0.016	3.68E-02	8.40E-03			
Phenanthrene	0	1.5	1.5	0.00E+00	2.06E-03	1.38E-03	0.00	9.03E-03	6.02E-03	0%	60%	0%	0.00E+00	0.004	0.006	9.64E-03	2.20E-03			
Phenol	0.9	0.9	0.67	2.06E-03	1.24E-03	6.14E-04	0.01	5.42E-03	2.69E-03	0%	60%	0%	3.61E-03	0.002	0.003	8.47E-03	1.93E-03			
Pyrene	0	0.39	0.39	0.00E+00	5.36E-04	3.58E-04	0.00	2.35E-03	1.57E-03	0%	60%	0%	0.00E+00	0.001	0.002	2.51E-03	5.72E-04			
Styrene	0	66	0	0.00E+00	9.08E-02	0.00E+00	0.00	3.97E-01	0.00E+00	0%	60%	0%	0.00E+00	0.159	0.000	1.59E-01	3.63E-02			
Toluene	7.5	180	100	1.72E-02	2.48E-01	9.17E-02	0.08	1.08E+00	4.02E-01	0%	60%	0%	3.01E-02	0.434	0.402	8.65E-01	1.98E-01			
Xylene	6.2	140	70	1.42E-02	1.93E-01	6.42E-02	0.06	8.43E-01	2.81E-01	0%	60%	0%	2.49E-02	0.337	0.281	6.43E-01	1.47E-01			
			Total Hazardous Air Pollutants (HAP), Uncontrolled			1.13			9.54			4.28			Total Hazardous Air Pollutants (HAP), Controlled			4.28		
			0.45			3.82			0.45			3.82			0.45			3.82		

Reference 1: "Emissions Estimation Protocol for Petroleum Refineries, Table 3-3. Default Emissions Factors for Petroleum Refinery Storage Tank. Emission factors shown are uncontrolled. Control efficiencies for hazardous emissions are conservatively estimated at 60% to take into account reductions due to double seal and wipers and IFR design.

*Table 3-3. Default Emissions Factors for Petroleum Refinery Storage Tanks (Normalized by production capacity of the refinery). Emission factors shown are uncontrolled.

**These factors consider an estimation of distillates production as a fraction of feed processing capacity.

Gasoline and Other Light Distillates (such as desulfurized naphtha, alkylates, reformates, butane) is considered to be up to 60% of refinery processing rate, and, Diesel Fuel and Other Middle Distillates (diesel, kerosenes, jet fuel, fuel oil), is considered to be up to 40% of refinery processing rate.

	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-9 OF A-34	

SECTION 3: Results for Stationary Combustion



	EMISSIONS INVENTORY	
VEPICA CODE: P-5715043-01-001-18042-1001		
COMPANY CODE: TBD		
ISSUE: 1 DATE: 03/23/17		
SHEET: A-13 OF A-34		

Table A3-1 –Controlled Emissions from Stationary Combustion Sources (Heaters/Boilers)*

	Atmospheric Distillation Unit #1		Atmospheric Distillation Unit #2		Vacuum Distillation Unit		Hydrocracking (HYK)		Naphtha Hydrotreater (NHT)			
	ADU #1 HEATER		ADU #2 HEATER		Vacuum Heater 1		Reactor Feed Heater		Fractionator Feed Heater		Reactor Feed	
	101-H-0101	102-H-0201	103-H-0801	112-H-1201	111-H-1202	105-H-0501	Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)
Heat Capacity (MMBTU/h)	82.13	82.13	75	37.16	40.34	8.6						
SCR Control Device (YES/NO)?	YES	YES	YES	YES	YES	NO						
Best Combustion Practice (5 ppm)	YES	YES	YES	YES	YES	YES						
Criteria Pollutants	Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)
Carbon Monoxide	2.30E+00	1.01E+01	2.10E+00	9.20E+00	1.13E+00	4.95E+00	2.41E-01	1.05E+00				
Lead	4.02E-05	1.76E-04	3.68E-05	1.61E-04	1.98E-05	8.66E-05	4.21E-06	1.85E-05				
PM (Total)	3.29E-01	1.44E+00	3.00E-01	1.31E+00	6.51E-01	7.07E-01	3.44E-02	1.51E-01				
PM (Condensable)	2.46E-01	1.08E+00	2.25E-01	9.86E-01	1.11E-01	5.30E-01	2.58E-02	1.13E-01				
PM (Filterable)	8.21E-02	3.60E-01	7.50E-02	3.29E-01	3.72E-02	1.77E-01	8.60E-03	3.77E-02				
NOX	5.17E-01	2.27E+00	4.73E-01	2.07E+00	2.34E-01	1.11E+00	2.58E-01	1.13E+00				
SOX	4.83E-02	2.12E-01	4.41E-02	1.93E-01	2.19E-02	9.57E-02	1.04E-01	2.22E-02				
VOC	4.43E-01	1.94E+00	4.04E-01	1.77E+00	2.00E-01	2.18E-01	4.64E-02	2.03E-01				
Metal HAP (Total)	6.01E-04	2.63E-03	5.48E-04	2.40E-03	2.72E-04	1.19E-03	6.29E-05	2.75E-04				
Org HAP (Total)	1.61E-01	7.03E-01	1.47E-01	6.42E-01	7.27E-02	3.18E-01	1.68E-02	7.37E-02				
Org HAP (Controlled)	4.02E-02	1.76E-01	3.67E-02	1.61E-01	1.82E-02	7.96E-02	4.20E-03	1.84E-02				



	EMISSIONS INVENTORY			
	VEPICA CODE: P-5715043-01-001-18042-1001			
	COMPANY CODE: TBD			
	ISSUE: 1	DATE: 03/23/17		
SHEET: A-12		OF	A-34	

Table A3-1 – Controlled Emissions from Stationary Combustion Sources (Heaters/Boilers)* (Cont.)

	BOILERS						
	202-B-0202A	202-B-0202B	202-B-0201A	202-B-0201B			
202-B-0201C							
Heat Capacity (MMBTU/h)	22	22	11.68	11.68			
SCR Control Device (YES/NO)?	NO	NO	NO	NO			
Best Combustion Practice (5 ppm)	YES	YES	YES	YES			
Criteria Pollutants	Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)	Total Emissions (STPY)
Carbon Monoxide	6.16E-01	2.70E+00	6.16E-01	2.70E+00	3.27E-01	1.43E+00	1.43E+00
Lead	1.08E-05	4.72E-05	1.08E-05	4.72E-05	5.72E-06	2.51E-05	2.51E-05
PM (Total)	8.80E-02	3.85E-01	8.80E-02	3.85E-01	4.67E-02	2.05E-01	2.05E-01
PM (Condensable)	6.60E-02	2.89E-01	6.60E-02	2.89E-01	3.50E-02	1.53E-01	1.53E-01
PM (Filterable)	2.20E-02	9.64E-02	2.20E-02	9.64E-02	1.17E-02	5.12E-02	5.12E-02
NOX	6.60E-01	2.89E+00	6.60E-01	2.89E+00	3.50E-01	1.53E+00	1.53E+00
SOX	1.29E-02	5.67E-02	1.29E-02	5.67E-02	6.87E-03	3.01E-02	3.01E-02
VOC	1.19E-01	5.20E-01	1.19E-01	5.20E-01	6.30E-02	2.76E-01	2.76E-01
Metal HAP (Total)	1.61E-04	7.05E-04	1.61E-04	7.05E-04	8.54E-05	3.74E-04	3.74E-04
Org HAP (Total)	4.30E-02	1.88E-01	4.30E-02	1.88E-01	2.28E-02	1.00E-01	1.00E-01
Org HAP (Controlled)	1.08E-02	4.71E-02	1.08E-02	4.71E-02	5.71E-03	2.50E-02	2.50E-02

Table A3-1 – Controlled Emissions from Stationary Combustion Sources (Heaters/Boilers)* (Summary)

Emissions Summary	CO	Pb	PM Total**	Filterable PM	Condensable PM	NOX	SO ₂	VOC	Total Metal HAP	Controlled Organic HAP
Heaters	66.47	1.16E-03	9.50	2.37	7.12	24.12	1.396	12.80	0.017	1.16
Boilers	9.69	1.70E-04	1.38	0.35	1.04	10.39	0.20	1.87	0.0025	0.1692
Total SFPY	76.16	1.33E-03	10.88	2.72	8.16	34.51	1.60	14.67	1.99E-02	1.33
Total lb/h	17.39	3.04E-04	2.48	0.62	1.86	7.88	0.37	3.35	4.54E-03	0.30

*Calculated based on the TABLE 1.4-2, AP. 42, Fifth Edition, Volume 1 Chapter 1: External Combustion Sources, unless noted otherwise
** All PM (total, condensable, and filterable) is assumed to be less than 1.0 micrometer in diameter. Therefore, the PM emission factors presented here may be used to estimate PM₁₀, PM_{2.5} or PM₁ emissions.



	EMISSIONS INVENTORY		VEPICA CODE: P-5715043-01-001-18042-1001		
			COMPANY CODE: TBD		
	ISSUE: 1	DATE: 03/23/17			
	SHEET: A-13	OF A-34			

Table A3-2 Emissions from Stationary Combustion Sources (Internal Combustion Engines)

Criteria Pollutants	Emission Factor lb/HP-hr	EMERGENCY GENERATOR SET						Total Emissions Gen Set (STPY)
		216-EG-1601A		216-EG-1601B		216-EG-1601C		
		Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)	
Carbon Monoxide	0.0055	25.8	1.29	25.8	1.3	25.8	1.3	3.87
PM	0.0007	3.29	0.16	3.29	0.16	3.29	0.16	0.49
PM 10 (Total)		3.32	0.17	3.3	0.2	3.3	0.2	4.98E-01
PM 10 (Filterable)	0.0573	2.87	0.14	2.9	0.1	2.9	0.1	4.31E-01
PM 2.5 (Total)	0.0496	2.78	0.14	2.8	0.1	2.8	0.1	4.16E-01
PM 2.5(Filterable)	0.0077	2.78	0.14	2.8	0.1	2.8	0.1	4.16E-01
PM (Condensable)		0.45	0.02	0.4	0.0	0.4	0.0	6.69E-02
NOx*	0.013	61.0	3.05	61.0	3.1	61.0	3.1	9.15
SOx	4.05E-06	1.90E-02	9.49E-04	1.90E-02	9.49E-04	1.90E-02	9.49E-04	2.85E-03
TOC (as VOC)	7.05E-04	3.31	0.17	3.31	0.17	3.31	0.17	4.96E-01
Org HAP (Total)		2.53E-01	1.26E-02	2.53E-01	1.26E-02	2.53E-01	1.26E-02	3.79E-02



	EMISSIONS INVENTORY		VEPICA CODE: P-5715043-01-001-18042-1001		
			COMPANY CODE: TBD		
	ISSUE: 1	DATE: 03/23/17			
	SHEET: A-14	OF A-34			

Table A3-2 Emissions from Stationary Combustion Sources (Internal Combustion Engines) Cont.

Criteria Pollutants	FIREWATER PUMPS								Total Emissions FWP (STPY)
	Emission Factor		212-P-1201 A		212-P-1201 B		212-P-1201 C		
	lb/HP-hr	lb/MMBTU	Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)	
Carbon Monoxide	0.0055		3.3	0.17	3.3	0.2	3.3	0.2	0.50
PM	0.0007		0.42	0.02	0.42	0.02	0.42	0.02	0.06
PM 10 (Total)		0.0573	0.26	0.01	0.26	0.01	0.26	0.01	3.93E-02
PM 10 (Filterable)		0.0496	0.23	0.01	0.23	0.01	0.23	0.01	3.40E-02
PM 2.5 (Total)		0.0479	0.22	0.01	0.22	0.01	0.22	0.01	3.28E-02
PM 2.5 (Filterable)		0.0479	0.22	0.01	0.22	0.01	0.22	0.01	3.28E-02
PM (Condensable)		0.0077	0.04	0.00	0.04	0.00	0.04	0.00	5.28E-03
NOx*	0.013		7.8	0.39	7.80	0.39	7.80	0.39	1.17
SOx	4.05E-06		2.43E-03	1.21E-04	2.43E-03	1.21E-04	2.43E-03	1.21E-04	3.64E-04
TOC (as VOC)	7.05E-04		0.42	0.02	0.42	0.02	0.42	0.02	6.35E-02
Org HAP (Total)			1.99E-02	9.97E-04	1.99E-02	9.97E-04	1.99E-02	9.97E-04	2.99E-03

*Controlled by ignition timing retard.

From AP-42 Chapter 3 Section 3.4. Large Stationary Diesel And All Stationary Dual-fue| Engines. Table 3.4-1. GASEOUS EMISSION FACTORS FOR LARGE STATIONARY DIESEL AND ALL STATIONARY DUAL-FUEL ENGINES and Table 3.4-2. PARTICULATE AND PARTICLE-SIZING EMISSION FACTORS FOR LARGE UNCONTROLLED STATIONARY DIESEL ENGINES"





	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-15 OF A-34	

Table A3-3 HAPs Emissions from Stationary Combustion Sources (Internal Combustion Engines)

Volatile HAPS	lb/MMBTU	EMERGENCY GENERATOR		FIREWATER PUMPSX3	
		SETX3	Emission (STPY)	lb/hr	Emission (STPY)
Benzene	7.76E-04	1.35E-01	6.75E-03	1.06E-02	5.32E-04
Toluene	2.81E-04	4.89E-02	2.44E-03	3.85E-03	1.93E-04
Xylene	1.93E-04	3.36E-02	1.68E-03	2.64E-03	1.32E-04
Propylene	2.79E-03	4.85E-01	2.43E-02	3.82E-02	1.91E-03
Formaldehyde	7.89E-05	1.37E-02	6.86E-04	1.08E-03	5.41E-05
Acetaldehyde	2.52E-05	4.38E-03	2.19E-04	3.45E-04	1.73E-05
Acrolein	7.88E-06	1.37E-03	6.85E-05	1.08E-04	5.40E-06
TOTAL VOLATILE HAPS		7.22E-01	3.61E-02	5.69E-02	2.84E-03
PAHs					
Naphthalene	1.30E-04	2.26E-02	1.13E-03	1.78E-03	8.91E-05
Acenaphthylene	9.23E-06	1.61E-03	8.03E-05	1.26E-04	6.32E-06
Acenaphthene	4.68E-06	8.14E-04	4.07E-05	6.41E-05	3.21E-06
Fluorene	1.28E-05	2.23E-03	1.11E-04	1.75E-04	8.77E-06
Phenanthrene	4.08E-05	7.09E-03	3.55E-04	5.59E-04	2.80E-05
Anthracene	1.23E-06	2.14E-04	1.07E-05	1.69E-05	8.43E-07
Fluoranthene	4.03E-06	7.01E-04	3.50E-05	5.52E-05	2.76E-06
Pyrene	3.71E-06	6.45E-04	3.23E-05	5.08E-05	2.54E-06
Benz(a)anthracene	6.22E-07	1.08E-04	5.41E-06	8.52E-06	4.26E-07
Chrysene	1.53E-06	2.66E-04	1.33E-05	2.10E-05	1.05E-06
Benzo(b)fluoranthene	1.11E-06	1.93E-04	9.65E-06	1.52E-05	7.61E-07
Benzo(k)fluoranthene	2.18E-07	3.79E-05	1.90E-06	2.99E-06	1.49E-07
Benzo(a)pyrene	2.57E-07	4.47E-05	2.23E-06	3.52E-06	1.76E-07
Indeno(1,2,3-cd)pyrene	4.14E-07	7.20E-05	3.60E-06	5.67E-06	2.84E-07
Dibenz(a,h)anthracene	3.46E-07	6.02E-05	3.01E-06	4.74E-06	2.37E-07
Benzo(g,h,i)perylene	5.56E-07	9.67E-05	4.83E-06	7.62E-06	3.81E-07
TOTAL PAH	2.12E-04	3.69E-02	1.84E-03	2.91E-03	1.45E-04

"From AP-42 Chapter 3 Section 3.4. Large Stationary Diesel And All Stationary Dual-fuel Engines. Table 3.4-3. SPECIATED ORGANIC COMPOUND EMISSION FACTORS FOR LARGE, UNCONTROLLED STATIONARY DIESEL ENGINES and Table 3.4-4. PAH EMISSION FACTORS FOR LARGE UNCONTROLLED STATIONARY DIESEL ENGINES"

	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-16 OF A-34	

SECTION 4: Results for Process Vents



 Meridian Energy Group Inc.	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-17 OF A-34	

Table A4-1 – Emissions from the Catalytic Reforming Units (Reformers) ^(a)

	Emissions Factor (lb/Mbbl fresh feed)	Catalytic Reformer Unit	
		Emission (lb/h)	Emission (STPY)
Dioxins/PCBs			
Dioxin toxic equivalents (TEQ) ^b	5.70E-09	3.83E-09	1.68E-08
Total polychlorinated biphenyls (PCB)	2.60E-06	1.75E-06	7.65E-06
Semi-volatile and Non-volatile Organic HAP			
Naphthalene	3.50E-05	2.35E-05	1.03E-04
2-Methylnaphthalene	1.30E-06	8.74E-07	3.83E-06
Acenaphthylene	3.00E-08	2.02E-08	8.83E-08
Acenaphthene	4.30E-08	2.89E-08	1.27E-07
Fluorene	2.00E-07	1.34E-07	5.89E-07
Phenanthrene	6.10E-07	4.10E-07	1.80E-06
Anthracene	9.10E-08	6.12E-08	2.68E-07
Fluoranthene	1.00E-07	6.72E-08	2.94E-07
Pyrene	1.50E-08	1.01E-08	4.42E-08
Benzo(a)anthracene	9.00E-10	6.05E-10	2.65E-09
Benzo(b)fluoranthene	1.50E-09	1.01E-09	4.42E-09
Benzo(k)fluoranthene	7.50E-10	5.04E-10	2.21E-09
Benzo(e)pyrene	2.90E-09	1.95E-09	8.54E-09
Benzo(g,h,i)perylene	4.00E-09	2.69E-09	1.18E-08
Chrysene	2.90E-09	1.95E-09	8.54E-09
Dibenzo(a,h)anthracene	7.80E-10	5.24E-10	2.30E-09
Indeno(1,2,3-c,d)pyrene	1.70E-09	1.14E-09	5.00E-09
Total SV-NV Organic HAPs		2.51E-05	1.10E-04
PAH without naphthalene		1.62E-06	



	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-18 OF A-34	

Table A4-1 – (Continued) Emissions from the Catalytic Reforming Units (Reformers) ^(a)

HAP	Emissions Factor (lb/Mbbl fresh feed)	Catalytic Reformer Unit	
		Emission (lb/h)	Emission (STPY)
Benzene	0.004	2.69E-03	1.18E-02
Toluene	0.0096	6.45E-03	2.83E-02
Xylene	0.007	4.70E-03	2.06E-02
Total SV-NV Organic HAPs		1.38E-02	6.06E-02
THC (Total Hydrocarbons)*	0.24	1.61E-01	7.06E-01
Other Inorganic HAPs			
Hydrogen Chloride**	-	1.74E-03	7.61E-03
Chlorine**	-	1.78E-04	7.79E-04
		1.91E-03	8.39E-03

^(a) All calculations are based on Table 5-6 *Emissions Factors for CRU Catalyst Regeneration Vent* of Emissions Estimation Protocol for Petroleum Refineries, Version 3 (RTI, 2015), unless noted otherwise.

*Total hydrocarbons may be used as a surrogate for VOC. Total hydrocarbons are presented on an as propane basis.

**Emissions from constant production of regenerator burn gas with max. 1 ppmv of HCl + Cl₂ (vendor information)



	<h2>EMISSIONS INVENTORY</h2>	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-19 OF A-34	

Table A4-2 – Controlled Emissions from Sulfur Recovery Unit (SRU) + Thermal Oxidizer (a)

SRU UNIT: LO-CAT * (licensed by MERICHEM)		LTPD		10.2	11.2				
Capacity (MMSCFD)	9.4	10.3	2240 lb=1 long ton	11.44	12.56				
Operating hours/year	8,760		lb/hsulfur	952.0	1045.3				
Number of Vents:	2								
to be directed to a Thermal Oxidizer							SCFD	SCFM	SCFM
Molar Flow combined	597.6	lbmol/h				OV	5.365	3725.6944	4,091
STD Vapor Volumetric Flow Combined	5.442	MMSCFD	3779.2	SFCM		FDV	0.077	53.472222	58.7
Component	Combined Mole%	Molar Flow (lbmol/h)	4,49.7	SFCM					
H2	0.1722	1.0292							
C1	0.4742	2.8335	OV VOC (lb/h)	FDV VOC (lb/h)					
Ethylene	0.3566	2.1310	248.3	3.6					
C2	0.4245	2.5370	272.7	3.9					
C3	0.1750	1.0456							
iC4	0.0295	0.1765							
nC4	0.0843	0.5040							
H2S	1.17E-06	0.0007	1.13 ppmv						
CO2	0.0000	0.0000							
H2O	14.3990	86.0485							
O2	15.9311	95.2045							
N2	07.1530	401.3183							
Ar	0.7985	4.7717							
	100.0000	597.6007							
Specifications Thermal Oxidizer									
Duty (MMBTU/h)	1.583								
VOC Destruction (%)	99.9		V1 (ft3/h)	389370.46					
Exit Temperatur (°F)	414.5	485.65	T1 (°F)	414.5					
Flue gas (lb/h)	16,081	17,658	T2 (°F)	68					
Density (lb/ft3)	0.0413								
Volume flow (ft3/h)	389,370.46	427,544.0	3,745.3	MMACF					
SCFM (68°F, 14 psi)	3,917.22	4,301.3	0978						
					For 10.2 LTPD	For 11.2 LTPD			
Flue Gas Component	Molar Flow (lbmol/h)	MW	lb/hr	STPY	Conc. (lb/ft3)	Conc. (mg/m3)	Conc. (ppmv)	lb/hr	STPY
C1	0.001	16.04	0.02	0.07	4.24E-08	6.80E-01	1.69E+00	0.018	0.08
Ethylene	0.003	28.05	0.08	0.35	2.04E-07	3.27E+00	4.65E+00	0.087	0.38
C2	0.002	30.07	0.06	0.28	1.65E-07	2.64E+00	3.50E+00	0.070	0.31
C3	0.003	44.1	0.11	0.49	2.87E-07	4.61E+00	4.16E+00	0.123	0.54
iC4	0.001	58.12	0.06	0.27	1.56E-07	2.50E+00	1.72E+00	0.067	0.29
nC4	0.000	58.12	0.01	0.04	2.63E-08	4.22E-01	2.90E-01	0.011	0.05
Sum VOC	0.010	35.17	0.34	1.50	8.81E-07	1.41E+01	16.0	0.377	1.65
SO2	0.0007	64.1	0.04	0.20	1.16E-07	1.85E+00	1.15	0.049	0.22
					FOR 10.2 LTPD	FOR 11.2 LTPD			
	Emission Factor *** (lb/MMBtu, LHV basis)	Emission (lb/h)	Emission (US tpy)	Conc. (lb/ft3)	Conc. (mg/m3)	Conc. (ppmv)		Emission (lb/h)	Emission (US tpy)
Carbon monoxide	0.31	4.91E-01	2.15E+00	1.26032E-06	2.02E+01	28.7		5.39E-01	2.36E+00
Nitrogen oxides	0.068	1.08E-01	4.71E-01	2.76457E-07	4.43E+00	3.84		1.18E-01	5.18E-01

(a) Calculations are based on available engineering data from licensor.





	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-20 OF A-34	

Table A4-3 – Emissions from Blowdown System (with vapor recovery and flaring) ^(a)

Criteria Pollutant	lb/Mbbl Refinery Capacity	Blowdown	
		Emission (lb/h)	Emission (STPY)
Carbon monoxide (CAS No. 630-08-0)	4.3	9.85	0.83
Nitrogen oxides	19	43.54	3.66
SOX	27	61.88	5.20
VOC	0.8	1.83	0.15
SOOT (PM _{2.5} -FIL) from Lightly smoking flares (b)	0.027	0.06	0.005

^(a) Calculations are based on Table 5-12. *Default Emissions Factors for Blowdown Systems* of Emissions Estimation Protocol for Petroleum Refineries, Version 3 (RTI, 2015).

^(b) "Emissions Estimation Protocol for Petroleum Refineries, Table 6-3 "Emission Factors for Soot from Flares" Calculated using the LHV energy consumption-based emission factor.

 Meridian Energy Group Inc.	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-21 OF A-34	

SECTION 5: Flares



	EMISSIONS INVENTORY	
VEPICA CODE: P-5715043-01-001-18042-1001		
COMPANY CODE: TBD		
ISSUE: 1 DATE: 03/23/17		
SHEET: A-22 OF A-34		

Table A5-1 – Flare Natural Gas (Fuel Gas)-Based Pilot Emissions



Tag	Flare	# Pilots	NG Flow/Pilot	NG SCF/h	EF (lb/MMBTU)*	Emissions (lb/h)									
						CO	Pb	PM total	PM COND	PM FILT	NOX	SO2	VOC		
207-FL-1701	Enclosed HC Operating Flare	12	100	1200	1.224	0.0280000	0.0000005	0.0040000	0.0030000	0.0010000	0.0300000	0.0005882	0.0053922		
207-FL-1702	Acid Flare	2	100	200	0.204	3.43E-02	6.00E-07	4.90E-03	3.67E-03	1.22E-03	3.67E-02	7.20E-04	6.60E-03		
207-FL-1703	HC Emergency Flare 1	3	100	300	0.306	5.71E-03	1.00E-07	8.16E-04	6.12E-04	2.04E-04	6.12E-03	1.20E-04	1.10E-03		
207-FL-1704	HC Emergency Flare 2	3	100	300	0.306	8.57E-03	1.50E-07	1.22E-03	9.18E-04	3.06E-04	9.18E-03	1.80E-04	1.65E-03		
	Total (lb/h)					5.71E-02	1.00E-06	8.16E-03	6.12E-03	2.04E-03	6.12E-02	1.20E-03	1.10E-02		
	Total (STPY)					0.25	4.38E-06	0.04	0.03	0.01	0.27	0.005	0.05		

*: Calculated based on the TABLE 1.4-2, AP 42, Fifth Edition, Volume 1, Chapter 1: External Combustion Sources.

Table A5-2 – Total Flare HAP Emissions (e)

Compound	Emission Factor (tons/y/ibblct)	Emission US TPY	Emission (lb/h)
Benzene	9.00E-06	9.49E-06	1.13E-04
Toluene	7.00E-06	7.38E-06	8.79E-05
Xylene	6.00E-06	6.33E-06	7.53E-05
Methyl tertiary-butyl ether	3.00E-06	3.16E-06	3.77E-05
Hexane	1.00E-05	1.05E-05	1.26E-04
Formaldehyde	1.00E-06	1.05E-06	1.26E-05
Ethylbenzene	2.00E-07	2.11E-07	2.51E-06
1,3-Butadiene	7.00E-06	7.38E-06	8.79E-05
Total VOC HAPs TPY		4.56E-05	5.42E-04

(e) Calculations are based on Table 6-4, Flare General Emission Factors of Emissions Estimation Protocol for Petroleum Refineries, Version 3 (RTI, 2015)

 Meridian Energy Group Inc.	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-23 OF A-34	

SECTION 6: Wastewater Treatment System



	EMISSIONS INVENTORY		VEPICA CODE: P-5715043-01-001-18042-1001		
			COMPANY CODE: TBD		
	ISSUE: 1	DATE: 03/23/17			
	SHEET: A-24	OF A-34			

Table A6-1 – Waste Water Flow and Benzene Mass calculation for Petroleum Refinery Wastewater (a)

Process Unit	Average Throughput of the Unit (bbl/d)	Average Waste Water Flow Factor (gal/bbl) (a)	Waste Water Flow (gal/d)	Average Benzene Concentration (ppmw) (a)	Benzene Mass Flow (lb/d) Uncontrolled	Benzene Mass Flow (lb/d) Controlled***
Desalter Charge*	55,000	0.05	167,342	21	29,413	1,471
Hydrocracking	18,380	2.6	-	14	-	-
Catalytic reforming	16,128	1.5	-	106	-	-
Hydrotreating/hydrorefining	37,730	2.6	-	6.3	-	-
Product blending	21,500	2.9	-	24	-	-
Sulfur plant**	12,56	9.7	121.8	0.8	0.001	0.000
Vacuum Distillation	16,800	3	-	12	-	-
Tank drawdown	107,300	0.02	2,146	188	3,355	0.168
Total					32.78	1.639

(a) Calculations are based on Table 7-8. Model Process Unit Characteristics for Petroleum Refinery Wastewater of Emissions Estimation Protocol for Petroleum Refineries, Version 3 (RTI, 2015)

* Estimated as 5% of the unit throughput (desalter purge)

** This flow factor is given in gal/ton of sulfur

*** Assumes VSEP pretreatment or similar pretreatment of inflow into API (or in lieu of API) 95% Assumed Efficiency



	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-1001 <hr/> COMPANY CODE: TBD <hr/> ISSUE: 1 DATE: 03/23/17 <hr/> SHEET: A-25 OF A-34	
---	----------------------------	--	---



Table A6-2 – Controlled Waste Water Emissions Calculations for Petroleum Refinery Wastewater ^(a)

	Benzene Mass Ratio (b)	Mass Flow (lb/d)	Mass Fraction Table 7-10 BWON (C)	Emissions (STPY)	Emissions Controlled
Total VOC	81	132.75	0.6	14.54	14.54
2,2,4- Trimethylpentane	1.97	3.23	0.55	0.32	1.46E-01
Benzene	1	1.64	0.25	0.07	3.36E-02
Biphenyl	0.034	0.06	0.031	3.15E-04	1.42E-04
Cresols	0.25	0.41	0	0.00E+00	0.00E+00
Cumene	0.37	0.61	0.24	0.03	1.20E-02
Ethylbenzene	0.88	1.44	0.22	0.06	2.61E-02
Hexane	3.5	5.74	0.55	0.58	2.59E-01
Methyl tertiary-butyl ether	0.58	0.95	0.091	0.02	7.10E-03
Naphthalene	0.29	0.48	0.098	0.01	3.83E-03
Phenol	0.18	0.30	0	0.00	0.00E+00
Styrene	0.58	0.95	0.64	0.11	5.00E-02
Toluene	3.3	5.41	0.19	0.19	8.44E-02
Xylene	3.6	5.90	0.21	0.23	1.02E-01
1,3-Butadiene	0.0006	0.00	0.75	0.00	6.06E-05
			Total HAP (Uncontrolled)	1.61	7.24E-01
			Total HAP (Controlled)	0.724	

^(a)Calculations are based on Table 7-8. Model Process Unit Characteristics for Petroleum Refinery Wastewater of Emissions Estimation Protocol for Petroleum Refineries, Version 3 (RTI, 2015)

^(b) Calculations are based on Table 7-3. Refinery Wastewater Contaminant Concentrations as a Ratio to Benzene of Emissions Estimation Protocol for Petroleum Refineries, Version 3 (RTI, 2015)

^(c) Calculations are based on Table 7-10. Default Mass Emission Factors for Refinery Wastewater Collection and Treatment Systems of Emissions Estimation Protocol for Petroleum Refineries, Version 3 (RTI, 2015). **Emission Factors for: BWON-Compliant Wastewater Collection and Treatment System

 Meridian Energy Group Inc.	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-26 OF A-34	

SECTION 7: Cooling Towers





	EMISSIONS INVENTORY		VEPICA CODE: P-5715043-01-001-18042-1001		
			COMPANY CODE: TBD		
	ISSUE: 1	DATE: 03/23/17			
	SHEET: A-27	OF A-34			

Table A7-1 – Controlled Emissions from the Cooling Tower Systems (a)

Emission	Emission Factor* (lb/Mgal)	TDS Concentration (ppm)	For 4 cells			
			Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)
VOC	0.006	-	2.25E-02	9.86E-02	9.00E-02	3.94E-01
PM10	0.0315	14,279	1.18E-01	5.18E-01	4.73E-01	2.07E+00

(a) Calculations are based on Table 8-5. *Methodology Rank 5 Default Emission Factors of Emissions Estimation Protocol for Petroleum Refineries, Version 3 (RTI, 2015).*

* Emission Factors showed correspond only to induced draft, counter flow cooling towers, for a drift factor Water Drift Factor of 208.5 lb/Mgal (0.001% of drift factor)

	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-28 OF A-34	

SECTION 8: Product Loading





	EMISSIONS INVENTORY		VEPICA CODE: P-5715043-01-001-18042-1001		
			COMPANY CODE: TBD		
	ISSUE: 1	DATE: 03/23/17			
	SHEET: A-29	OF A-34			



Table A8-1 – Controlled Emissions from the Truck Product Loading/Unloading Operations ^(a)

Description	EF (lb/Mgal) ¹	Uncontrolled Emissions (lb/h)	Uncontrolled Emissions (TPY)	Control Device	% Efficiency	Actual Emissions (TPY)	Actual Emissions (lb/h)
Gasoline	5	80	233	NG Assisted Flare or VRU	98.00%	4.65	1.06
Diesel N°2	0.014	0.2	0.7	None	0%	0.68	0.2
Fuel Oil No. 6	0.0001	0.001	0.004	None	0%	0.004	0.0010
Totals		80	233			5.34	1.22

^(a) Calculations are based on Table 5.2-5 AP-42, Fifth Edition, Volume I, Chapter 5: Transportation And Marketing Of Petroleum Liquids.



 Meridian Energy Group Inc.	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-30 OF A-34	

SECTION 9: Fugitive Dust



	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-31 OF A-34	

A.9.1. PAVED ROADS DUST



BASIS						
It is assumed that crude oil inlet is via pipeline, not trucking or rail. Also, it is assumed that the same volume of products obtained in Phase 1 are loaded and transported via trucking, and the difference produced in Phase 2 will be loaded and transported via pipeline.						
Refinery production	bbl/d	gal/d	Notes		Truck Capacity (gallon)	trips/day
Gasoline	9,100	382,200			10,000	38
Diesel / Jet	9,550	401,100			6,000	67
LS Fuel Oil	8,400	352,800			6,000	59
LPG / Butane						6
					Total	170
Truck Round Trip Distance/t	0.0379 mile					
	5280 feet					
	mile					
	200 feet traveled					
TRUCK LOADING VMT						
	169.87 Trip	0.04 mile	365 day	=	2,349	VMT
	day	Round Trip	year			year
				=	6.43	VMT
						d
Maximum Gross Weight for USDOT tractor trailer						
	80000 lb					
	40 ton					
Average Speed						
	5	mile				
		hr				
Wet days (Mean)						
	90	day				
P (Value)	2160	hour				
N (Value)	8760	hour				
TRUCK VMT IN LIMITED ACCESS ROAD						
Pollutant	k (lb/VMT)	Silt L (grain/sq ft) [2]	W (ST)	N (hour)	P (hour)	Emission Factor (lb/VMT)
PM 2.5	0.00054	2.15E-02	40	8760	2160	0.001
PM 10	0.0022	2.15E-02	40	8760	2160	0.003

	<h2>EMISSIONS INVENTORY</h2>	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-32 OF A-34	



PM 2.5 Emissions				0.001 lb	6.43 VMT	d	=	1.78E-04	lb PM 2.5
				VMT	d	24 h			h
				0.001 lb	6.43 VMT	365 day	=	7.78E-04	Ton PM 2.5
				VMT	d	year			Year
	0.001 lb	6.43 VMT	d	h	kg	1000 g	=	2.24E-05	g PM 2.5
	VMT	d	24 h	3600 s	2.206 lb	s			s
PM 10 Emissions									
				0.003 lb	6.43 VMT	d	=	7.24E-04	lb PM TOT
				VMT	d	24 h			h
				0 lb	6.43 VMT	365 day	=	3.17E-03	Ton PM TOT
				VMT	d	year			Year
	0.003 lb	6.43 VMT	d	h	kg	1000 g	=	5.37E-04	g PM TOT
	VMT	d	24 h	3600 s	2.206 lb	s			s
Assumption		Silt loading at the lower range of values since the vehicles will not exceed 5 MPH, and will not be involved in heavy braking							
EMPLOYEE PARKING VMT									
Employees/shift	Shifts	Trips							
100	2	200							
Employee Round Trip Distance/trip									
	0.1894	mile							
	5280	feet							
		mile							
	1000	feet traveled							

	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-33 OF A-34	

Vehicle Miles Traveled						
	200 Trip	0.19 mile	365 day	=	13,826	VMT
	day	Round Trip	year			year
				=	37.88	VMT
						d
Average Gross Weight Vehicle [1]						
	3600 lb					
	1.8 ton					
Average Speed						
	5	mile				
		hr				
Wet days (Mean)						
	90	day				
	P (Value)	2160	hour			
	N (Value)	8760	hour			
EMPLOYEE VMT IN LIMITED ACCESS PARKING LOT						
Pollutant	k (lb/VMT)	Silt L (grain/sq ft) [2]	W (ST)	N (hour)	P (hour)	Emission Factor (lb/VMT)
PM 2.5	0.00054	2.15E-02	1.8	8760	2160	2.80E-05
PM 10	0.0022	2.15E-02	1.8	8760	2160	1.14E-04
PM 2.5 Emissions						
				0.000028 lb	37.88 VMT	d
				VMT	d	24 h
						=
						4.42E-05
						lb PM 2.5
						h
				0.00003 lb	37.88 VMT	365 day
				VMT	d	year
						ton
						2000 lb
						=
						1.94E-04
						Ton PM 2.5
						Year
	0.00003 lb	37.88 VMT	d	h	kg	1000 g
	VMT	d	24 h	3600 s	2.206 lb	s
						=
						5.57E-06
						g PM 2.5
						s

	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-34 OF A-34	

PM 10 Emissions												
				0.0001142 lb	37.88 VMT	d	=	1.80E-04	lb PM TOT			
				VMT	d	24 h			h			
				0.00011 lb	37.88 VMT	365 day	ton	=	7.89E-04	Ton PM TOT		
				VMT	d	year	2000 lb		Year			
				0.00011 lb	37.88 VMT	d	h	kg	1000 g	=	2.27E-05	g PM TOT
				VMT	d	24 h	3600 s	2.206 lb	s			s
Assumption	Silt loading at the lower range of values since the vehicles will not exceed 5 MPH, and will not be involved in heavy braking											
	[1] Passenger Car and Light Truck Fleets Characteristics, Corporate Average Fuel Economy (CAFE) standards http://www.nhtsa.gov/cars/rules/CAFE/NewPassengerCarFleet.htm											
	[2] AP 42 Emission Factors, Fifth Edition, Volume I, Section 13.2.1. Paved Roads, Silt loading factor for limited access roads, page 13.2.1-9											

 Meridian Energy Group Inc.	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: OF	

APPENDIX B - TANKS 4.09d RUNS

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

Identification
 User Identification: 203-T-0001
 City: Belfield
 State: North Dakota
 Company: Meridian
 Type of Tank: Internal Floating Roof Tank
 Description: Crude Oil

Tank Dimensions
 Diameter (ft): 115.00
 Volume (gallons): 4,661,968.00
 Turnovers: 60.25
 Self Supp. Roof? (y/n): Y
 No. of Columns: 0.00
 Eff. Col. Diam. (ft): 0.00

Paint Characteristics
 Internal Shell Condition: Light Rust
 Shell Color/Shade: Gray/Light
 Shell Condition: Good
 Roof Color/Shade: Gray/Light
 Roof Condition: Good

Rim-Seal System
 Primary Seal: Mechanical Shoe
 Secondary Seal: Rim-mounted

Deck Characteristics
 Deck Fitting Category: Detail
 Deck Type: Welded

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1
Automatic Gauge Float Well/Bolted Cover, Gasketed	1
Roof Leg or Hanger Well/Fixed	39
Sample Pipe or Well (24-in. Diam.)/Slotted Pipe-Sliding Cover, Gask.	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1

Meteorological Data used in Emissions Calculations: Bismarck, North Dakota (Avg Atmospheric Pressure = 13.86 psia)

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

203-T-0001 - Internal Floating Roof Tank Belfield, North Dakota

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Crude oil (RVP 5)	Jan	30.90	24.94	36.87	43.84	1.5709	N/A	N/A	50.0000		207.00	Optior 4: RVP=5	
Crude oil (RVP 5)	Feb	34.98	28.04	41.91	43.84	1.7173	N/A	N/A	50.0000		207.00	Optior 4: RVP=5	
Crude oil (RVP 5)	Mar	42.09	33.80	50.39	43.84	1.9992	N/A	N/A	50.0000		207.00	Optior 4: RVP=5	
Crude oil (RVP 5)	Apr	50.10	39.90	60.29	43.84	2.3601	N/A	N/A	50.0000		207.00	Optior 4: RVP=5	
Crude oil (RVP 5)	May	56.81	45.06	68.55	43.84	2.7017	N/A	N/A	50.0000		207.00	Optior 4: RVP=5	
Crude oil (RVP 5)	Jun	61.81	49.29	74.32	43.84	2.9814	N/A	N/A	50.0000		207.00	Optior 4: RVP=5	
Crude oil (RVP 5)	Jul	64.71	51.53	77.88	43.84	3.1539	N/A	N/A	50.0000		207.00	Optior 4: RVP=5	
Crude oil (RVP 5)	Aug	62.42	50.31	74.54	43.84	3.0174	N/A	N/A	50.0000		207.00	Optior 4: RVP=5	
Crude oil (RVP 5)	Sep	55.34	45.27	65.40	43.84	2.6237	N/A	N/A	50.0000		207.00	Optior 4: RVP=5	
Crude oil (RVP 5)	Oct	48.45	40.33	56.58	43.84	2.2821	N/A	N/A	50.0000		207.00	Optior 4: RVP=5	
Crude oil (RVP 5)	Nov	39.43	33.50	45.36	43.84	1.8896	N/A	N/A	50.0000		207.00	Optior 4: RVP=5	
Crude oil (RVP 5)	Dec	32.50	27.06	37.95	43.84	1.6272	N/A	N/A	50.0000		207.00	Optior 4: RVP=5	

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

Emissions Report for: January, February, March, April, May, June, July, August, September, October, November, December

**203-T-0001 - Internal Floating Roof Tank
Belfield, North Dakota**

Components	Rim Seal Loss	Withdrawl Loss	Losses(lbs)		Total Emissions
			Deck Fitting Loss	Deck Seam Loss	
Crude oil (RVP 5)	63.73	2,336.15	49.51	0.00	2,449.39

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

Identification
 User Identification: 203-T-005
 City: Belfield
 State: North Dakota
 Company: Meridian
 Type of Tank: Internal Floating Roof Tank
 Description: Heavy Naphtha

Tank Dimensions
 Diameter (ft): 88.00
 Volume (gallons): 2,729,832.00
 Turnovers: 10.87
 Self Supp. Roof? (y/n): Y
 No. of Columns: 0.00
 Eff. Col. Diam. (ft): 0.00

Paint Characteristics
 Internal Shell Condition: Light Rust
 Shell Color/Shade: Gray/Light
 Shell Condition: Good
 Roof Color/Shade: Gray/Light
 Roof Condition: Good

Rim-Seal System
 Primary Seal: Liquid-mounted
 Secondary Seal: Rim-mounted

Deck Characteristics
 Deck Fitting Category: Detail
 Deck Type: Welded

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1
Automatic Gauge Float Well/Bolted Cover, Gasketed	1
Roof Leg or Hanger Well/Fixed	18
Sample Pipe or Well (24-in. Diam.)/Slotted Pipe-Sliding Cover, Gask.	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1

Meteorological Data used in Emissions Calculations: Bismarck, North Dakota (Avg Atmospheric Pressure = 13.86 psia)

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

203-T-005 - Internal Floating Roof Tank Belfield, North Dakota

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Jet naphtha (JP-4)	Jan	30.90	24.94	36.87	43.84	0.8000	N/A	N/A	80.0000		120.00	Option 1: VP40 = .8	
Jet naphtha (JP-4)	Feb	34.98	28.04	41.91	43.84	0.8000	N/A	N/A	80.0000		120.00	Option 1: VP40 = .8	
Jet naphtha (JP-4)	Mar	42.09	33.80	50.39	43.84	0.8418	N/A	N/A	80.0000		120.00	Option 1: VP40 = .8 VP50 = 1	
Jet naphtha (JP-4)	Apr	50.10	39.90	60.29	43.84	1.0029	N/A	N/A	80.0000		120.00	Option 1: VP50 = 1 VP60 = 1.3	
Jet naphtha (JP-4)	May	56.81	45.06	68.55	43.84	1.2042	N/A	N/A	80.0000		120.00	Option 1: VP50 = 1 VP60 = 1.3	
Jet naphtha (JP-4)	Jun	61.81	49.29	74.32	43.84	1.3542	N/A	N/A	80.0000		120.00	Option 1: VP60 = 1.3 VP70 = 1.6	
Jet naphtha (JP-4)	Jul	64.71	51.53	77.88	43.84	1.4412	N/A	N/A	80.0000		120.00	Option 1: VP60 = 1.3 VP70 = 1.6	
Jet naphtha (JP-4)	Aug	62.42	50.31	74.54	43.84	1.3727	N/A	N/A	80.0000		120.00	Option 1: VP60 = 1.3 VP70 = 1.6	
Jet naphtha (JP-4)	Sep	55.34	45.27	65.40	43.84	1.1601	N/A	N/A	80.0000		120.00	Option 1: VP50 = 1 VP60 = 1.3	
Jet naphtha (JP-4)	Oct	48.45	40.33	56.58	43.84	0.9691	N/A	N/A	80.0000		120.00	Option 1: VP40 = .8 VP50 = 1	
Jet naphtha (JP-4)	Nov	39.43	33.50	45.36	43.84	0.8000	N/A	N/A	80.0000		120.00	Option 1: VP40 = .8	
Jet naphtha (JP-4)	Dec	32.50	27.06	37.95	43.84	0.8000	N/A	N/A	80.0000		120.00	Option 1: VP40 = .8	

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

203-T-005 - Internal Floating Roof Tank Belfield, North Dakota

Month:	January	February	March	April	May	June	July	August	September	October	November	December
Rim Seal Losses (lb):	2,6153	2,6153	2,7565	3,3039	3,9978	4,5222	4,8291	4,5872	3,8450	3,1885	2,6153	2,6153
Seal Factor A (lb-mole/ft-yr):	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000
Seal Factor B (lb-mole/ft-yr)(mph^n):	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000
Value of Vapor Pressure Function:	0.0149	0.0149	0.0157	0.0188	0.0227	0.0257	0.0274	0.0261	0.0218	0.0181	0.0149	0.0149
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.8000	0.8000	0.8418	1.0029	1.2042	1.3542	1.4412	1.3727	1.1801	0.9691	0.8000	0.8000
Tank Diameter (ft):	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000
Vapor Molecular Weight (lb/lb-mole):	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Product Factor:	6.0558	6.0558	6.0558	6.0558	6.0558	6.0558	6.0558	6.0558	6.0558	6.0558	6.0558	6.0558
Withdrawal Losses (lb):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Number of Columns:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Effective Column Diameter (ft):	2,472,422.4160	2,472,422.4160	2,472,422.4160	2,472,422.4160	2,472,422.4160	2,472,422.4160	2,472,422.4160	2,472,422.4160	2,472,422.4160	2,472,422.4160	2,472,422.4160	2,472,422.4160
Net Throughput (gal/mo.):	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Shell Clingage Factor (bbil/1000 sqft):	6.4000	6.4000	6.4000	6.4000	6.4000	6.4000	6.4000	6.4000	6.4000	6.4000	6.4000	6.4000
Average Organic Liquid Density (lb/gal):	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000
Tank Diameter (ft):	5.3099	5.3099	5.5965	6.7079	8.1167	9.1815	9.8046	9.3134	7.8065	6.4736	5.3099	5.3099
Deck Fitting Losses (lb):	0.0149	0.0149	0.0157	0.0188	0.0227	0.0257	0.0274	0.0261	0.0218	0.0181	0.0149	0.0149
Value of Vapor Pressure Function:	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000
Vapor Molecular Weight (lb/lb-mole):	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Product Factor:	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000
Tot. Roof Fitting Loss Fact. (lb-mole/yr):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Deck Seam Losses (lb):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Deck Seam Length (ft):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Deck Seam Loss per Unit Length Factor (lb-mole/ft-yr):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tank Diameter (ft):	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000
Vapor Molecular Weight (lb/lb-mole):	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Product Factor:	13.9811	13.9811	14.4088	16.0676	18.1703	19.7595	20.6896	19.9565	17.7773	15.7180	13.9811	13.9811
Total Losses (lb):	13.9811	13.9811	14.4088	16.0676	18.1703	19.7595	20.6896	19.9565	17.7773	15.7180	13.9811	13.9811

Roof Fitting/Status	Quantity	KFa(lb-mole/yr)	KFb(lb-mole/yr mph^n)	Losses (lb)
Access Hatch (24-in. Diam./Bolted Cover, Gasketed)	1	1.60	0.00	2.5188
Automatic Gauge Float Well/Bolted Cover, Gasketed	18	0.00	0.00	4.4078
Roof Leg or Hanger Well/Fixed	1	0.00	0.00	0.0000
Sample Pipe or Well (24-in. Diam./Slotted Pipe-Sliding Cover, Gask.	1	43.00	0.00	67.6919
Vacuum Breaker (10-in. Diam./Weighted Mech. Actiation, Gask.	1	6.20	1.20	9.7602

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

Emissions Report for: January, February, March, April, May, June, July, August, September, October, November, December

**203-T-005 - Internal Floating Roof Tank
Belfield, North Dakota**

Components	Losses(lbs)				Total Emissions
	Rim Seal Loss	Withdrawl Loss	Deck Fitting Loss	Deck Seam Loss	
Jet naphtha (JP-4)	41.49	72.67	84.24	0.00	198.40

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

Identification
 User Identification: 203-T-006
 City: Belfield
 State: North Dakota
 Company: Meridian
 Type of Tank: Internal Floating Roof Tank
 Description: Reformate

Tank Dimensions
 Diameter (ft): 63.00
 Volume (gallons): 1,399,104.00
 Turnovers: 56.70
 Self Supp. Roof? (y/n): Y
 No. of Columns: 0.00
 Eff. Col. Diam. (ft): 0.00

Paint Characteristics
 Internal Shell Condition: Light Rust
 Shell Color/Shade: Gray/Light
 Shell Condition: Good
 Roof Color/Shade: Gray/Light
 Roof Condition: Good

Rim-Seal System
 Primary Seal: Liquid-mounted
 Secondary Seal: Rim-mounted

Deck Characteristics
 Deck Fitting Category: Detail
 Deck Type: Welded

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1
Automatic Gauge Float Well/Bolted Cover, Gasketed	1
Roof Leg or Hanger Well/Fixed	18
Sample Pipe or Well (24-in. Diam.)/Slotted Pipe-Sliding Cover, Gask.	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1

Meteorological Data used in Emissions Calculations: Bismarck, North Dakota (Avg Atmospheric Pressure = 13.86 psia)

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

203-T-006 - Internal Floating Roof Tank Belfield, North Dakota

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)		Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.		Max.	Avg.	Min.					
Gasoline (RVP 7.8)	Jan	30.90	24.94	36.87	2.1175	N/A	N/A	68.0000			92.00	Optilor 4: RVP=7.8, ASTM Slope=3
Gasoline (RVP 7.8)	Feb	34.98	28.04	41.91	2.3194	N/A	N/A	68.0000			92.00	Optilor 4: RVP=7.8, ASTM Slope=3
Gasoline (RVP 7.8)	Mar	42.09	33.80	50.39	2.7093	N/A	N/A	68.0000			92.00	Optilor 4: RVP=7.8, ASTM Slope=3
Gasoline (RVP 7.8)	Apr	50.10	39.90	60.29	3.2102	N/A	N/A	68.0000			92.00	Optilor 4: RVP=7.8, ASTM Slope=3
Gasoline (RVP 7.8)	May	56.81	45.06	68.55	3.6857	N/A	N/A	68.0000			92.00	Optilor 4: RVP=7.8, ASTM Slope=3
Gasoline (RVP 7.8)	Jun	61.81	49.29	74.32	4.0761	N/A	N/A	68.0000			92.00	Optilor 4: RVP=7.8, ASTM Slope=3
Gasoline (RVP 7.8)	Jul	64.71	51.53	77.88	4.3173	N/A	N/A	68.0000			92.00	Optilor 4: RVP=7.8, ASTM Slope=3
Gasoline (RVP 7.8)	Aug	62.42	50.31	74.54	4.1264	N/A	N/A	68.0000			92.00	Optilor 4: RVP=7.8, ASTM Slope=3
Gasoline (RVP 7.8)	Sep	55.34	45.27	65.40	3.5770	N/A	N/A	68.0000			92.00	Optilor 4: RVP=7.8, ASTM Slope=3
Gasoline (RVP 7.8)	Oct	48.45	40.33	56.58	3.1018	N/A	N/A	68.0000			92.00	Optilor 4: RVP=7.8, ASTM Slope=3
Gasoline (RVP 7.8)	Nov	39.43	33.50	45.36	2.5576	N/A	N/A	68.0000			92.00	Optilor 4: RVP=7.8, ASTM Slope=3
Gasoline (RVP 7.8)	Dec	32.50	27.06	37.95	2.1952	N/A	N/A	68.0000			92.00	Optilor 4: RVP=7.8, ASTM Slope=3

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

203-T-006 - Internal Floating Roof Tank Belfield, North Dakota

Month:	January	February	March	April	May	June	July	August	September	October	November	December
Rim Seal Losses (lb):	4.4360	4.8994	5.8171	7.0428	8.2595	9.2997	9.9625	9.4366	7.9767	6.7729	5.4563	4.6132
Seal Factor A (lb-mole/ft-yr):	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000
Seal Factor B (lb-mole/ft-yr)(mph) ^{0.75}):	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000
Value of Vapor Pressure Function:	0.0414	0.0457	0.0543	0.0658	0.0771	0.0868	0.0930	0.0881	0.0745	0.0632	0.0509	0.0431
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.1175	2.3194	2.7093	3.2102	3.6857	4.0761	4.3173	4.1264	3.5770	3.1018	2.5576	2.1952
Tank Diameter (ft):	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000
Vapor Molecular Weight (lb/lb-mole):	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Product Factor:												
Withdrawal Losses (lb):	19.7904	19.7904	19.7904	19.7904	19.7904	19.7904	19.7904	19.7904	19.7904	19.7904	19.7904	19.7904
Number of Columns:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Effective Column Diameter (ft):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Net Throughput (gal/mo.):	6,610,807.0000	6,610,807.0000	6,610,807.0000	6,610,807.0000	6,610,807.0000	6,610,807.0000	6,610,807.0000	6,610,807.0000	6,610,807.0000	6,610,807.0000	6,610,807.0000	6,610,807.0000
Shell Clingage Factor (bbl/1000 sqft):	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Average Organic Liquid Density (lb/gal):	5.6000	5.6000	5.6000	5.6000	5.6000	5.6000	5.6000	5.6000	5.6000	5.6000	5.6000	5.6000
Tank Diameter (ft):	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000
Deck Fitting Losses (lb):	12.5803	13.8945	16.4971	19.9733	23.4237	26.3738	28.2536	26.7621	22.8217	19.2078	15.4740	13.0829
Value of Vapor Pressure Function:	0.0414	0.0457	0.0543	0.0658	0.0771	0.0868	0.0930	0.0881	0.0745	0.0632	0.0509	0.0431
Vapor Molecular Weight (lb/lb-mole):	68.0000	68.0000	68.0000	68.0000	68.0000	68.0000	68.0000	68.0000	68.0000	68.0000	68.0000	68.0000
Product Factor:	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Tot. Roof Fitting Loss Fact. (lb-mole/yr):	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000
Deck Seam Losses (lb):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Deck Seam Length (ft):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Deck Seam Loss per Unit Length Factor (lb-mole/ft-yr):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tank Diameter (ft):	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000
Vapor Molecular Weight (lb/lb-mole):	68.0000	68.0000	68.0000	68.0000	68.0000	68.0000	68.0000	68.0000	68.0000	68.0000	68.0000	68.0000
Product Factor:	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total Losses (lb):	36.8067	38.5843	42.1047	46.8066	51.4736	55.4640	58.0066	55.9892	50.3888	45.7712	40.7208	37.4865

Roof Fitting/Status	Quantity	KFa (lb-mole/yr)	KFb (lb-mole/yr mph ^{0.75})	Losses (lb)
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketec	1	1.60	0.00	7.1214
Automatic Gauge Float Well/Bolted Cover, Gasketec	1	2.80	0.00	12.4624
Roof Leg or Hanger Well/Fixed	18	0.00	0.00	0.0000
Sample Pipe or Well (24-in. Diam.)/Slotted Pipe-Sliding Cover, Gask.	1	43.00	0.00	191.3864
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actiation, Gask.	1	6.20	1.20	27.5952

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

Emissions Report for: January, February, March, April, May, June, July, August, September, October, November, December

**203-T-006 - Internal Floating Roof Tank
Belfield, North Dakota**

Components	Losses (lbs)				Total Emissions
	Rim Seal Loss	Withdrawal Loss	Deck Fitting Loss	Deck Seam Loss	
Gasoline (RVP 7.8)	83.97	237.49	238.14	0.00	559.60

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

Identification
 User Identification: 203-T-008
 City: Belfield
 State: North Dakota
 Company: Meridian
 Type of Tank: Internal Floating Roof Tank
 Description: Gasoline

Tank Dimensions
 Diameter (ft): 88.00
 Volume (gallons): 2,729,832.00
 Turnovers: 48.30
 Self Supp. Roof? (y/n): Y
 No. of Columns: 0.00
 Eff. Col. Diam. (ft): 0.00

Paint Characteristics
 Internal Shell Condition: Light Rust
 Shell Color/Shade: Gray/Light
 Shell Condition: Good
 Roof Color/Shade: Gray/Light
 Roof Condition: Good

Rim-Seal System
 Primary Seal: Liquid-mounted
 Secondary Seal: Rim-mounted

Deck Characteristics
 Deck Fitting Category: Detail
 Deck Type: Welded

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1
Automatic Gauge Float Well/Bolted Cover, Gasketed	1
Roof Leg or Hanger Well/Fixed	18
Sample Pipe or Well (24-in. Diam.)/Slotted Pipe-Sliding Cover, Gask.	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1

Meteorological Data used in Emissions Calculations: Bismarck, North Dakota (Avg Atmospheric Pressure = 13.86 psia)

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

203-T-008 - Internal Floating Roof Tank Belfield, North Dakota

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Gasoline (RVP 15.0)	Jan	30.90	24.94	36.87	43.84	4.6376	N/A	N/A	60.0000		92.00	Optior 4: RVP=15, ASTM Slope=3	
Gasoline (RVP 15.0)	Feb	34.98	28.04	41.91	43.84	5.0388	N/A	N/A	60.0000		92.00	Optior 4: RVP=15, ASTM Slope=3	
Gasoline (RVP 15.0)	Mar	42.09	33.80	50.39	43.84	5.8049	N/A	N/A	60.0000		92.00	Optior 4: RVP=15, ASTM Slope=3	
Gasoline (RVP 15.0)	Apr	50.10	39.90	60.29	43.84	6.7748	N/A	N/A	60.0000		92.00	Optior 4: RVP=15, ASTM Slope=3	
Gasoline (RVP 13)	May	56.81	45.06	68.55	43.84	6.5424	N/A	N/A	62.0000		92.00	Optior 4: RVP=13, ASTM Slope=3	
Gasoline (RVP 13)	Jun	61.81	49.29	74.32	43.84	7.1848	N/A	N/A	62.0000		92.00	Optior 4: RVP=13, ASTM Slope=3	
Gasoline (RVP 13)	Jul	64.71	51.53	77.88	43.84	7.5796	N/A	N/A	62.0000		92.00	Optior 4: RVP=13, ASTM Slope=3	
Gasoline (RVP 13)	Aug	62.42	50.31	74.54	43.84	7.2672	N/A	N/A	62.0000		92.00	Optior 4: RVP=13, ASTM Slope=3	
Gasoline (RVP 13)	Sep	55.34	45.27	65.40	43.84	6.3627	N/A	N/A	62.0000		92.00	Optior 4: RVP=13, ASTM Slope=3	
Gasoline (RVP 15.0)	Oct	48.45	40.33	56.58	43.84	6.5661	N/A	N/A	60.0000		92.00	Optior 4: RVP=15, ASTM Slope=3	
Gasoline (RVP 15.0)	Nov	39.43	33.50	45.36	43.84	5.5080	N/A	N/A	60.0000		92.00	Optior 4: RVP=15, ASTM Slope=3	
Gasoline (RVP 15.0)	Dec	32.50	27.06	37.95	43.84	4.7922	N/A	N/A	60.0000		92.00	Optior 4: RVP=15, ASTM Slope=3	

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

203-T-008 - Internal Floating Roof Tank
Belfield, North Dakota

Month:	January	February	March	April	May	June	July	August	September	October	November	December
Rim Seal Losses (lb):	13.3948	14.8452	17.7966	21.9332	21.5928	24.6351	26.6399	25.0448	20.7868	21.0009	16.6229	13.9465
Seal Factor A (lb-mole/ft-yr):	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000
Seal Factor B (lb-mole/ft-yr):	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000
Value of Vapor Pressure Function:	0.1015	0.1125	0.1348	0.1662	0.1583	0.1806	0.1953	0.1636	0.1524	0.1591	0.1259	0.1057
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	4.6376	5.0388	5.8049	6.7748	6.5424	7.1848	7.5796	7.2672	6.3677	6.5661	5.5080	4.7922
Tank Diameter (ft):	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000
Vapor Molecular Weight (lb/lb-mole):	60.0000	60.0000	60.0000	60.0000	62.0000	62.0000	62.0000	62.0000	62.0000	60.0000	60.0000	60.0000
Product Factor:	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Withdrawal Losses (lb):	23.5461	23.5461	23.5461	23.5461	23.5461	23.5461	23.5461	23.5461	23.5461	23.5461	23.5461	23.5461
Number of Columns:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Effective Column Diameter (ft):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Net Throughput (gallon):	10,986,500.0000	10,986,500.0000	10,986,500.0000	10,986,500.0000	10,986,500.0000	10,986,500.0000	10,986,500.0000	10,986,500.0000	10,986,500.0000	10,986,500.0000	10,986,500.0000	10,986,500.0000
Shell Clingage Factor (bbl/1000 sqft):	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Average Organic Liquid Density (lb/gal):	5.6000	5.6000	5.6000	5.6000	5.6000	5.6000	5.6000	5.6000	5.6000	5.6000	5.6000	5.6000
Tank Diameter (ft):	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000
Deck Fitting Losses (lb):	27.1954	30.1402	36.1326	44.5310	43.8400	50.0168	54.0871	50.8485	42.2015	42.6382	33.7496	28.3157
Value of Vapor Pressure Function:	0.1015	0.1125	0.1348	0.1662	0.1583	0.1806	0.1953	0.1636	0.1524	0.1591	0.1259	0.1057
Vapor Molecular Weight (lb/lb-mole):	60.0000	60.0000	60.0000	60.0000	62.0000	62.0000	62.0000	62.0000	62.0000	60.0000	60.0000	60.0000
Product Factor:	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Tot. Roof Fitting Loss Fact. (lb-mole/yr):	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000
Deck Seam Losses (lb):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Deck Seam Length (ft):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Deck Seam Loss per Unit Length Factor (lb-mole/ft-yr):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tank Diameter (ft):	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000
Vapor Molecular Weight (lb/lb-mole):	60.0000	60.0000	60.0000	60.0000	62.0000	62.0000	62.0000	62.0000	62.0000	60.0000	60.0000	60.0000
Product Factor:	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total Losses (lb):	64.1362	68.5314	77.4753	90.0102	88.9788	98.1980	104.2731	99.4394	86.5344	87.1852	73.9186	65.8083

Roof Fitting/Status	Quantity	KFa (lb-mole/yr)	KFb (lb-mole/yr mph ^{1.5})	m	Losses (lb)
Access Hatch (24-in. Diam./Bolted Cover, Gasketec	1	1.60	0.00	0.00	14.4595
Automatic Gauge Float/Bolted Cover, Gasketec	1	2.80	0.00	0.00	25.3042
Roof Leg or Hanger Well/Fixed	18	0.00	0.00	0.00	0.0000
Sample Pipe or Well (24-in. Diam./Slotted Pipe-Sliding Cover, Gask.	1	43.00	0.00	0.00	388.6003
Vacuum Breaker (10-in. Diam./Weighted Mech. Actiation, Gask.	1	6.20	1.20	0.94	56.0307

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

Emissions Report for: January, February, March, April, May, June, July, August, September, October, November, December

**203-T-008 - Internal Floating Roof Tank
Belfield, North Dakota**

Components	Losses (lbs)				Total Emissions
	Rim Seal Loss	Withdrawal Loss	Deck Fitting Loss	Deck Seam Loss	
Gasoline (RVP 13)	118.70	117.73	240.99	0.00	477.42
Gasoline (RVP 15.0)	119.54	164.82	242.70	0.00	527.07

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

Identification
 User Identification: 203-T-011
 City: Belfield
 State: North Dakota
 Company: Meridian
 Type of Tank: Internal Floating Roof Tank
 Description: Jet Fuel

Tank Dimensions
 Diameter (ft): 63.00
 Volume (gallons): 1,399,104.00
 Turnovers: 23.19
 Self Supp. Roof? (y/n): Y
 No. of Columns: 0.00
 Eff. Col. Diam. (ft): 0.00

Paint Characteristics
 Internal Shell Condition: Light Rust
 Shell Color/Shade: Gray/Light
 Shell Condition: Good
 Roof Color/Shade: Gray/Light
 Roof Condition: Good

Rim-Seal System
 Primary Seal: Liquid-mounted
 Secondary Seal: Rim-mounted

Deck Characteristics
 Deck Fitting Category: Detail
 Deck Type: Welded

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1
Automatic Gauge Float Well/Bolted Cover, Gasketed	1
Roof Leg or Hanger Well/Fixed	18
Sample Pipe or Well (24-in. Diam.)/Slotted Pipe-Sliding Cover, Gask.	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1

Meteorological Data used in Emissions Calculations: Bismarck, North Dakota (Avg Atmospheric Pressure = 13.86 psia)

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

203-T-011 - Internal Floating Roof Tank Belfield, North Dakota

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Jet kerosene	Jan	30.90	24.94	36.87	43.84	0.0041	N/A	N/A	130.0000	N/A	162.00	Option 1: VP40 = .0041	
Jet kerosene	Feb	34.98	28.04	41.91	43.84	0.0041	N/A	N/A	130.0000	N/A	162.00	Option 1: VP40 = .0041	
Jet kerosene	Mar	42.09	33.80	50.39	43.84	0.0045	N/A	N/A	130.0000	N/A	162.00	Option 1: VP40 = .0041 VP50 = .006	
Jet kerosene	Apr	50.10	39.90	60.29	43.84	0.0060	N/A	N/A	130.0000	N/A	162.00	Option 1: VP50 = .006 VP60 = .0085	
Jet kerosene	May	56.81	45.06	68.55	43.84	0.0077	N/A	N/A	130.0000	N/A	162.00	Option 1: VP50 = .006 VP60 = .0085	
Jet kerosene	Jun	61.81	49.29	74.32	43.84	0.0090	N/A	N/A	130.0000	N/A	162.00	Option 1: VP60 = .0085 VP70 = .011	
Jet kerosene	Jul	64.71	51.53	77.88	43.84	0.0097	N/A	N/A	130.0000	N/A	162.00	Option 1: VP60 = .0085 VP70 = .011	
Jet kerosene	Aug	62.42	50.31	74.54	43.84	0.0091	N/A	N/A	130.0000	N/A	162.00	Option 1: VP60 = .0085 VP70 = .011	
Jet kerosene	Sep	55.34	45.27	65.40	43.84	0.0073	N/A	N/A	130.0000	N/A	162.00	Option 1: VP50 = .006 VP60 = .0085	
Jet kerosene	Oct	48.45	40.33	56.58	43.84	0.0057	N/A	N/A	130.0000	N/A	162.00	Option 1: VP40 = .0041 VP50 = .006	
Jet kerosene	Nov	39.43	33.50	45.36	43.84	0.0041	N/A	N/A	130.0000	N/A	162.00	Option 1: VP40 = .0041	
Jet kerosene	Dec	32.50	27.06	37.95	43.84	0.0041	N/A	N/A	130.0000	N/A	162.00	Option 1: VP40 = .0041	

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

203-T-011 - Internal Floating Roof Tank
Belfield, North Dakota

Month:	January	February	March	April	May	June	July	August	September	October	November	December
Rim Seal Losses (lb):	0.0151	0.0151	0.0166	0.0222	0.0284	0.0331	0.0357	0.0336	0.0271	0.0211	0.0151	0.0151
Seal Factor A (lb-mole/ft-yr):	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000
Seal Factor B (lb-mole/ft-yr)(mph) ^{0.75}):	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000
Value of Vapor Pressure Function:	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0041	0.0041	0.0045	0.0060	0.0077	0.0090	0.0097	0.0091	0.0073	0.0057	0.0041	0.0041
Tank Diameter (ft):	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000
Vapor Molecular Weight (lb/lb-mole):	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000
Product Factor:	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Withdrawal Losses (lb):	10.1167	10.1167	10.1167	10.1167	10.1167	10.1167	10.1167	10.1167	10.1167	10.1167	10.1167	10.1167
Number of Columns:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Effective Column Diameter (ft):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Net Throughput (gal/mo.):	2,703,509.4160	2,703,509.4160	2,703,509.4160	2,703,509.4160	2,703,509.4160	2,703,509.4160	2,703,509.4160	2,703,509.4160	2,703,509.4160	2,703,509.4160	2,703,509.4160	2,703,509.4160
Shell Clingage Factor (bbl/1000 sqft):	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Average Organic Liquid Density (lb/gal):	7.0000	7.0000	7.0000	7.0000	7.0000	7.0000	7.0000	7.0000	7.0000	7.0000	7.0000	7.0000
Tank Diameter (ft):	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000
Deck Fitting Losses (lb):	0.0429	0.0429	0.0471	0.0631	0.0807	0.0938	0.1014	0.0954	0.0768	0.0598	0.0429	0.0429
Value of Vapor Pressure Function:	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001
Vapor Molecular Weight (lb/lb-mole):	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000
Product Factor:	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Tot. Roof Fitting Loss Fact. (lb-mole/yr):	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000
Deck Seam Losses (lb):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Deck Seam Length (ft):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Deck Seam Loss per Unit Length Factor (lb-mole/ft-yr):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tank Diameter (ft):	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000
Vapor Molecular Weight (lb/lb-mole):	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000
Product Factor:	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total Losses (lb):	10.1748	10.1748	10.1804	10.2021	10.2258	10.2435	10.2538	10.2457	10.2206	10.1976	10.1748	10.1748

Roof Fitting/Status	Quantity	KFa (lb-mole/yr)	KFb (lb-mole/yr mph ^{0.75})	Losses (lb)
Access Hatch (24-in. Diam./Bolted Cover, Gasketec	1	1.60	0.00	0.0236
Automatic Gauge Float Well/Bolted Cover, Gasketec	1	2.80	0.00	0.0414
Roof Leg or Hanger Well/Fixed	18	0.00	0.00	0.0000
Sample Pipe or Well (24-in. Diam./Slotted Pipe-Sliding Cover, Gask.	1	43.00	0.00	0.6351
Vacuum Breaker (10-in. Diam./Weighted Mech. Actiation, Gask.	1	6.20	1.20	0.0916

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

Emissions Report for: January, February, March, April, May, June, July, August, September, October, November, December

**203-T-011 - Internal Floating Roof Tank
Belfield, North Dakota**

Components	Losses(lbs)			Total Emissions
	Rim Seal Loss	Withdrawal Loss	Deck Fitting Loss	
Jet kerosene	0.28	121.40	0.79	122.47
			Deck Seam Loss	0.00

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

Identification
 User Identification: 203-T-013
 City: Belfield
 State: North Dakota
 Company: Meridian
 Type of Tank: Vertical Fixed Roof Tank
 Description: Straight Run Diesel

Tank Dimensions
 Shell Height (ft): 60.00
 Diameter (ft): 63.00
 Liquid Height (ft) : 50.00
 Avg. Liquid Height (ft): 48.00
 Volume (gallons): 1,241,137.21
 Turnovers: 38.59
 Net Throughput(gal/yr): 47,890,920.00
 Is Tank Heated (y/n): N

Paint Characteristics
 Shell Color/Shade: Gray/Light
 Shell Condition: Good
 Roof Color/Shade: Gray/Light
 Roof Condition: Good

Roof Characteristics
 Type: Cone
 Height (ft) 5.00
 Slope (ft/ft) (Cone Roof) 0.16

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

Meteorological Data used in Emissions Calculations: Bismarck, North Dakota (Avg Atmospheric Pressure = 13.86 psia)

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

203-T-013 - Vertical Fixed Roof Tank Belfield, North Dakota

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Distillate fuel oil no. 2	Jan	30.90	24.94	36.87	43.84	0.0031	0.0031	0.0031	130.0000		188.00	Option 1: VP40 = .0031	
Distillate fuel oil no. 2	Feb	34.98	28.04	41.91	43.84	0.0031	0.0031	0.0034	130.0000		188.00	Option 1: VP40 = .0031	
Distillate fuel oil no. 2	Mar	42.09	33.80	50.39	43.84	0.0034	0.0031	0.0046	130.0000		188.00	Option 1: VP40 = .0031 VP50 = .0045	
Distillate fuel oil no. 2	Apr	50.10	39.90	60.29	43.84	0.0046	0.0031	0.0066	130.0000		188.00	Option 1: VP50 = .0045 VP60 = .0065	
Distillate fuel oil no. 2	May	56.81	45.06	68.55	43.84	0.0059	0.0038	0.0086	130.0000		188.00	Option 1: VP50 = .0045 VP60 = .0065	
Distillate fuel oil no. 2	Jun	61.81	49.29	74.32	43.84	0.0070	0.0044	0.0103	130.0000		188.00	Option 1: VP60 = .0065 VP70 = .009	
Distillate fuel oil no. 2	Jul	64.71	51.53	77.88	43.84	0.0077	0.0048	0.0114	130.0000		188.00	Option 1: VP60 = .0065 VP70 = .009	
Distillate fuel oil no. 2	Aug	62.42	50.31	74.54	43.84	0.0071	0.0046	0.0104	130.0000		188.00	Option 1: VP60 = .0065 VP70 = .009	
Distillate fuel oil no. 2	Sep	55.34	45.27	65.40	43.84	0.0056	0.0038	0.0079	130.0000		188.00	Option 1: VP50 = .0045 VP60 = .0065	
Distillate fuel oil no. 2	Oct	48.45	40.33	56.58	43.84	0.0043	0.0031	0.0058	130.0000		188.00	Option 1: VP40 = .0031 VP50 = .0045	
Distillate fuel oil no. 2	Nov	39.43	33.50	45.36	43.84	0.0031	0.0031	0.0038	130.0000		188.00	Option 1: VP40 = .0031	
Distillate fuel oil no. 2	Dec	32.50	27.06	37.95	43.84	0.0031	0.0031	0.0031	130.0000		188.00	Option 1: VP40 = .0031	

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

203-T-013 - Vertical Fixed Roof Tank
Belfield, North Dakota

Month:	January	February	March	April	May	June	July	August	September	October	November	December
Standing Losses (lb):	4.4697	4.6783	6.6820	10.3855	15.7289	18.9145	22.5150	19.2619	12.3666	8.0394	4.1466	4.0158
Vapor Space Volume (cu ft):	42,602.3525	42,602.3525	42,602.3525	42,602.3525	-2,602.3525	42,602.3525	42,602.3525	42,602.3525	42,602.3525	42,602.3525	42,602.3525	42,602.3525
Vapor Density (lb/cu ft):	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001
Vapor Space Expansion Factor:	0.0443	0.0518	0.0619	0.0759	0.0870	0.0921	0.0967	0.0889	0.0741	0.0598	0.0432	0.0399
Vented Vapor Saturation Factor:	0.9978	0.9978	0.9975	0.9967	0.9958	0.9950	0.9845	0.9949	0.9960	0.9969	0.9978	0.9978
Tank Vapor Space Volume:	42,602.3525	42,602.3525	42,602.3525	42,602.3525	-2,602.3525	42,602.3525	42,602.3525	42,602.3525	42,602.3525	42,602.3525	42,602.3525	42,602.3525
Tank Diameter (ft):	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000
Vapor Space Outage (ft):	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667
Tank Shell Height (ft):	60.0000	60.0000	60.0000	60.0000	60.0000	60.0000	60.0000	60.0000	60.0000	60.0000	60.0000	60.0000
Average Liquid Height (ft):	48.0000	48.0000	48.0000	48.0000	48.0000	48.0000	48.0000	48.0000	48.0000	48.0000	48.0000	48.0000
Roof Outage (ft):	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667
Roof Outage (Cone Roof)												
Roof Outage (ft):	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667
Roof Height (ft):	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000
Roof Slope (ft/ft):	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600
Shell Radius (ft):	31.5000	31.5000	31.5000	31.5000	31.5000	31.5000	31.5000	31.5000	31.5000	31.5000	31.5000	31.5000
Vapor Density	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001
Vapor Density (lb/cu ft):	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000
Vapor Molecular Weight (lb/lb-mole):												
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0031	0.0031	0.0034	0.0045	0.0059	0.0070	0.0077	0.0071	0.0056	0.0043	0.0031	0.0031
Daily Avg. Liquid Surface Temp. (deg. R):	490.5714	494.6481	501.7622	509.7857	516.4753	521.4772	524.3774	522.0931	515.4772	508.1246	499.0999	492.1748
Daily Average Ambient Temp. (deg. F):	9.2500	15.7500	28.1500	42.9500	55.0000	64.3500	70.4000	68.3000	56.9000	45.6000	28.5500	13.9000
Ideal Gas Constant R (psia cu ft / (lb-mol-deg R)):	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731
Liquid Bulk Temperature (deg. R):	503.5058	503.5058	503.5058	503.5058	503.5058	503.5058	503.5058	503.5058	503.5058	503.5058	503.5058	503.5058
Tank Paint Solar Absorbance (Shell):	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400
Tank Paint Solar Absorbance (Roof):	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400
Daily Total Solar Insulation Factor (Btu/sqft day):	535.2345	820.4602	1,209.1160	1,558.7475	1,888.7083	2,096.8374	2,152.6770	1,833.8206	1,343.3312	900.7295	543.8008	431.4872
Vapor Space Expansion Factor	0.0443	0.0518	0.0619	0.0759	0.0870	0.0921	0.0967	0.0889	0.0741	0.0598	0.0432	0.0399
Vapor Space Expansion Factor (deg. R):	23.8607	27.7414	33.1858	40.7763	46.9883	50.0642	52.7085	48.4634	40.2560	32.4830	23.7023	21.7881
Daily Vapor Pressure Range (psia):	0.0000	0.0003	0.0015	0.0035	0.0059	0.0066	0.0066	0.0058	0.0040	0.0027	0.0007	0.0000
Breather Vent Press. Setting Range (psia):	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0031	0.0031	0.0034	0.0045	0.0059	0.0070	0.0077	0.0071	0.0056	0.0043	0.0031	0.0031
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0031	0.0031	0.0031	0.0031	0.0038	0.0044	0.0048	0.0046	0.0038	0.0031	0.0031	0.0031
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0031	0.0034	0.0046	0.0066	0.0086	0.0103	0.0114	0.0104	0.0079	0.0058	0.0038	0.0031
Daily Avg. Liquid Surface Temp. (deg R):	490.5714	494.6481	501.7622	509.7857	516.4753	521.4772	524.3774	522.0931	515.4772	508.1246	499.0999	492.1748
Daily Min. Liquid Surface Temp. (deg R):	484.6062	487.7128	493.4657	499.5716	504.7280	508.9611	511.2003	509.9773	504.9829	500.0038	493.1744	486.7278
Daily Max. Liquid Surface Temp. (deg R):	496.5366	501.5835	510.0586	519.9597	528.2226	533.9932	537.5545	534.2090	525.0704	516.2453	505.0255	497.6218
Daily Ambient Temp. Range (deg. R):	21.9000	21.3000	20.7000	23.9000	25.6000	25.5000	28.0000	28.8000	27.7000	26.2000	21.5000	21.2000
Vented Vapor Saturation Factor	0.9978	0.9978	0.9975	0.9967	0.9958	0.9950	0.9845	0.9949	0.9960	0.9969	0.9978	0.9978
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0031	0.0031	0.0034	0.0045	0.0059	0.0070	0.0077	0.0071	0.0056	0.0043	0.0031	0.0031
Vapor Space Outage (ft):	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667

Working Losses (lb):	36.1548	36.1548	39.5709	52.7060	68.3566	81.0777	89.5338	82.8737	64.9309	49.9594	36.1548	36.1548
Vapor Molecular Weight (lb/lb-mole):	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0031	0.0031	0.0034	0.0045	0.0059	0.0070	0.0077	0.0071	0.0056	0.0043	0.0031	0.0031
Net Throughput (gallmo.):	3,990,910.0000	3,990,910.0000	3,990,910.0000	3,990,910.0000	3,990,910.0000	3,990,910.0000	3,990,910.0000	3,990,910.0000	3,990,910.0000	3,990,910.0000	3,990,910.0000	3,990,910.0000
Annual Turnovers:	38.5863	38.5863	38.5863	38.5863	38.5863	38.5863	38.5863	38.5863	38.5863	38.5863	38.5863	38.5863
Turnover Factor:	0.9441	0.9441	0.9441	0.9441	0.9441	0.9441	0.9441	0.9441	0.9441	0.9441	0.9441	0.9441
Maximum Liquid Volume (gal):	1,241,137.2073	1,241,137.2073	1,241,137.2073	1,241,137.2073	1,241,137.2073	1,241,137.2073	1,241,137.2073	1,241,137.2073	1,241,137.2073	1,241,137.2073	1,241,137.2073	1,241,137.2073
Maximum Liquid Height (ft):	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000
Tank Diameter (ft):	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000
Working Loss Product Factor:	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Total Losses (lb): 40.6245 40.8331 46.2529 63.0915 84.0855 99.9922 112.0488 102.1356 77.2376 57.9989 40.3014 40.1706

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

Emissions Report for: January, February, March, April, May, June, July, August, September, October, November, December

203-T-013 - Vertical Fixed Roof Tank
Belfield, North Dakota

Components	Losses (lbs)		Total Emissions
	Working Loss	Breathing Loss	
Distillate fuel oil no. 2	673.63	131.19	804.82

TANKS 4.0.9d

Emissions Report - Detail Format

Tank Identification and Physical Characteristics

Identification	203-T-015	
User Identification:	Belfield	
City:	North Dakota	
State:	Meridian	
Company:	Vertical Fixed Roof Tank	
Type of Tank:	ULSD	
Description:		
Tank Dimensions		
Shell Height (ft):	60.00	
Diameter (ft):	88.00	
Liquid Height (ft) :	50.00	
Avg. Liquid Height (ft):	48.00	
Volume (gallons):	2,274,879.65	
Turnovers:	74.67	
Net Throughput(gal/yr):	169,856,400.00	
Is Tank Heated (y/n):	N	
Paint Characteristics		
Shell Color/Shade:	Gray/Light	
Shell Condition:	Good	
Roof Color/Shade:	Gray/Light	
Roof Condition:	Good	
Roof Characteristics		
Type:	Cone	
Height (ft)	6.00	
Slope (ft/ft) (Cone Roof)	0.14	
Breather Vent Settings		
Vacuum Settings (psig):	-0.03	
Pressure Settings (psig)	0.03	

Meteorological Data used in Emissions Calculations: Bismarck, North Dakota (Avg Atmospheric Pressure = 13.86 psia)

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

203-T-015 - Vertical Fixed Roof Tank
Belfield, North Dakota

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Distillate fuel oil no. 2	Jan	30.90	24.94	36.87	43.84	0.0031	0.0031	0.0031	130.0000		188.00	Option 1: VP40 = .0031	
Distillate fuel oil no. 2	Feb	34.98	28.04	41.91	43.84	0.0031	0.0031	0.0034	130.0000		188.00	Option 1: VP40 = .0031	
Distillate fuel oil no. 2	Mar	42.09	33.80	50.39	43.84	0.0034	0.0031	0.0046	130.0000		188.00	Option 1: VP40 = .0031 VP50 = .0045	
Distillate fuel oil no. 2	Apr	50.10	39.90	60.29	43.84	0.0045	0.0031	0.0066	130.0000		188.00	Option 1: VP50 = .0045 VP60 = .0065	
Distillate fuel oil no. 2	May	56.81	45.06	68.55	43.84	0.0059	0.0038	0.0086	130.0000		188.00	Option 1: VP50 = .0045 VP60 = .0065	
Distillate fuel oil no. 2	Jun	61.81	49.29	74.32	43.84	0.0070	0.0044	0.0103	130.0000		188.00	Option 1: VP60 = .0065 VP70 = .009	
Distillate fuel oil no. 2	Jul	64.71	51.53	77.88	43.84	0.0077	0.0048	0.0114	130.0000		188.00	Option 1: VP60 = .0065 VP70 = .009	
Distillate fuel oil no. 2	Aug	62.42	50.31	74.54	43.84	0.0071	0.0046	0.0104	130.0000		188.00	Option 1: VP60 = .0065 VP70 = .009	
Distillate fuel oil no. 2	Sep	55.34	45.27	65.40	43.84	0.0056	0.0038	0.0079	130.0000		188.00	Option 1: VP50 = .0045 VP60 = .0065	
Distillate fuel oil no. 2	Oct	48.45	40.33	56.58	43.84	0.0043	0.0031	0.0058	130.0000		188.00	Option 1: VP40 = .0031 VP50 = .0045	
Distillate fuel oil no. 2	Nov	39.43	33.50	45.36	43.84	0.0031	0.0031	0.0038	130.0000		188.00	Option 1: VP40 = .0031	
Distillate fuel oil no. 2	Dec	32.50	27.06	37.95	43.84	0.0031	0.0031	0.0031	130.0000		188.00	Option 1: VP40 = .0031	

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

203-T-015 - Vertical Fixed Roof Tank Belfield, North Dakota

Month:	January	February	March	April	May	June	July	August	September	October	November	December
Standing Losses (lb):	8.9332	9.3501	13.3546	20.7560	31.4344	37.8001	44.9948	38.4941	24.6949	16.0673	8.2874	8.0260
Vapor Space Volume (cu ft):	85,149,7272	85,149,7272	85,149,7272	85,149,7272	85,149,7272	85,149,7272	85,149,7272	85,149,7272	85,149,7272	85,149,7272	85,149,7272	85,149,7272
Vapor Density (lb/cu ft):	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001
Vapor Space Expansion Factor:	0.0443	0.0518	0.0619	0.0759	0.0870	0.0921	0.0967	0.0889	0.0741	0.0598	0.0432	0.0399
Vented Vapor Saturation Factor:	0.9977	0.9977	0.9975	0.9967	0.9957	0.9949	0.9943	0.9948	0.9969	0.9968	0.9977	0.9977
Tank Vapor Space Volume:	85,149,7272	85,149,7272	85,149,7272	85,149,7272	85,149,7272	85,149,7272	85,149,7272	85,149,7272	85,149,7272	85,149,7272	85,149,7272	85,149,7272
Vapor Space Volume (cu ft):	88,0000	88,0000	88,0000	88,0000	88,0000	88,0000	88,0000	88,0000	88,0000	88,0000	88,0000	88,0000
Tank Diameter (ft):	14.0000	14.0000	14.0000	14.0000	14.0000	14.0000	14.0000	14.0000	14.0000	14.0000	14.0000	14.0000
Vapor Space Outage (ft):	60.0000	60.0000	60.0000	60.0000	60.0000	60.0000	60.0000	60.0000	60.0000	60.0000	60.0000	60.0000
Tank Shell Height (ft):	48.0000	48.0000	48.0000	48.0000	48.0000	48.0000	48.0000	48.0000	48.0000	48.0000	48.0000	48.0000
Average Liquid Height (ft):	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000
Roof Outage (ft):	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000
Roof Slope (ft/ft):	0.1400	0.1400	0.1400	0.1400	0.1400	0.1400	0.1400	0.1400	0.1400	0.1400	0.1400	0.1400
Shell Radius (ft):	44.0000	44.0000	44.0000	44.0000	44.0000	44.0000	44.0000	44.0000	44.0000	44.0000	44.0000	44.0000
Roof Outage (Cone Roof)												
Roof Outage (ft):	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000
Roof Height (ft):	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000
Roof Slope (ft/ft):	0.1400	0.1400	0.1400	0.1400	0.1400	0.1400	0.1400	0.1400	0.1400	0.1400	0.1400	0.1400
Shell Radius (ft):	44.0000	44.0000	44.0000	44.0000	44.0000	44.0000	44.0000	44.0000	44.0000	44.0000	44.0000	44.0000
Vapor Density	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001
Vapor Density (lb/cu ft):	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000
Vapor Molecular Weight (lb/lb-mole):												
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0031	0.0031	0.0034	0.0045	0.0059	0.0070	0.0077	0.0071	0.0068	0.0043	0.0031	0.0031
Daily Avg. Liquid Surface Temp. (deg. R):	490.5714	494.6481	501.7622	509.7857	516.4753	521.4772	524.3774	522.0931	515.0067	508.1246	499.0999	492.1748
Daily Average Ambient Temp. (deg. F):	9.2500	15.7500	28.1500	42.9500	55.0000	64.3500	70.4000	68.3000	56.9500	45.6000	28.5500	13.9000
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731
Liquid Bulk Temperature (deg. R):	503.5058	503.5058	503.5058	503.5058	503.5058	503.5058	503.5058	503.5058	503.5058	503.5058	503.5058	503.5058
Tank Paint Solar Absorptance (Shell):	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400
Tank Paint Solar Absorptance (Roof):	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400
Daily Total Solar Insulation Factor (Btu/sqft day):	535.2345	820.4602	1,209.1160	1,568.7475	1,988.7083	2,096.8374	2,152.6770	1,833.8206	1,343.3212	900.7295	543.8008	431.4872
Vapor Space Expansion Factor:	0.0443	0.0518	0.0619	0.0759	0.0870	0.0921	0.0967	0.0889	0.0741	0.0598	0.0432	0.0399
Daily Vapor Temperature Range (deg. R):	23.8607	27.7414	33.1858	40.7763	46.9893	50.0642	52.7085	48.4634	40.2540	32.4830	23.7023	21.7881
Daily Vapor Pressure Range (psia):	0.0000	0.0003	0.0015	0.0035	0.0048	0.0059	0.0066	0.0058	0.0040	0.0027	0.0007	0.0000
Breather Vent Press. Setting Range(psia):	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0031	0.0031	0.0034	0.0045	0.0059	0.0070	0.0077	0.0071	0.0068	0.0043	0.0031	0.0031
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0031	0.0031	0.0031	0.0031	0.0038	0.0044	0.0048	0.0046	0.0038	0.0031	0.0031	0.0031
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0031	0.0034	0.0046	0.0066	0.0086	0.0103	0.0114	0.0104	0.0079	0.0058	0.0038	0.0031
Daily Avg. Liquid Surface Temp. (deg R):	490.5714	494.6481	501.7622	509.7857	516.4753	521.4772	524.3774	522.0931	515.0067	508.1246	499.0999	492.1748
Daily Min. Liquid Surface Temp. (deg R):	484.6062	487.7128	493.4657	499.5716	504.7280	508.9611	511.2003	509.9773	504.9049	500.0038	493.1744	486.7278
Daily Max. Liquid Surface Temp. (deg R):	496.5366	501.5835	510.0586	519.9597	528.2226	533.9832	537.5545	534.2090	525.0714	516.2453	505.0255	497.6218
Daily Ambient Temp. Range (deg. R):	21.9000	21.3000	20.7000	23.9000	25.6000	25.5000	28.0000	28.8000	27.7000	26.2000	21.5000	21.2000
Vented Vapor Saturation Factor:	0.9977	0.9977	0.9975	0.9967	0.9957	0.9949	0.9943	0.9948	0.9969	0.9968	0.9977	0.9977
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0031	0.0031	0.0034	0.0045	0.0059	0.0070	0.0077	0.0071	0.0068	0.0043	0.0031	0.0031
Vapor Space Outage (ft):	14.0000	14.0000	14.0000	14.0000	14.0000	14.0000	14.0000	14.0000	14.0000	14.0000	14.0000	14.0000

Working Losses (lb):	77.2063	77.2063	84.5011	112.5503	145.9712	173.1363	191.1939	176.9715	138.6569	106.6852	77.2063	77.2063
Vapor Molecular Weight (lb/lb-mole):	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000	130.0000
Vapor Pressure at Daily Average Liquid												
Surface Temperature (psia):	0.0031	0.0031	0.0034	0.0045	0.0059	0.0070	0.0077	0.0071	0.0066	0.0043	0.0031	0.0031
Net Throughput (gal/mo.):	14,154,700.0000	14,154,700.0000	14,154,700.0000	14,154,700.0000	14,154,700.0000	14,154,700.0000	14,154,700.0000	14,154,700.0000	14,154,700.0000	14,154,700.0000	14,154,700.0000	14,154,700.0000
Annual Turnovers:	74.6661	74.6661	74.6661	74.6661	74.6661	74.6661	74.6661	74.6661	74.6661	74.6661	74.6661	74.6661
Turnover Factor:	0.5685	0.5685	0.5685	0.5685	0.5685	0.5685	0.5685	0.5685	0.5685	0.5685	0.5685	0.5685
Maximum Liquid Volume (gal):	2,274,879.6529	2,274,879.6529	2,274,879.6529	2,274,879.6529	2,274,879.6529	2,274,879.6529	2,274,879.6529	2,274,879.6529	2,274,879.6529	2,274,879.6529	2,274,879.6529	2,274,879.6529
Maximum Liquid Height (ft):	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000
Tank Diameter (ft):	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000	88.0000
Working Loss Product Factor:	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total Losses (lb):	86.1395	86.5564	97.8557	133.3063	177.4056	210.9363	236.1887	215.4656	163.3509	122.7525	85.4937	85.2323

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

Emissions Report for: January, February, March, April, May, June, July, August, September, October, November, December

203-T-015 - Vertical Fixed Roof Tank
Belfield, North Dakota

Components	Losses (lbs)		Total Emissions
	Working Loss	Breathing Loss	
Distillate fuel oil no. 2	1,438.49	262.19	1,700.68

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

Identification
 User Identification: 203-T-023
 City: Belfield
 State: North Dakota
 Company: Meridian
 Type of Tank: Vertical Fixed Roof Tank
 Description: Fuel Oil/WGO

Tank Dimensions
 Shell Height (ft): 60.00
 Diameter (ft): 63.00
 Liquid Height (ft) : 50.00
 Avg. Liquid Height (ft): 48.00
 Volume (gallons): 1,241,137.21
 Turnovers: 41.48
 Net Throughput(gal/yr): 51,484,272.00
 Is Tank Heated (y/n): N

Paint Characteristics
 Shell Color/Shade: Gray/Medium
 Shell Condition: Good
 Roof Color/Shade: Gray/Light
 Roof Condition: Good

Roof Characteristics
 Type: Cone
 Height (ft) 5.00
 Slope (ft/ft) (Cone Roof) 0.16

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

Meteorological Data used in Emissions Calculations: Bismarck, North Dakota (Avg Atmospheric Pressure = 13.86 psia)

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

203-T-023 - Vertical Fixed Roof Tank Belfield, North Dakota

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Residual oil no. 6	Jan	31.43	25.21	37.66	44.26	0.0000	0.0000	0.0000	190.0000		387.00	Option 1: VP40 = .00002	
Residual oil no. 6	Feb	35.67	28.33	43.00	44.26	0.0000	0.0000	0.0000	190.0000		387.00	Option 1: VP40 = .00002	
Residual oil no. 6	Mar	43.00	34.11	51.88	44.26	0.0000	0.0000	0.0000	190.0000		387.00	Option 1: VP40 = .00002 VP50 = .00003	
Residual oil no. 6	Apr	51.19	40.24	62.15	44.26	0.0000	0.0000	0.0000	190.0000		387.00	Option 1: VP50 = .00003 VP60 = .00004	
Residual oil no. 6	May	58.08	45.41	70.76	44.26	0.0000	0.0000	0.0001	190.0000		387.00	Option 1: VP50 = .00003 VP60 = .00004	
Residual oil no. 6	Jun	63.20	49.66	76.75	44.26	0.0000	0.0000	0.0001	190.0000		387.00	Option 1: VP60 = .00004 VP70 = .00006	
Residual oil no. 6	Jul	66.13	51.90	80.36	44.26	0.0001	0.0000	0.0001	190.0000		387.00	Option 1: VP60 = .00004 VP70 = .00006	
Residual oil no. 6	Aug	63.67	50.66	76.69	44.26	0.0000	0.0000	0.0001	190.0000		387.00	Option 1: VP60 = .00004 VP70 = .00006	
Residual oil no. 6	Sep	56.31	45.59	67.04	44.26	0.0000	0.0000	0.0000	190.0000		387.00	Option 1: VP50 = .00003 VP60 = .00004	
Residual oil no. 6	Oct	49.19	40.63	57.75	44.26	0.0000	0.0000	0.0000	190.0000		387.00	Option 1: VP40 = .00002 VP50 = .00003	
Residual oil no. 6	Nov	39.97	33.77	46.16	44.26	0.0000	0.0000	0.0000	190.0000		387.00	Option 1: VP40 = .00002	
Residual oil no. 6	Dec	32.98	27.32	38.64	44.26	0.0000	0.0000	0.0000	190.0000		387.00	Option 1: VP40 = .00002	

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

203-T-023 - Vertical Fixed Roof Tank
Belfield, North Dakota

Month:	January	February	March	April	May	June	July	August	September	October	November	December
Standing Losses (lb):	0.0442	0.0468	0.0710	0.1126	0.1610	0.1944	0.2416	0.2013	0.1255	0.0845	0.0410	0.0395
Vapor Space Volume (cu ft):	42,602.3525	42,602.3525	42,602.3525	42,602.3525	-2,602.3525	42,602.3525	42,602.3525	42,602.3525	42,602.3525	42,602.3525	42,602.3525	42,602.3525
Vapor Density (lb/cu ft):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vapor Space Expansion Factor:	0.0464	0.0549	0.0664	0.0815	0.0936	0.0993	0.1039	0.0951	0.0788	0.0630	0.0452	0.0416
Vented Vapor Saturation Factor:	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Tank Vapor Space Volume:	42,602.3525	42,602.3525	42,602.3525	42,602.3525	-2,602.3525	42,602.3525	42,602.3525	42,602.3525	42,602.3525	42,602.3525	42,602.3525	42,602.3525
Tank Diameter (ft):	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000
Vapor Space Outage (ft):	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667
Tank Shell Height (ft):	60.0000	60.0000	60.0000	60.0000	60.0000	60.0000	60.0000	60.0000	60.0000	60.0000	60.0000	60.0000
Average Liquid Height (ft):	48.0000	48.0000	48.0000	48.0000	48.0000	48.0000	48.0000	48.0000	48.0000	48.0000	48.0000	48.0000
Roof Outage (ft):	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667
Roof Outage (Cone Roof)												
Roof Outage (ft):	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667	1.6667
Roof Height (ft):	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000
Roof Slope (ft/ft):	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600	0.1600
Shell Radius (ft):	31.5000	31.5000	31.5000	31.5000	31.5000	31.5000	31.5000	31.5000	31.5000	31.5000	31.5000	31.5000
Vapor Density	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vapor Density (lb/cu ft):	190.0000	190.0000	190.0000	190.0000	190.0000	190.0000	190.0000	190.0000	190.0000	190.0000	190.0000	190.0000
Vapor Molecular Weight (lb/lb-mole):												
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
Daily Avg. Liquid Surface Temp. (deg. R):	491.1026	495.3371	502.6660	510.8629	517.7550	522.8719	525.8030	523.3424	515.947	508.8579	499.6358	492.6486
Daily Average Ambient Temp. (deg. F):	9.2500	15.7500	28.1500	42.9500	55.0000	64.3500	70.4000	68.3000	56.9900	45.6000	28.5500	13.9000
Ideal Gas Constant R (psia cu ft / (lb-mol-deg R)):	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731
Liquid Bulk Temperature (deg. R):	503.9258	503.9258	503.9258	503.9258	503.9258	503.9258	503.9258	503.9258	503.9258	503.9258	503.9258	503.9258
Tank Paint Solar Absorbance (Shell):	0.6800	0.6800	0.6800	0.6800	0.6800	0.6800	0.6800	0.6800	0.6800	0.6800	0.6800	0.6800
Tank Paint Solar Absorbance (Roof):	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400	0.5400
Daily Total Solar Insulation Factor (Btu/sqft day):	535.2345	820.4602	1,209.1160	1,558.7475	1,888.7083	2,096.8374	2,152.6770	1,833.8206	1,343.3312	900.7295	543.8008	431.4872
Vapor Space Expansion Factor:	0.0464	0.0549	0.0664	0.0815	0.0936	0.0993	0.1039	0.0951	0.0788	0.0630	0.0452	0.0416
Daily Vapor Temperature Range (deg. R):	24.9088	29.3495	35.5557	43.8314	50.6911	54.1740	56.9277	52.0577	42.8379	34.2485	24.7681	22.6338
Daily Vapor Pressure Range (psia):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
Breather Vent Press. Setting Range (psia):	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000
Daily Avg. Liquid Surface Temp. (deg R):	491.1026	495.3371	502.6660	510.8629	517.7550	522.8719	525.8030	523.3424	515.947	508.8579	499.6358	492.6486
Daily Min. Liquid Surface Temp. (deg R):	484.8751	487.9997	493.7771	499.9050	505.0284	509.3284	511.5711	510.3280	505.2327	500.2958	493.4438	486.9902
Daily Max. Liquid Surface Temp. (deg R):	497.3300	502.6744	511.5549	521.8207	530.4277	536.4154	540.0349	536.3569	526.767	517.4200	505.8279	498.3071
Daily Ambient Temp. Range (deg. R):	21.9000	21.3000	20.7000	23.9000	25.6000	25.5000	28.0000	28.8000	27.7000	26.2000	21.5000	21.2000
Vented Vapor Saturation Factor:	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
Vapor Space Outage (ft):	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667	13.6667

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

Emissions Report for: January, February, March, April, May, June, July, August, September, October, November, December

203-T-023 - Vertical Fixed Roof Tank
Belfield, North Dakota

Components	Losses (lbs)		Total Emissions
	Working Loss	Breathing Loss	
Residual oil no. 6	6.63	1.37	8.00

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

Identification
 User Identification: 203-T-027-IFR
 City: Belfield
 State: North Dakota
 Company: Meridian
 Type of Tank: Internal Floating Roof Tank
 Description: Light Slops

Tank Dimensions
 Diameter (ft): 25.00
 Volume (gallons): 91,727.00
 Turnovers: 22.98
 Self Supp. Roof? (y/n): Y
 No. of Columns: 0.00
 Eff. Col. Diam. (ft): 0.00

Paint Characteristics
 Internal Shell Condition: Light Rust
 Shell Color/Shade: Gray/Light
 Shell Condition: Good
 Roof Color/Shade: Gray/Light
 Roof Condition: Good

Rim-Seal System
 Primary Seal: Liquid-mounted
 Secondary Seal: Rim-mounted

Deck Characteristics
 Deck Fitting Category: Detail
 Deck Type: Welded

Deck Fitting/Status	Quantity
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1
Automatic Gauge Float Well/Bolted Cover, Gasketed	1
Roof Leg or Hanger Well/Fixed	18
Sample Pipe or Well (24-in. Diam.)/Slotted Pipe-Sliding Cover, Gask.	1
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1

Meteorological Data used in Emissions Calculations: Bismarck, North Dakota (Avg Atmospheric Pressure = 13.86 psia)

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

203-T-027-IFR - Internal Floating Roof Tank Belfield, North Dakota

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Gasoline (RVP 15.0)	Jan	30.90	24.94	36.87	43.84	4.6376	N/A	N/A	60.0000		92.00	Optior 4: RVP=15, ASTM Slope=3	
Gasoline (RVP 15.0)	Feb	34.98	28.04	41.91	43.84	5.0388	N/A	N/A	60.0000		92.00	Optior 4: RVP=15, ASTM Slope=3	
Gasoline (RVP 15.0)	Mar	42.09	33.80	50.39	43.84	5.8049	N/A	N/A	60.0000		92.00	Optior 4: RVP=15, ASTM Slope=3	
Gasoline (RVP 15.0)	Apr	50.10	39.90	60.29	43.84	6.7748	N/A	N/A	60.0000		92.00	Optior 4: RVP=15, ASTM Slope=3	
Gasoline (RVP 15.0)	May	56.81	45.06	68.55	43.84	7.6833	N/A	N/A	60.0000		92.00	Optior 4: RVP=15, ASTM Slope=3	
Gasoline (RVP 15.0)	Jun	61.81	49.29	74.32	43.84	8.4212	N/A	N/A	60.0000		92.00	Optior 4: RVP=15, ASTM Slope=3	
Gasoline (RVP 15.0)	Jul	64.71	51.53	77.88	43.84	8.8740	N/A	N/A	60.0000		92.00	Optior 4: RVP=15, ASTM Slope=3	
Gasoline (RVP 15.0)	Aug	62.42	50.31	74.54	43.84	8.5158	N/A	N/A	60.0000		92.00	Optior 4: RVP=15, ASTM Slope=3	
Gasoline (RVP 15.0)	Sep	55.34	45.27	65.40	43.84	7.4767	N/A	N/A	60.0000		92.00	Optior 4: RVP=15, ASTM Slope=3	
Gasoline (RVP 15.0)	Oct	48.45	40.33	56.58	43.84	6.5661	N/A	N/A	60.0000		92.00	Optior 4: RVP=15, ASTM Slope=3	
Gasoline (RVP 15.0)	Nov	39.43	33.50	45.36	43.84	5.5080	N/A	N/A	60.0000		92.00	Optior 4: RVP=15, ASTM Slope=3	
Gasoline (RVP 15.0)	Dec	32.50	27.06	37.95	43.84	4.7922	N/A	N/A	60.0000		92.00	Optior 4: RVP=15, ASTM Slope=3	

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

203-T-027-IFR - Internal Floating Roof Tank
Belfield, North Dakota

Month:	January	February	March	April	May	June	July	August	September	October	November	December
Rim Seal Losses (lb):	3,8053	4,2174	5,0559	6,2310	7,4740	8,6114	9,3791	8,7671	7,1774	5,9662	4,7224	3,9621
Seal Factor A (lb-mole/ft-yr):	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000
Seal Factor B (lb-mole/ft-yr)(mph) ²):	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000
Value of Vapor Pressure Function:	0.1015	0.1125	0.1348	0.1662	0.1993	0.2296	0.2501	0.2338	0.1914	0.1591	0.1259	0.1057
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	4,6376	5,0388	5,8049	6,7748	7,6833	8,4212	8,8740	8,5158	7,4767	6,5661	5,5080	4,7922
Tank Diameter (ft):	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000
Vapor Molecular Weight (lb/lb-mole):	60,0000	60,0000	60,0000	60,0000	60,0000	60,0000	60,0000	60,0000	60,0000	60,0000	60,0000	60,0000
Product Factor:	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
Withdrawal Losses (lb):	1,3252	1,3252	1,3252	1,3252	1,3252	1,3252	1,3252	1,3252	1,3252	1,3252	1,3252	1,3252
Number of Columns:	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Effective Column Diameter (ft):	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Net Throughput (gal/mo.):	175,656,2500	175,656,2500	175,656,2500	175,656,2500	175,656,2500	175,656,2500	175,656,2500	175,656,2500	175,656,2500	175,656,2500	175,656,2500	175,656,2500
Shell Clingage Factor (bbl/1000 sqft):	0,0015	0,0015	0,0015	0,0015	0,0015	0,0015	0,0015	0,0015	0,0015	0,0015	0,0015	0,0015
Average Organic Liquid Density (lb/gal):	5,6000	5,6000	5,6000	5,6000	5,6000	5,6000	5,6000	5,6000	5,6000	5,6000	5,6000	5,6000
Tank Diameter (ft):	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000
Deck Fitting Losses (lb):	27,1954	30,1402	36,1326	44,5310	53,4145	61,5432	67,0295	62,6553	51,2944	42,6362	33,7496	28,3157
Value of Vapor Pressure Function:	0.1015	0.1125	0.1348	0.1662	0.1993	0.2296	0.2501	0.2338	0.1914	0.1591	0.1259	0.1057
Vapor Molecular Weight (lb/lb-mole):	60,0000	60,0000	60,0000	60,0000	60,0000	60,0000	60,0000	60,0000	60,0000	60,0000	60,0000	60,0000
Product Factor:	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
Tot. Roof Fitting Loss Fact. (lb-mole/yr):	53,6000	53,6000	53,6000	53,6000	53,6000	53,6000	53,6000	53,6000	53,6000	53,6000	53,6000	53,6000
Deck Seam Losses (lb):	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Deck Seam Length (ft):	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Deck Seam Loss per Unit Length Factor (lb-mole/ft-yr):	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Tank Diameter (ft):	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000
Vapor Molecular Weight (lb/lb-mole):	60,0000	60,0000	60,0000	60,0000	60,0000	60,0000	60,0000	60,0000	60,0000	60,0000	60,0000	60,0000
Product Factor:	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
Total Losses (lb):	32,3259	35,6827	42,5136	52,0871	62,2137	71,4798	77,7338	72,7476	59,7770	49,9295	39,7972	33,6029

Roof Fitting/Status	Quantity	KFa (lb-mole/yr)	KFb (lb-mole/yr mph ²)	Losses (lb)
Access Hatch (24-in. Diam./Bolted Cover, Gasketec	1	1.60	0.00	16,1109
Automatic Gauge Float Well/Bolted Cover, Gasketec	1	2.80	0.00	28,1940
Roof Leg or Hanger Well/Fixed	18	0.00	0.00	0.0000
Sample Pipe or Well (24-in. Diam./Slotted Pipe-Sliding Cover, Gask.	1	43.00	0.00	432,9792
Vacuum Breaker (10-in. Diam./Weighted Mech. Actiation, Gask.	1	6.20	1.20	62,4296

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

Emissions Report for: January, February, March, April, May, June, July, August, September, October, November, December

203-T-027-IFR - Internal Floating Roof Tank
Belfield, North Dakota

Components	Losses (lbs)				Total Emissions
	Rim Seal Loss	Withdrawal Loss	Deck Fitting Loss	Deck Seam Loss	
Gasoline (RVP 15.0)	75.37	15.90	538.64	0.00	629.91

TANKS 4.0.9d

Emissions Report - Detail Format

Tank Identification and Physical Characteristics

Identification	203-T-028
User Identification:	Belfield
City:	North Dakota
State:	Meridian
Company:	Vertical Fixed Roof Tank
Type of Tank:	Heavy Slops
Description:	
Tank Dimensions	
Shell Height (ft):	30.00
Diameter (ft):	25.00
Liquid Height (ft) :	27.00
Avg. Liquid Height (ft):	10.00
Volume (gallons):	91,277.00
Turnovers:	23.09
Net Throughput(gal/yr):	2,107,875.00
Is Tank Heated (y/n):	Y
Paint Characteristics	
Shell Color/Shade:	Gray/Light
Shell Condition:	Good
Roof Color/Shade:	Gray/Light
Roof Condition:	Good
Roof Characteristics	
Type:	Cone
Height (ft)	2.00
Slope (ft/ft) (Cone Roof)	0.16
Breather Vent Settings	
Vacuum Settings (psig):	0.00
Pressure Settings (psig)	0.00

Meteorological Data used in Emissions Calculations: Bismarck, North Dakota (Avg Atmospheric Pressure = 13.86 psia)

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

203-T-028 - Vertical Fixed Roof Tank Belfield, North Dakota

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Distillate fuel oil no. 2	Jan	48.29	39.09	57.50	43.84	0.0043	0.0031	0.0060	130.0000		188.00	Option 1: VP40 = .0031 VP50 = .0045	
Distillate fuel oil no. 2	Feb	48.29	39.09	57.50	43.84	0.0043	0.0031	0.0060	130.0000		188.00	Option 1: VP40 = .0031 VP50 = .0045	
Distillate fuel oil no. 2	Mar	48.29	39.09	57.50	43.84	0.0043	0.0031	0.0060	130.0000		188.00	Option 1: VP40 = .0031 VP50 = .0045	
Distillate fuel oil no. 2	Apr	48.29	39.09	57.50	43.84	0.0043	0.0031	0.0060	130.0000		188.00	Option 1: VP40 = .0031 VP50 = .0045	
Distillate fuel oil no. 2	May	48.29	39.09	57.50	43.84	0.0043	0.0031	0.0060	130.0000		188.00	Option 1: VP40 = .0031 VP50 = .0045	
Distillate fuel oil no. 2	Jun	48.29	39.09	57.50	43.84	0.0043	0.0031	0.0060	130.0000		188.00	Option 1: VP40 = .0031 VP50 = .0045	
Distillate fuel oil no. 2	Jul	48.29	39.09	57.50	43.84	0.0043	0.0031	0.0060	130.0000		188.00	Option 1: VP40 = .0031 VP50 = .0045	
Distillate fuel oil no. 2	Aug	48.29	39.09	57.50	43.84	0.0043	0.0031	0.0060	130.0000		188.00	Option 1: VP40 = .0031 VP50 = .0045	
Distillate fuel oil no. 2	Sep	48.29	39.09	57.50	43.84	0.0043	0.0031	0.0060	130.0000		188.00	Option 1: VP40 = .0031 VP50 = .0045	
Distillate fuel oil no. 2	Oct	48.29	39.09	57.50	43.84	0.0043	0.0031	0.0060	130.0000		188.00	Option 1: VP40 = .0031 VP50 = .0045	
Distillate fuel oil no. 2	Nov	48.29	39.09	57.50	43.84	0.0043	0.0031	0.0060	130.0000		188.00	Option 1: VP40 = .0031 VP50 = .0045	
Distillate fuel oil no. 2	Dec	48.29	39.09	57.50	43.84	0.0043	0.0031	0.0060	130.0000		188.00	Option 1: VP40 = .0031 VP50 = .0045	

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

203-T-028 - Vertical Fixed Roof Tank Belfield, North Dakota

Month:	January	February	March	April	May	June	July	August	September	October	November	December
Standing Losses (lb):	1,1601	1,0478	1,1226	1,1226	1,1601	1,1226	1,1601	1,1601	1,1226	1,1601	1,1226	1,1601
Vapor Space Volume (cu ft):	10,144,7263	10,144,7263	10,144,7263	10,144,7263	10,144,7263	10,144,7263	10,144,7263	10,144,7263	10,144,7263	10,144,7263	10,144,7263	10,144,7263
Vapor Density (lb/cu ft):	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Vapor Space Expansion Factor:	0.0365	0.0365	0.0365	0.0365	0.0365	0.0365	0.0365	0.0365	0.0365	0.0365	0.0365	0.0365
Vented Vapor Saturation Factor:	0.9954	0.9954	0.9954	0.9954	0.9954	0.9954	0.9954	0.9954	0.9954	0.9954	0.9954	0.9954
Tank Vapor Space Volume:	10,144,7263	10,144,7263	10,144,7263	10,144,7263	10,144,7263	10,144,7263	10,144,7263	10,144,7263	10,144,7263	10,144,7263	10,144,7263	10,144,7263
Tank Diameter (ft):	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000	25,0000
Vapor Space Outage (ft):	20,6667	20,6667	20,6667	20,6667	20,6667	20,6667	20,6667	20,6667	20,6667	20,6667	20,6667	20,6667
Tank Shell Height (ft):	30,0000	30,0000	30,0000	30,0000	30,0000	30,0000	30,0000	30,0000	30,0000	30,0000	30,0000	30,0000
Average Liquid Height (ft):	10,0000	10,0000	10,0000	10,0000	10,0000	10,0000	10,0000	10,0000	10,0000	10,0000	10,0000	10,0000
Roof Outage (ft):	0,6667	0,6667	0,6667	0,6667	0,6667	0,6667	0,6667	0,6667	0,6667	0,6667	0,6667	0,6667
Roof Outage (Cone Roof)												
Roof Outage (ft):	0,6667	0,6667	0,6667	0,6667	0,6667	0,6667	0,6667	0,6667	0,6667	0,6667	0,6667	0,6667
Roof Height (ft):	2,0000	2,0000	2,0000	2,0000	2,0000	2,0000	2,0000	2,0000	2,0000	2,0000	2,0000	2,0000
Roof Slope (ft/ft):	0,1600	0,1600	0,1600	0,1600	0,1600	0,1600	0,1600	0,1600	0,1600	0,1600	0,1600	0,1600
Shell Radius (ft):	12,5000	12,5000	12,5000	12,5000	12,5000	12,5000	12,5000	12,5000	12,5000	12,5000	12,5000	12,5000
Vapor Density	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001
Vapor Density (lb/cu ft):	130,0000	130,0000	130,0000	130,0000	130,0000	130,0000	130,0000	130,0000	130,0000	130,0000	130,0000	130,0000
Vapor Molecular Weight (lb/lb-mole):												
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0,0043	0,0043	0,0043	0,0043	0,0043	0,0043	0,0043	0,0043	0,0043	0,0043	0,0043	0,0043
Daily Avg. Liquid Surface Temp. (deg. R):	507,9647	507,9647	507,9647	507,9647	507,9647	507,9647	507,9647	507,9647	507,9647	507,9647	507,9647	507,9647
Daily Average Ambient Temp. (deg. F):	9,2500	15,7500	28,1500	42,9500	55,0000	64,3500	70,4000	68,3000	56,9000	45,6000	28,5500	13,9000
Ideal Gas Constant R (psia cu ft / (lb-mol-deg R)):	10,731	10,731	10,731	10,731	10,731	10,731	10,731	10,731	10,731	10,731	10,731	10,731
Liquid Bulk Temperature (deg. R):	503,5058	503,5058	503,5058	503,5058	503,5058	503,5058	503,5058	503,5058	503,5058	503,5058	503,5058	503,5058
Tank Paint Solar Absorbance (Shell):	0,5400	0,5400	0,5400	0,5400	0,5400	0,5400	0,5400	0,5400	0,5400	0,5400	0,5400	0,5400
Tank Paint Solar Absorbance (Roof):	0,5400	0,5400	0,5400	0,5400	0,5400	0,5400	0,5400	0,5400	0,5400	0,5400	0,5400	0,5400
Daily Total Solar Insulation Factor (Btu/sqft day):	535,2345	820,4602	1,209,1160	1,558,7475	1,888,7083	2,096,8374	2,152,6770	1,833,8206	1,343,3312	900,7295	543,8008	431,4872
Vapor Space Expansion Factor:	0,0365	0,0365	0,0365	0,0365	0,0365	0,0365	0,0365	0,0365	0,0365	0,0365	0,0365	0,0365
Daily Vapor Temperature Range (deg. R):	18,4174	18,4174	18,4174	18,4174	18,4174	18,4174	18,4174	18,4174	18,4174	18,4174	18,4174	18,4174
Daily Vapor Pressure Range (psia):	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029	0,0029
Breather Vent Press. Setting Range (psia):	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0,0043	0,0043	0,0043	0,0043	0,0043	0,0043	0,0043	0,0043	0,0043	0,0043	0,0043	0,0043
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031	0,0031
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0,0060	0,0060	0,0060	0,0060	0,0060	0,0060	0,0060	0,0060	0,0060	0,0060	0,0060	0,0060
Daily Avg. Liquid Surface Temp. (deg R):	507,9647	507,9647	507,9647	507,9647	507,9647	507,9647	507,9647	507,9647	507,9647	507,9647	507,9647	507,9647
Daily Min. Liquid Surface Temp. (deg R):	498,7560	498,7560	498,7560	498,7560	498,7560	498,7560	498,7560	498,7560	498,7560	498,7560	498,7560	498,7560
Daily Max. Liquid Surface Temp. (deg R):	517,1734	517,1734	517,1734	517,1734	517,1734	517,1734	517,1734	517,1734	517,1734	517,1734	517,1734	517,1734
Daily Ambient Temp. Range (deg. R):	21,9000	21,3000	20,7000	23,9000	25,6000	25,5000	28,0000	28,8000	27,7000	26,2000	21,5000	21,2000
Vented Vapor Saturation Factor	0,9954	0,9954	0,9954	0,9954	0,9954	0,9954	0,9954	0,9954	0,9954	0,9954	0,9954	0,9954
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0,0043	0,0043	0,0043	0,0043	0,0043	0,0043	0,0043	0,0043	0,0043	0,0043	0,0043	0,0043
Vapor Space Outage (ft):	20,6667	20,6667	20,6667	20,6667	20,6667	20,6667	20,6667	20,6667	20,6667	20,6667	20,6667	20,6667

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

Emissions Report for: January, February, March, April, May, June, July, August, September, October, November, December

203-T-028 - Vertical Fixed Roof Tank
Belfield, North Dakota

Components	Losses (lbs)		Total Emissions
	Working Loss	Breathing Loss	
Distillate fuel oil no. 2	27.80	13.66	41.46

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

Identification			
User Identification:	203-T-031		
City:	Belfield		
State:	North Dakota		
Company:	Meridian		
Type of Tank:	Internal Floating Roof Tank		
Description:	Light Naphtha		
Tank Dimensions			
Diameter (ft):	63.00		
Volume (gallons):	1,399,104.00		
Turnovers:	36.47		
Self Supp. Roof? (y/n):	Y		
No. of Columns:	0.00		
Eff. Col. Diam. (ft):	0.00		
Paint Characteristics			
Internal Shell Condition:	Light Rust		
Shell Color/Shade:	Gray/Light		
Shell Condition:	Good		
Roof Color/Shade:	Gray/Light		
Roof Condition:	Good		
Rim-Seal System			
Primary Seal:	Liquid-mounted		
Secondary Seal:	Rim-mounted		
Deck Characteristics			
Deck Fitting Category:	Detail		
Deck Type:	Welded		
Deck Fitting/Status			Quantity
Access Hatch (24-in. Diam.):	Bolted Cover, Gasketed		1
Automatic Gauge Float Well:	Bolted Cover, Gasketed		1
Roof Leg or Hanger Well:	Fixed		18
Sample Pipe or Well (24-in. Diam.):	Slotted Pipe-Sliding Cover, Gask.		1
Vacuum Breaker (10-in. Diam.):	Weighted Mech. Actuation, Gask.		1

Meteorological Data used in Emissions Calculations: Bismarck, North Dakota (Avg Atmospheric Pressure = 13.86 psia)

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

203-T-031 - Internal Floating Roof Tank Belfield, North Dakota

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Gasoline (RVP 13)	Jan	30.90	24.94	36.87	43.84	3.9065	N/A	N/A	62.0000		92.00	Optior 4: RVP=13, ASTM Slope=3	
Gasoline (RVP 13)	Feb	34.98	28.04	41.91	43.84	4.2520	N/A	N/A	62.0000		92.00	Optior 4: RVP=13, ASTM Slope=3	
Gasoline (RVP 13)	Mar	42.09	33.80	50.39	43.84	4.9133	N/A	N/A	62.0000		92.00	Optior 4: RVP=13, ASTM Slope=3	
Gasoline (RVP 13)	Apr	50.10	39.90	60.29	43.84	5.7533	N/A	N/A	62.0000		92.00	Optior 4: RVP=13, ASTM Slope=3	
Gasoline (RVP 13)	May	56.81	45.06	68.55	43.84	6.5424	N/A	N/A	62.0000		92.00	Optior 4: RVP=13, ASTM Slope=3	
Gasoline (RVP 13)	Jun	61.81	49.29	74.32	43.84	7.1848	N/A	N/A	62.0000		92.00	Optior 4: RVP=13, ASTM Slope=3	
Gasoline (RVP 13)	Jul	64.71	51.53	77.88	43.84	7.5796	N/A	N/A	62.0000		92.00	Optior 4: RVP=13, ASTM Slope=3	
Gasoline (RVP 13)	Aug	62.42	50.31	74.54	43.84	7.2672	N/A	N/A	62.0000		92.00	Optior 4: RVP=13, ASTM Slope=3	
Gasoline (RVP 13)	Sep	55.34	45.27	65.40	43.84	6.3627	N/A	N/A	62.0000		92.00	Optior 4: RVP=13, ASTM Slope=3	
Gasoline (RVP 13)	Oct	48.45	40.33	56.58	43.84	5.5723	N/A	N/A	62.0000		92.00	Optior 4: RVP=13, ASTM Slope=3	
Gasoline (RVP 13)	Nov	39.43	33.50	45.36	43.84	4.6568	N/A	N/A	62.0000		92.00	Optior 4: RVP=13, ASTM Slope=3	
Gasoline (RVP 13)	Dec	32.50	27.06	37.95	43.84	4.0396	N/A	N/A	62.0000		92.00	Optior 4: RVP=13, ASTM Slope=3	

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

203-T-031 - Internal Floating Roof Tank Belfield, North Dakota

Month:	January	February	March	April	May	June	July	August	September	October	November	December
Rim Seal Losses (lb):	8,0629	8,9185	10,6416	13,0123	15,4585	17,6365	19,0718	17,9298	14,8308	12,4828	9,9584	8,3890
Seal Factor A (lb-mole/ft-yr):	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000
Seal Factor B (lb-mole/ft-yr)(mph) ^{0.75}):	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000
Value of Vapor Pressure Function:	0.0826	0.0913	0.1090	0.1333	0.1583	0.1806	0.1953	0.1636	0.1324	0.1278	0.1020	0.0859
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	3.9065	4.2520	4.9133	5.7533	6.5424	7.1848	7.5796	7.2672	6.3927	5.5723	4.6568	4.0396
Tank Diameter (ft):	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000
Vapor Molecular Weight (lb/lb-mole):	62.0000	62.0000	62.0000	62.0000	62.0000	62.0000	62.0000	62.0000	62.0000	62.0000	62.0000	62.0000
Product Factor:	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Withdrawal Losses (lb):	12.7306	12.7306	12.7306	12.7306	12.7306	12.7306	12.7306	12.7306	12.7306	12.7306	12.7306	12.7306
Number of Columns:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Effective Column Diameter (ft):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Net Throughput (gal/mo.):	4,252,542.0000	4,252,542.0000	4,252,542.0000	4,252,542.0000	4,252,542.0000	4,252,542.0000	4,252,542.0000	4,252,542.0000	4,252,542.0000	4,252,542.0000	4,252,542.0000	4,252,542.0000
Shell Clingage Factor (bbl/1000 sqft):	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Average Organic Liquid Density (lb/gal):	5.6000	5.6000	5.6000	5.6000	5.6000	5.6000	5.6000	5.6000	5.6000	5.6000	5.6000	5.6000
Tank Diameter (ft):	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000
Deck Fitting Losses (lb):	22.8661	25.2926	30.1793	36.9027	43.8400	50.0168	54.0871	50.8485	42.2015	35.4009	28.2445	23.7911
Value of Vapor Pressure Function:	0.0826	0.0913	0.1090	0.1333	0.1583	0.1806	0.1953	0.1636	0.1324	0.1278	0.1020	0.0859
Vapor Molecular Weight (lb/lb-mole):	62.0000	62.0000	62.0000	62.0000	62.0000	62.0000	62.0000	62.0000	62.0000	62.0000	62.0000	62.0000
Product Factor:	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Tot. Roof Fitting Loss Fact. (lb-mole/yr):	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000	53.6000
Deck Seam Losses (lb):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Deck Seam Length (ft):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Deck Seam Loss per Unit Length Factor (lb-mole/ft-yr):	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Tank Diameter (ft):	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000	63.0000
Vapor Molecular Weight (lb/lb-mole):	62.0000	62.0000	62.0000	62.0000	62.0000	62.0000	62.0000	62.0000	62.0000	62.0000	62.0000	62.0000
Product Factor:	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total Losses (lb):	43.6596	46.9418	53.5515	62.6456	72.0291	80.3839	85.8895	81.5089	69.8129	60.6142	50.9345	44.9108



Roof Fitting/Status	Quantity	KFa(lb-mole/yr)	KFb(lb-mole/yr mph ^{0.75})	Roof Fitting Loss Factors	Losses (lb)
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1	1.60	0.00	m	0.00
Automatic Gauge Float Well/Bolted Cover, Gasketed	1	2.80	0.00	0.00	23.2208
Roof Leg or Hanger Well/Fixed	18	0.00	0.00	0.00	0.0000
Sample Pipe or Well (24-in. Diam.)/Slotted Pipe-Sliding Cover, Gask.	1	43.00	0.00	0.00	356.6045
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actiation, Gask.	1	6.20	1.20	0.94	51.4174

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


Emissions Report for: January, February, March, April, May, June, July, August, September, October, November, December

**203-T-031 - Internal Floating Roof Tank
Belfield, North Dakota**

Components	Losses (lbs)				Total Emissions
	Rim Seal Loss	Withdrawal Loss	Deck Fitting Loss	Deck Seam Loss	
Gasoline (RVP 13)	156.44	152.77	443.67	0.00	752.88

 Meridian Energy Group Inc.	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: OF	


APPENDIX C ENGINEERING DATA


	CALCULATION NOTES			
			Job No: N/A	
CODE: N/A	UNIT:	Spc. No.:		
	LOCATION: N/A	Sh. 1 of 4	Rev. A	


- 1
- 2
- 3
- 4
- 11
- 5
- 6
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 10
- 7
- 8
- 9
- 22
- 23
- 24
- 25
- 26
- 27
- 28
- 29
- 30
- 31
- 32
- 33
- 34
- 35
- 36
- 37
- 38
- 39
- 40
- 41
- 42
- 43
- 44
- 45
- 46
- 47
- 48
- 49
- 50
- 51
- 52
- 53
- 54
- 55
- 56
- 57
- 58
- 59
- 60
- 61
- 62
- 63
- 64
- 65


1. FLARE EMISSION


	UNITS	HC Emergency Flare (Phase 1)	Acid Flare (Phase 1)	Enclosed HC Operating Flare (Phase 1)	HC Emergency Flare (Phase 2)
Flare Mass Flow	lb/h	722,000	36,153	150,000	777,437
Flare Vol IFlow	MMSCFD	74.6	15.8	24.4	88.8
Flare MW	lb/lbmol	88.2	20.9	56	79.7
Flowing Temperature	F	382	290	120	389
Molar Flowrate	lbmol/h	8,186	1,730	2,679	9,755
Lower Heating Value	BTU/SCF	4183	441	2951	3780
	BTU/lb	18,000	8000	20000	18,000
Heat Release	MMBTU/h	12,996	289	3,000	13,994
Height	ft	150	150	50	150
Diameter	in	36	10	360	36
Discharge Velocity	ft/s	194	382.2	-	205
Heating Value (Natural Gas)	BTU/SCF	520	520	520	520
Pilots	#	3	2	12	3
Fuel Gas to Pilots/per Pilot	SCFH	100	100	100	100

		<h2 style="margin: 0;">CALCULATION NOTES</h2>		Job No: P-5715043-01	
				Spec. No.:	
CODE: N/A		UNIT: N/A		Sh. 1 of 3	
LOCATION: N/A				Rev. G	
1					
2	1. PREMISES				
3					
4	- Site Conditions:				
5	Relative Humidity: 66 % RH				
6	Pressure: 0 psig				
7	Temperature (for efficiency): 60 °F				
8	- Radiant Duty Heat loss: 1.5 %				
9	- Heat Efficiency: 80 %				
10	- Excess Air: 20 %				
11					
12	- Fuel Gas Composition (% mass):				
13	Hydrogen	23.2			
14	Methane	13.4			
15	Ethane	27.0			
16	Propane	17.8			
17	Butane	18.6			
18		100.0			
19					
20	2. DISTILLATION UNIT				
21					
22	- Tag: 101-H-0101		- Fuel Gas:	2978.6	lb/h
23	- Stack Height:	127.6 ft	- Flue Gas:	75585.3	lb/h
24	- Stack Diameter (ID):	6' 3 1/2" 6.3 ft	- Flue Gas Temp:	790.2	°F
25	- Stack Area:	31.1 ft ²	- Density:	0.0296	lb/ft ³
26			- Flue Gas Vel:	22.8	ft/s
27	- Process Duty:	65.7 MM BTU/hr			
28	- Duty (Heater Fuel Gas):	82.13 MM BTU/hr			
29					
30	- Tag: 102-H-0201		- Fuel Gas:	2978.6	lb/h
31	- Stack Height:	127.6 ft	- Flue Gas:	75585.3	lb/h
32	- Stack Diameter (ID):	6' 3 1/2" 6.3 ft	- Flue Gas Temp:	790.2	°F
33	- Stack Area:	31.1 ft ²	- Density:	0.0296	lb/ft ³
34			- Flue Gas Vel:	22.8	ft/s
35	- Process Duty:	65.7 MM BTU/hr			
36	- Duty (Heater Fuel Gas):	82.13 MM BTU/hr			
37					
38	3. VACUUM UNIT				
39					
40	- Tag: 103-H-0301		- Fuel Gas:	2720.2	lb/h
41	- Stack Height:	125.0 ft	- Flue Gas:	69027.7	lb/h
42	- Stack Diameter (ID):	6' 6" 6.5 ft	- Flue Gas Temp:	790.2	°F
43	- Stack Area:	33.2 ft ²	- Density:	0.0296	lb/ft ³
44			- Flue Gas Vel:	19.5	ft/s
45	- Process Duty:	60.0 MM BTU/hr			
46	- Duty (Heater Fuel Gas):	75.00 MM BTU/hr			
47					
48	4. NHDT				
49					
50	- Tag: 105-H-0501		- Fuel Gas:	311.9	lb/h
51	- Stack Height:	91.0 ft	- Flue Gas:	7915.2	lb/h
52	- Stack Diameter (ID):	2' 5" 2.4 ft	- Flue Gas Temp:	790.2	°F
53	- Stack Area:	4.6 ft ²	- Density:	0.0296	lb/ft ³
54			- Flue Gas Vel:	16.2	ft/s
55	- Process Duty:	6.9 MM BTU/hr			
56	- Duty (Heater Fuel Gas):	8.60 MM BTU/hr			
57					
58					
59					
60					


		CALCULATION NOTES			
				Job No: P-5715043-01	
CODE:	UNIT:	N/A		Spec. No.:	
N/A	LOCATION: N/A			Sh.	2 of 3 Rev. G
1					
2					
3	- Tag: 105-H-0502			- Fuel Gas:	337.3 lb/h
4	- Stack Height:	91.0 ft		- Flue Gas:	8559.4 lb/h
5	- Stack Diameter (ID):	2' 3 3/4"	2.3 ft	- Flue Gas Temp:	790.2 °F
6	- Stack Area:	4.2 ft ²		- Density:	0.0296 lb/ft ³
7				- Flue Gas Vel:	19.1 ft/s
8	- Process Duty:	7.4 MM BTU/hr			
9	- Duty (Heater Fuel Gas):	9.30 MM BTU/hr			
10					
11					
12	- Tag: 105-H-0503			- Fuel Gas:	649.2 lb/h
13	- Stack Height:	105.0 ft		- Flue Gas:	16474.6 lb/h
14	- Stack Diameter (ID):	3' 6"	3.5 ft	- Flue Gas Temp:	790.2 °F
15	- Stack Area:	9.6 ft ²		- Density:	0.0296 lb/ft ³
16				- Flue Gas Vel:	16.1 ft/s
17	- Process Duty:	14.3 MM BTU/hr			
18	- Duty (Heater Fuel Gas):	17.90 MM BTU/hr			
19					
20	5. CCR REFORMER				
21					
22	- Tag: 106-H-0601			- Fuel Gas:	4965.3 lb/h
23	- Stack Height:	130.0 ft		- Flue Gas:	125998 lb/h
24	- Stack Diameter (ID):	7' 5 1/4"	7.4 ft	- Flue Gas Temp:	790.2 °F
25	- Stack Area:	43.4 ft ²		- Density:	0.0296 lb/ft ³
26				- Flue Gas Vel:	27.2 ft/s
27	- Process Duty:	109.5 MM BTU/hr			
28	- Duty (Heater Fuel Gas):	136.9 MM BTU/hr			
29					
30					
31					
32	- Tag: 106-H-0605			- Fuel Gas:	206.7 lb/h
33	- Stack Height:	42.0 ft		- Flue Gas:	5246.1 lb/h
34	- Stack Diameter (ID):	2'	2.0 ft	- Flue Gas Temp:	790.2 °F
35	- Stack Area:	3.1 ft ²		- Density:	0.0296 lb/ft ³
36				- Flue Gas Vel:	15.7 ft/s
37	- Process Duty:	4.56 MM BTU/hr			
38	- Duty (Heater Fuel Gas):	5.70 MM BTU/hr			
39					
40	6. DIESEL HDT				
41					
42	- Tag: 110-H-1001			- Fuel Gas:	707.3 lb/h
43	- Stack Height:	96.0 ft		- Flue Gas:	17947.2 lb/h
44	- Stack Diameter (ID):	2' 9"	2.8 ft	- Flue Gas Temp:	790.2 °F
45	- Stack Area:	5.9 ft ²		- Density:	0.0296 lb/ft ³
46				- Flue Gas Vel:	28.4 ft/s
47	- Process Duty:	15.6 MM BTU/hr			
48	- Duty (Heater Fuel Gas):	19.50 MM BTU/hr			
49					
50					
51					
52	- Tag: 110-H-1002			- Fuel Gas:	990.2 lb/h
53	- Stack Height:	91.0 ft		- Flue Gas:	25126.1 lb/h
54	- Stack Diameter (ID):	3' 6"	3.5 ft	- Flue Gas Temp:	790.2 °F
55	- Stack Area:	9.6 ft ²		- Density:	0.0296 lb/ft ³
56				- Flue Gas Vel:	24.5 ft/s
57	- Process Duty:	21.84 MM BTU/hr			
58	- Duty (Heater Fuel Gas):	27.30 MM BTU/hr			
59					
60					


		<h2 style="margin: 0;">CALCULATION NOTES</h2>		Job No: P-5715043-01	
				Spec. No.:	
CODE: N/A		UNIT: N/A		Sh. 3 of 3 Rev. G	
LOCATION: N/A					
1					
2	7. HYDROCRACKER (HYK)				
3					
4	- Tag: 112-H-1201			- Fuel Gas:	1347.8 lb/h
5	- Stack Height:	100.0 ft		- Flue Gas:	34200.9 lb/h
6	- Stack Diameter (ID):	4' 4.0 ft		- Flue Gas Temp:	790.0 °F
7	- Stack Area:	12.6 ft ²		- Density:	0.0296 lb/ft ³
8				- Flue Gas Vel:	25.5 ft/s
9	- Process Duty:	29.7 MM BTU/hr			
10	- Duty (Heater Fuel Gas):	37.16 MM BTU/hr			
11					
12	- Tag: 112-H-1202			- Fuel Gas:	1463.1 lb/h
13	- Stack Height:	100.0 ft		- Flue Gas:	37127.7 lb/h
14	- Stack Diameter (ID):	4' 4.0 ft		- Flue Gas Temp:	790.4 °F
15	- Stack Area:	12.6 ft ²		- Density:	0.0296 lb/ft ³
16				- Flue Gas Vel:	27.7 ft/s
17	- Process Duty:	32.3 MM BTU/hr			
18	- Duty (Heater Fuel Gas):	40.34 MM BTU/hr			
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					
41					
42					
43					
44					
45					
46					
47					
48					
49					
50					
51					
52					
53					
54					
55					
56					
57					
58					
59					
60					

		<h2 style="margin: 0;">CALCULATION NOTES</h2>		Job No: P-5715043-01																																																													
				Spec. No.:																																																													
CODE: N/A		UNIT: Boiler		Sh. 1 of 1 Rev. G																																																													
LOCATION: N/A																																																																	
1	<div style="margin-left: 20px;"> <p>Boiler</p> <p>- Site Conditions:</p> <ul style="list-style-type: none"> Relative Humidity: 66 % RH Pressure: 0 psig Temperature (for efficiency): 60 °F <p>- Radiant Duty Heat loss: 1.5 %</p> <p>- Heat Efficiency: 93 %</p> <p>- Excess Air: 12 %</p> <p>- Fuel Gas Composition (% mass):</p> <table style="margin-left: 20px; border-collapse: collapse;"> <tr><td>Hydrogen</td><td style="text-align: right;">23.2</td></tr> <tr><td>Methane</td><td style="text-align: right;">13.4</td></tr> <tr><td>Ethane</td><td style="text-align: right;">27.0</td></tr> <tr><td>Propane</td><td style="text-align: right;">17.8</td></tr> <tr><td>Butane</td><td style="text-align: right; border-bottom: 1px solid black;">18.6</td></tr> <tr><td></td><td style="text-align: right;">100.0</td></tr> </table> <p>- Tag: High Pressure Steam Boiler</p> <p>- Boiler Capacity: 15000 lb/hr</p> <table style="margin-left: 20px; border-collapse: collapse;"> <tr> <td>- Stack Height:</td><td style="text-align: right;">100.0 ft</td> <td>- Fuel Gas:</td><td style="text-align: right;">797.6 lb/h</td> </tr> <tr> <td>- Stack Diameter (ID):</td><td style="text-align: right;">2' 2.0 ft</td> <td>- Flue Gas:</td><td style="text-align: right;">18942.8 lb/h</td> </tr> <tr> <td>- Stack Area:</td><td style="text-align: right;">3.1 ft²</td> <td>- Flue Gas Temp:</td><td style="text-align: right;">300.4 °F</td> </tr> <tr> <td></td><td></td> <td>- Density:</td><td style="text-align: right;">0.0484 lb/ft³</td> </tr> <tr> <td>- Process Duty:</td><td style="text-align: right;">20.45 MM BTU/hr</td> <td>- Flue Gas Vel:</td><td style="text-align: right;">34.6 ft/s</td> </tr> <tr> <td>- Duty (Heater Fuel Gas):</td><td style="text-align: right;">22.00 MM BTU/hr</td> <td></td><td></td> </tr> </table> <p>- Tag: Medium Pressure Steam Boiler</p> <p>- Boiler Capacity: 10350 lb/hr</p> <table style="margin-left: 20px; border-collapse: collapse;"> <tr> <td>- Stack Height:</td><td style="text-align: right;">100.0 ft</td> <td>- Fuel Gas:</td><td style="text-align: right;">423.6 lb/h</td> </tr> <tr> <td>- Stack Diameter (ID):</td><td style="text-align: right;">1' 8" 1.7 ft</td> <td>- Flue Gas:</td><td style="text-align: right;">10059.8 lb/h</td> </tr> <tr> <td>- Stack Area:</td><td style="text-align: right;">2.2 ft²</td> <td>- Flue Gas Temp:</td><td style="text-align: right;">300.5 °F</td> </tr> <tr> <td></td><td></td> <td>- Density:</td><td style="text-align: right;">0.0484 lb/ft³</td> </tr> <tr> <td>- Process Duty:</td><td style="text-align: right;">10.86 MM BTU/hr</td> <td>- Flue Gas Vel:</td><td style="text-align: right;">26.5 ft/s</td> </tr> <tr> <td>- Duty (Heater Fuel Gas):</td><td style="text-align: right;">11.68 MM BTU/hr</td> <td></td><td></td> </tr> </table> </div>					Hydrogen	23.2	Methane	13.4	Ethane	27.0	Propane	17.8	Butane	18.6		100.0	- Stack Height:	100.0 ft	- Fuel Gas:	797.6 lb/h	- Stack Diameter (ID):	2' 2.0 ft	- Flue Gas:	18942.8 lb/h	- Stack Area:	3.1 ft ²	- Flue Gas Temp:	300.4 °F			- Density:	0.0484 lb/ft ³	- Process Duty:	20.45 MM BTU/hr	- Flue Gas Vel:	34.6 ft/s	- Duty (Heater Fuel Gas):	22.00 MM BTU/hr			- Stack Height:	100.0 ft	- Fuel Gas:	423.6 lb/h	- Stack Diameter (ID):	1' 8" 1.7 ft	- Flue Gas:	10059.8 lb/h	- Stack Area:	2.2 ft ²	- Flue Gas Temp:	300.5 °F			- Density:	0.0484 lb/ft ³	- Process Duty:	10.86 MM BTU/hr	- Flue Gas Vel:	26.5 ft/s	- Duty (Heater Fuel Gas):	11.68 MM BTU/hr		
Hydrogen						23.2																																																											
Methane						13.4																																																											
Ethane						27.0																																																											
Propane						17.8																																																											
Butane						18.6																																																											
						100.0																																																											
- Stack Height:						100.0 ft	- Fuel Gas:	797.6 lb/h																																																									
- Stack Diameter (ID):						2' 2.0 ft	- Flue Gas:	18942.8 lb/h																																																									
- Stack Area:						3.1 ft ²	- Flue Gas Temp:	300.4 °F																																																									
							- Density:	0.0484 lb/ft ³																																																									
- Process Duty:						20.45 MM BTU/hr	- Flue Gas Vel:	34.6 ft/s																																																									
- Duty (Heater Fuel Gas):						22.00 MM BTU/hr																																																											
- Stack Height:						100.0 ft	- Fuel Gas:	423.6 lb/h																																																									
- Stack Diameter (ID):						1' 8" 1.7 ft	- Flue Gas:	10059.8 lb/h																																																									
- Stack Area:						2.2 ft ²	- Flue Gas Temp:	300.5 °F																																																									
							- Density:	0.0484 lb/ft ³																																																									
- Process Duty:						10.86 MM BTU/hr	- Flue Gas Vel:	26.5 ft/s																																																									
- Duty (Heater Fuel Gas):						11.68 MM BTU/hr																																																											
2																																																																	
3																																																																	
4																																																																	
5																																																																	
6																																																																	
7																																																																	
8																																																																	
9																																																																	
10																																																																	
11																																																																	
12																																																																	
13																																																																	
14																																																																	
15																																																																	
16																																																																	
17																																																																	
18																																																																	
19																																																																	
20																																																																	
21																																																																	
22																																																																	
23																																																																	
24																																																																	
25																																																																	
26																																																																	
27																																																																	
28																																																																	
29																																																																	
30																																																																	
31																																																																	
32																																																																	
33																																																																	
34																																																																	
35																																																																	
36																																																																	
37																																																																	
38																																																																	
39																																																																	
40																																																																	
41																																																																	
42																																																																	
43																																																																	
44																																																																	
45																																																																	
46																																																																	
47																																																																	
48																																																																	
49																																																																	
50																																																																	
51																																																																	
52																																																																	
53																																																																	
54																																																																	
55																																																																	
56																																																																	
57																																																																	
58																																																																	
59																																																																	
60																																																																	

		<h2 style="margin: 0;">CALCULATION NOTES</h2>		Job No: P-5715043-01	
				Spec. No.:	
CODE: N/A		UNIT: N/A		Sh. 1 of 3	
LOCATION: N/A		Rev. G			

1	
2	1. PREMISES
3	
4	- Site Conditions:
5	Relative Humidity: 66 % RH
6	Pressure: 0 psig
7	Temperature (for efficiency): 60 °F
8	- Radiant Duty Heat loss: 1.5 %
9	- Heat Efficiency: 80 %
10	- Excess Air: 20 %
11	
12	- Fuel Gas Composition (% mass):
13	Hydrogen 23.2
14	Methane 13.4
15	Ethane 27.0
16	Propane 17.8
17	Butane <u>18.6</u>
18	100.0
19	
20	2. DISTILLATION UNIT
21	
22	- Tag: 101-H-0101
23	- Stack Height: 127.6 ft
24	- Stack Diameter (ID): 6' 3 1/2" 6.3 ft
25	- Stack Area: 31.1 ft ²
26	
27	- Process Duty: 65.7 MM BTU/hr
28	- Duty (Heater Fuel Gas): 82.13 MM BTU/hr
29	
30	- Fuel Gas: 2978.6 lb/h
31	- Flue Gas: 75585.3 lb/h
32	- Flue Gas Temp: 790.2 °F
33	- Density: 0.0296 lb/ft ³
34	- Flue Gas Vel: 22.8 ft/s
35	
36	
37	
38	3. VACUUM UNIT
39	
40	- Tag: 105-H-0501
41	- Stack Height: 91.0 ft
42	- Stack Diameter (ID): 2' 5" 2.4 ft
43	- Stack Area: 4.6 ft ²
44	
45	- Process Duty: 3.4 MM BTU/hr
46	- Duty (Heater Fuel Gas): 4.30 MM BTU/hr
47	
48	
49	
50	- Fuel Gas: 156.0 lb/h
51	- Flue Gas: 3957.6 lb/h
52	- Flue Gas Temp: 790.2 °F
53	- Density: 0.0296 lb/ft ³
54	- Flue Gas Vel: 8.1 ft/s
55	
56	
57	
58	
59	
60	

		CALCULATION NOTES			
				Job No: P-5715043-01	
CODE: N/A	UNIT: N/A			Sp. No.:	
		LOCATION: N/A			Sh. 2 of 3 Rev. G
1					
2					
3	- Tag: 105-H-0502			- Fuel Gas:	210.4 lb/h
4	- Stack Height:	91.0 ft		- Flue Gas:	5338.1 lb/h
5	- Stack Diameter (ID):	2' 3 3/4" 2.3 ft		- Flue Gas Temp:	790.2 °F
6	- Stack Area:	4.2 ft ²		- Density:	0.0296 lb/ft ³
7				- Flue Gas Vel:	11.9 ft/s
8	- Process Duty:	4.64 MM BTU/hr			
9	- Duty (Heater Fuel Gas):	5.80 MM BTU/hr			
10					
11					
12	- Tag: 105-H-0503			- Fuel Gas:	406.2 lb/h
13	- Stack Height:	105.0 ft		- Flue Gas:	10308.1 lb/h
14	- Stack Diameter (ID):	3' 6" 3.5 ft		- Flue Gas Temp:	790.2 °F
15	- Stack Area:	9.6 ft ²		- Density:	0.0296 lb/ft ³
16				- Flue Gas Vel:	10.1 ft/s
17	- Process Duty:	8.96 MM BTU/hr			
18	- Duty (Heater Fuel Gas):	11.20 MM BTU/hr			
19					
20	5. SR REFORMER				
21					
22	- Tag: 106-H-0601			- Fuel Gas:	1479.8 lb/h
23	- Stack Height:	130.0 ft		- Flue Gas:	37551 lb/h
24	- Stack Diameter (ID):	7' 5 1/4" 7.4 ft		- Flue Gas Temp:	790.2 °F
25	- Stack Area:	43.4 ft ²		- Density:	0.0296 lb/ft ³
26				- Flue Gas Vel:	8.1 ft/s
27	- Process Duty:	32.64 MM BTU/hr			
28	- Duty (Heater Fuel Gas):	40.80 MM BTU/hr			
29					
30					
31					
32	- Tag: 106-H-0605			- Fuel Gas:	94.3 lb/h
33	- Stack Height:	42.0 ft		- Flue Gas:	2393.0 lb/h
34	- Stack Diameter (ID):	2' 2.0 ft		- Flue Gas Temp:	790.2 °F
35	- Stack Area:	3.1 ft ²		- Density:	0.0296 lb/ft ³
36				- Flue Gas Vel:	7.1 ft/s
37	- Process Duty:	2.08 MM BTU/hr			
38	- Duty (Heater Fuel Gas):	2.60 MM BTU/hr			
39					
40	6. DIESEL HDT				
41					
42	- Tag: 110-H-1001			- Fuel Gas:	707.3 lb/h
43	- Stack Height:	96.0 ft		- Flue Gas:	17947.2 lb/h
44	- Stack Diameter (ID):	2' 9" 2.8 ft		- Flue Gas Temp:	790.2 °F
45	- Stack Area:	5.9 ft ²		- Density:	0.0296 lb/ft ³
46				- Flue Gas Vel:	28.4 ft/s
47	- Process Duty:	15.6 MM BTU/hr			
48	- Duty (Heater Fuel Gas):	19.50 MM BTU/hr			
49					
50					
51					
52	- Tag: 110-H-1002	96.0 ft	2' 9" 2.8 ft	- Fuel Gas:	707.3 lb/h
53	- Stack Height:	96.0 ft	2' 9" 2.8 ft	- Flue Gas:	17947.2 lb/h
54	- Stack Diameter (ID):	2' 9" 2.8 ft	2' 9" 2.8 ft	- Flue Gas Temp:	790.2 °F
55	- Stack Area:	5.9 ft²	5.9 ft²	- Density:	0.0296 lb/ft³
56	- Process Duty:	15.6 MM BTU/hr	15.6 MM BTU/hr	- Flue Gas Vel:	28.4 ft/s
57	- Duty (Heater Fuel Gas):	19.50 MM BTU/hr	19.50 MM BTU/hr		
58					
59					
60					

		<h2 style="margin: 0;">CALCULATION NOTES</h2>		Job No: P-5715043-01																																												
				CODE:		UNIT: Boiler		Spc. No.:																																								
N/A		LOCATION: N/A		Sh. 1 of 1		Rev. G																																										
1	<div style="border: 1px solid black; padding: 5px;"> <p>Boiler</p> <ul style="list-style-type: none"> - Site Conditions: <li style="padding-left: 20px;">Relative Humidity: 66 % RH <li style="padding-left: 20px;">Pressure: 0 psig <li style="padding-left: 20px;">Temperature (for efficiency): 60 °F - Radiant Duty Heat loss: 1.5 % - Heat Efficiency: 93 % - Excess Air: 12 % - Fuel Gas Composition (% mass): <li style="padding-left: 20px;">Hydrogen 23.2 <li style="padding-left: 20px;">Methane 13.4 <li style="padding-left: 20px;">Ethane 27.0 <li style="padding-left: 20px;">Propane 17.8 <li style="padding-left: 20px;">Butane <u>18.6</u> <li style="padding-left: 40px;">100.0 <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr> <td colspan="6" style="text-align: center;"> <div style="background-color: #cccccc; border: 1px solid black; padding: 2px;"> Tag: Medium Pressure Steam Boiler </div> </td> </tr> <tr> <td style="width: 30%;">Boiler Capacity:</td> <td style="width: 15%;">10350 lb/hr</td> <td style="width: 15%;"></td> <td style="width: 15%;"></td> <td style="width: 15%;">Fuel Gas:</td> <td style="width: 10%;">423.6 lb/h</td> </tr> <tr> <td>Stack Height:</td> <td>100.0 ft</td> <td></td> <td></td> <td>Flue Gas:</td> <td>10059.8 lb/h</td> </tr> <tr> <td>Stack Diameter (ID):</td> <td>1' 8" 1.7 ft</td> <td></td> <td></td> <td>Flue Gas Temp:</td> <td>300.5 °F</td> </tr> <tr> <td>Stack Area:</td> <td>2.2 ft²</td> <td></td> <td></td> <td>Density:</td> <td>0.0484 lb/ft³</td> </tr> <tr> <td>Process Duty:</td> <td>10.86 MM BTU/hr</td> <td></td> <td></td> <td>Flue Gas Vel:</td> <td>26.5 ft/s</td> </tr> <tr> <td>Duty (Heater Fuel Gas):</td> <td>11.68 MM BTU/hr</td> <td></td> <td></td> <td></td> <td></td> </tr> </table> </div>						<div style="background-color: #cccccc; border: 1px solid black; padding: 2px;"> Tag: Medium Pressure Steam Boiler </div>						Boiler Capacity:	10350 lb/hr			Fuel Gas:	423.6 lb/h	Stack Height:	100.0 ft			Flue Gas:	10059.8 lb/h	Stack Diameter (ID):	1' 8" 1.7 ft			Flue Gas Temp:	300.5 °F	Stack Area:	2.2 ft ²			Density:	0.0484 lb/ft ³	Process Duty:	10.86 MM BTU/hr			Flue Gas Vel:	26.5 ft/s	Duty (Heater Fuel Gas):	11.68 MM BTU/hr				
<div style="background-color: #cccccc; border: 1px solid black; padding: 2px;"> Tag: Medium Pressure Steam Boiler </div>																																																
Boiler Capacity:							10350 lb/hr			Fuel Gas:	423.6 lb/h																																					
Stack Height:							100.0 ft			Flue Gas:	10059.8 lb/h																																					
Stack Diameter (ID):							1' 8" 1.7 ft			Flue Gas Temp:	300.5 °F																																					
Stack Area:							2.2 ft ²			Density:	0.0484 lb/ft ³																																					
Process Duty:							10.86 MM BTU/hr			Flue Gas Vel:	26.5 ft/s																																					
Duty (Heater Fuel Gas):							11.68 MM BTU/hr																																									
2																																																
3																																																
4																																																
5																																																
6																																																
7																																																
8																																																
9																																																
10																																																
11																																																
12																																																
13																																																
14																																																
15																																																
16																																																
17																																																
18																																																
19																																																
20																																																
21																																																
22																																																
23																																																
24																																																
25																																																
26																																																
27																																																
28																																																
29																																																
30																																																
31																																																
32																																																
33																																																
34																																																
35																																																
36																																																
37																																																
38																																																
39																																																
40																																																
41																																																
42																																																
43																																																
44																																																
45																																																
46																																																
47																																																
48																																																
49																																																
50																																																
51																																																
52																																																
53																																																
54																																																
55																																																
56																																																
57																																																
58																																																
59																																																
60																																																



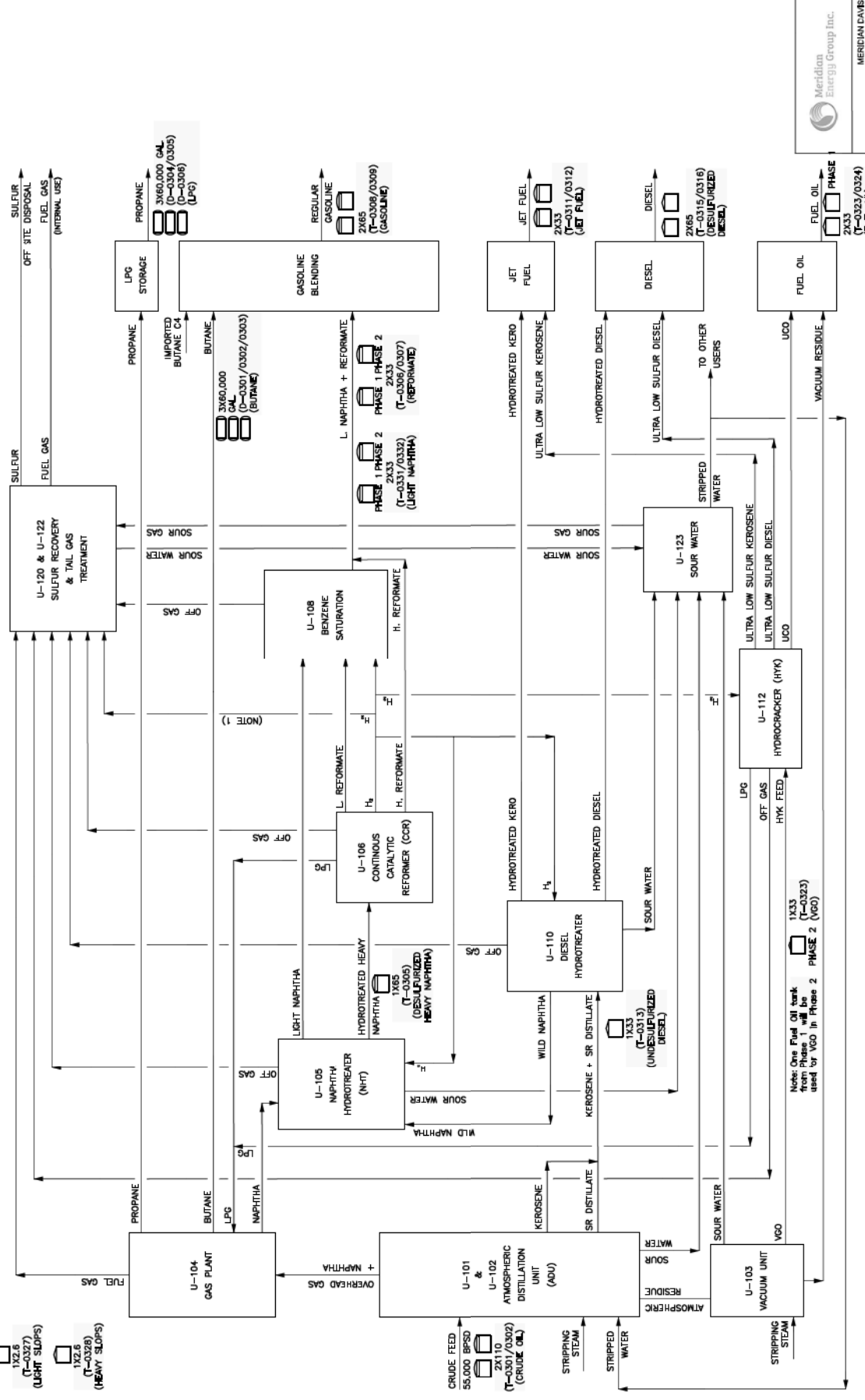
Utility Requirements
Davis Refinery Phase 2

	ADU A	ADU B	Gas Plant A	Gas Plant B	Vacuum	NHT	CCR Reformer	BenFreeC w/Splitter	Diesel HT	Hydrocracker	SWSU	SRU	BFW/Steam /Condensate	Storage
Notes						(2)	(3)(5)			(6)				
Unit Feed Rate	27,500	27,500	9,500	9,500	16,800	18,205	16,128	8,322	19,525	14,380				
Utilities														
HP Steam	0	0	0	0	0	0	0	0	0	25,658	0	0	0	0
MP Steam	0	0	0	0	0	0	0	16,727	4,881	-21,322	0	0	0	0
LP Steam	5,000	5,000	0	0	7,000	0	0	416	0	-2,760	6,600	17	1,686	6,572
Electricity	2,166	2,166	748	748	630	1,045	4339	371	3,510	3,669	345	0	150	TBD
Cooling Water (4)	0	0	0	0	1,110	0	1,954	332	0	4,640	0	0	4	0
Fuel Gas (1)	82.13	82.13	0.00	0.00	75.00	35.70	142.60	0.00	46.80	77.53	0.00	0	143.92	TBD
Sour Steam Condensate	5,000	5,000	0	0	0	4,915	7,500	0	1,027	8,055	0	0	0	0
Process Water	13,159	13,159	0	0	0	0	0	0	0	0	0	0	0	0
Stripped Sour Water	11,021	11,021	0	0	0	0	0	0	0	0	0	0	0	0
Fresh Caustic (2.5 wt%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acid	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Steam condensate Return	0	0	0	0	0	0	0	17,143	4,881	0	6,600	0	0	0
Waste Effluents														
Sour Water	0	0	0	0	6,650	4,670	0	0	976	9,746	0	0	0	0
H2S Content	1	1	0	0	0	315	0	0	18,183	9,775	0	0	0	0
Desalter Brine / Oily Water	23,180	29,180	0	0	0	0	0	0	0	0	0	0	0	0
Spent Caustic	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Max Flare Loading	3:2,205	312,205	53,926	53,926	51,692	67,359	10,483	209,465	117,150	82,316	18,870	0	0	12,050
MW	101	101	85	85	134	92	10	86	100	5	18			

Notes:

- 1- Fired duty of fired heaters assuming 80% efficiency
- 2- Wash water (Process Water) is intermittent use only
- 3- Regenerator waste water will contain dissolved CO₂, HCl, and salt traces
- 4- Cooling water usage assumes 15 temperature rise and Air Cooling break-point of 110 F.
- 5- Constant production of regenerator burn gas 620 lb/hr with the following composition
 Composition: N₂ + CO₂ + O₂ + HCl + Cl₂
 N₂ vol % 82 to 100
 CO₂ vol % 17 to 0
 O₂ vol % 1 to 0
 HCl + Cl₂ vol/ppm 1 max
- 6- Steam balance based on a back-pressure recycle compressor producing MP Steam

U-203 STORAGE



REV.	DATE	BY	CHK	APP.	NO.	DESCRIPTION	REVISION
A	03/17	A			1	FOR INFORMATION ONLY	

ENGINEER'S RECORD	DATE	NAME	APP.
DESIGNED	03/17	M. DAVIS	
CHECKED	03/17	C. DAVIS	
APPROVED	03/17	L. DAVIS	
SCALE	AS SHOWN		
PROJECT NO.	P-5715043-01-16-03-010X		
SHEET NO.	1		
TITLE	BLOCK FLOW DIAGRAM		



REFERENCE DRAWINGS	DESCRIPTION

SCALE	DATE	BY	CHK	APP.
NONE	TBD			



Meridian Energy Group Inc.
MERICAN DAVIS REFINERY
PERMITS SUPPORT

BLOCK FLOW DIAGRAM
LUGO STORAGE
DAVIS REFINERY

 Meridian Energy Group Inc.	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: OF	

APPENDIX D – VENDOR DATA





Project: 7118
Client: Meridian
Location: North Dakota

Date: 2/23/2016
Revision: 7

Phase 2 Permit and Utilities Information - Hydrocracker Scheme

	NHT + Splitter (2)	CCR Reformer (3)(5)	BenFreeC w/Splitter	DHT + Splitter	Hydrocracker Max Steam Gen. (6)	Hydrocracker Min FG Consumption (6)
Unit Feed Rate	18,205	16,128	8,322	19,525	14,380	14,380
Utilities						
HP Steam	0	0	0	0	25,658	25,453
MP Steam	0	0	16,727	4,881	-26,653	-21,322
LP Steam	0	0	416	0	-6,133	-2,760
Electricity	1045	4339	371	3510	3669	3,596
Cooling Water (4)	0	1,954	332	0	2,309	4,640
Fuel Gas (1)	35.7	142.6	0.0	46.8	77.5	60.9
Process Water	4,915	7,500	0	1,027	8,055	8,055
Fresh Caustic (100 wt%)	0	0	0	0	0	0
Acid	0	0	0	0	0	0
Waste Effluents	0	0	0	0	0	0
Sour Wash Water	4,670	0	0	976	9,746	9,746
H2S Content	315	0	0	18,183	9,775	9,775
Spent Caustic	0	0	0	0	0	0
Max Flare Loading	67,359	10,483	209,465	117,150	82,316	82,316
MW	92	10	86	100	5	5

Notes:

- 1- Fired duty of fired heaters assuming 80% efficiency
- 2- Wash water (Process Water) is intermittent use only
- 3- Regenerator waste water will contain dissolved CO₂, HCl, and salt traces
- 4- Cooling water usage assumes 15 F temperature rise and Air Cooling break-point of 110 F.
- 5- Constant production of regenerator burn gas 620 lb/hr with the following composition.

Composition: N₂ + CO₂ + O₂ + HCl + Cl₂

N ₂	vol %	82	to	100
CO ₂	vol %	17	to	0
O ₂	vol %	1	to	0
HCl + Cl ₂	volppm	1	max	

6- Steam balance based on a back-pressure recycle compressor producing MP Steam. Turbine drive to be adjusted based on refinery steam balance.