Meridian Energy Group Inc.	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	vepica USA
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		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 MMTBU.
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.

Table 3: Summary of changes to tankage

Product	Changes
Crude oil	Reduced number of tanks from 3 to 2
Gasolinel	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

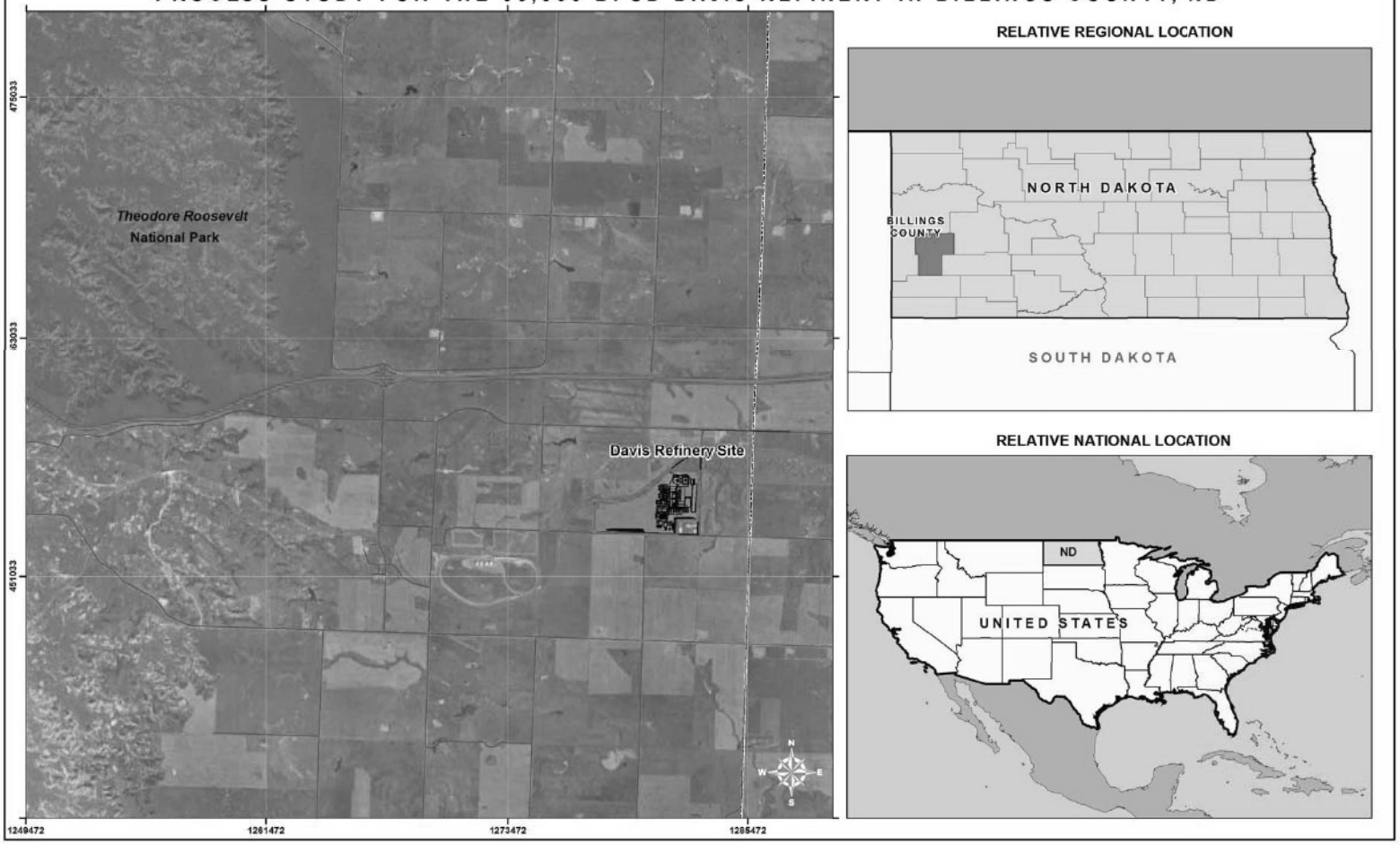
It is important to highlight that the estimations for New Source Review (NSR) regulated pollutants presented in this document comprise normal operating scenarios using the engineering, licensor and vendor data available to date. Additionally, Greenhouse Gas (GHG) emissions are not included as part of 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 (PM_{10}), particulate matter with a diameter of 2.5 microns or less ($PM_{2.5}$), sulfur dioxide (SO_2), nitrogen oxides (NOx), carbon monoxide (CO), ozone (as VOCs), lead (Pb), hydrogen sulfide (H_2S) 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.

FIGURE 1.: SITE LOCATION MAP

PROCESS STUDY FOR THE 55,000 BPSD DAVIS REFINERY IN BILLINGS COUNTY, ND



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.

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

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

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 Recoivery 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.

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

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

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 Plant	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

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	

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 IIII 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).

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.

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		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: 20 OF 35	

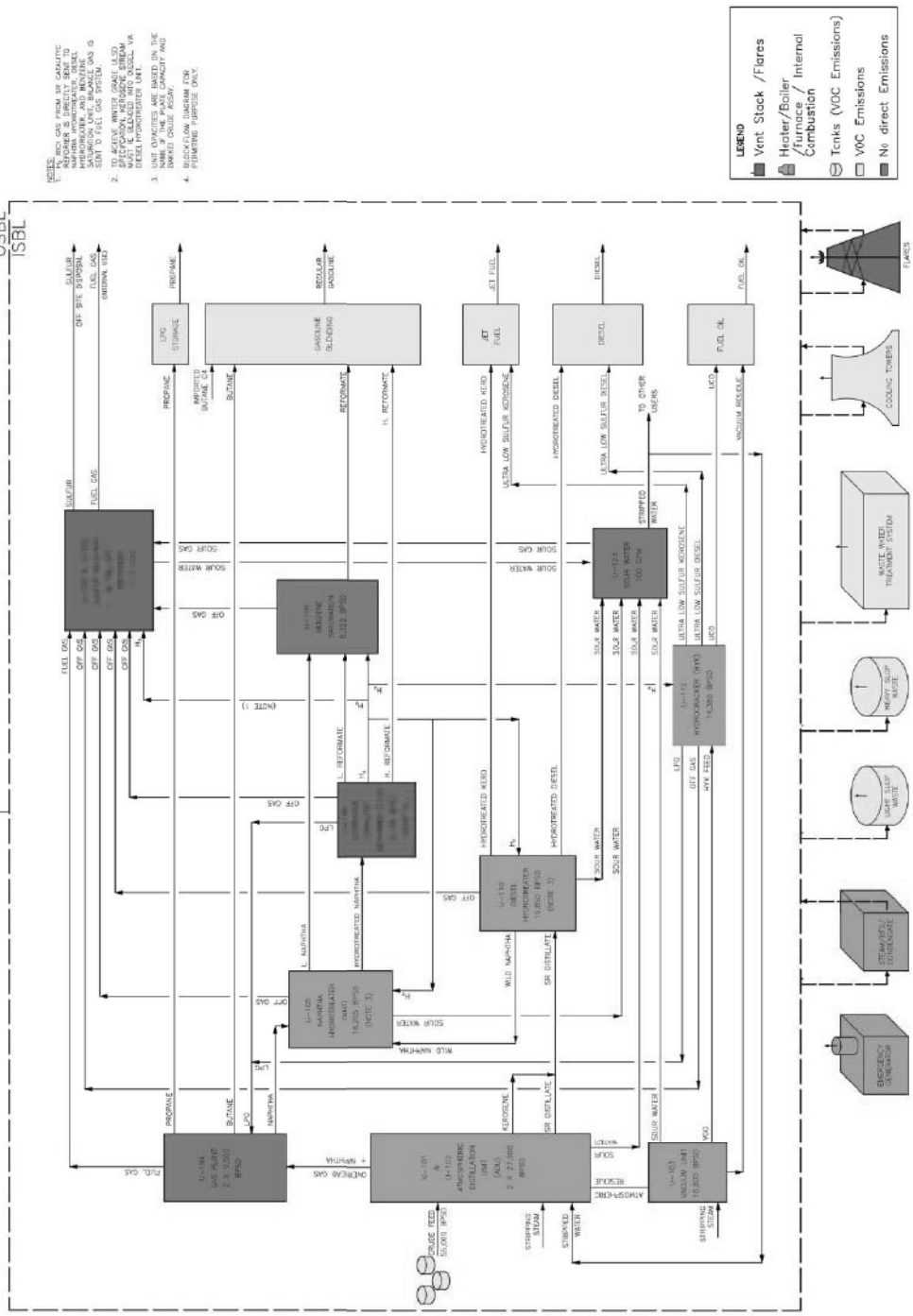

Figure 2: Identification of emission sources per main process units (full refinery scenario)

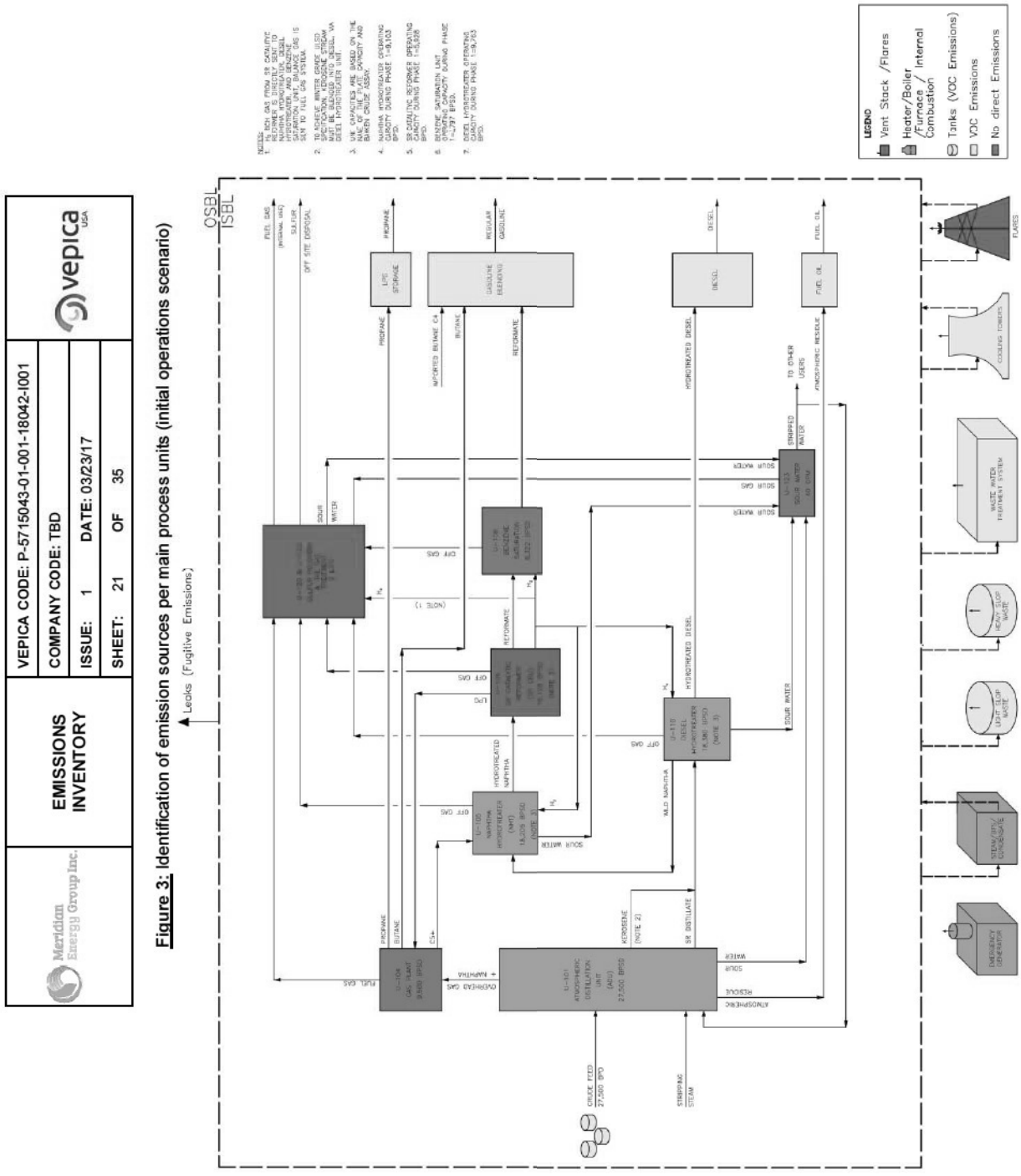

Figure 3: Identification of emission sources per main process units (initial operations scenario)

6. CALCULATION BASIS

This section describes de 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, Meridian 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. Meridian'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.

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.

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 (NOx), and carbon monoxide (CO) were utilized to obtain the controlled emissions inventory process for process heaters and utility boilers. For emission estimates of SO_2 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 NOx 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 (MMBTUh) 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.

6.4.1. Catalytic Reforming Unit (CRU)

Meridian 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 Cl_2 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 H_2S 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 H_2S concentrations and has an H_2S 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.

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 Distilation 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., CH_4, CO, VOC, and specific organic HAP) that are not combusted in the flare; SO_2 resulting from the oxidation of sulfur compound impurities, such as H_2S, in the gas stream; and CO_2 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

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 PM2.5 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.

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:*

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.

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

	Criteria Pollutants										HAPs
Emissions Unit	CO	Pb	PM<10	Filerable 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	195.29	29.26
Tanks	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
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	3,679.20	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	290.73	32.17
Cooling Towers	0.00	0.00	82.78	0.00	0.00	0.00	0.00	0.00	0.00	15.77	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
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)	**79.60**	**1.34E-03**	**93.71**	**2.73**	**10.92**	**2.73**	**8.19**	**86.04**	**7.02**	**5,032.62**	**81.78**

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

	Criteria Pollutants										HAPs
Emissions Unit	CO	Pb	PM<10	Filerable 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	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**

Meridian Energy Group Inc.	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	vepica USA
		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.

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

	Criteria Pollutants										HAPs
Emissions Unit	CO	Pb	PM<10	Filerable 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**

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

	Criteria Pollutants										HAPs
Emissions Unit	CO	Pb	PM<10	Filerable 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	10.27	1.20
Tanks	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
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
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	9.62	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
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)	**26.46**	**3.90E-04**	**3.71**	**0.80**	**3.19**	**0.80**	**2.39**	**13.04**	**3.11**	**36.71**	**11.74**

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

9. REFERENCES

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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

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

APPENDIX A - EMISSIONS INVENTORY CALCULATION NOTES

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

SECTION 1: Results for Equipment Leaks

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

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

Table A1-2 – Controlled Emissions from Leaking Equipment

					LDAR Program*	Controlled Leak Emissions (VOC) in lb/h							
	Median Equipments Leak Components Count	Screening Value (ppmv)**	Emission Factor (Kg/h)***	Emission Factor (lb/h)***	Yes	Crude Distillation	Hydrocracker	Catalytic reforming	Hydrotreating/ hydrorefining	Product blending	Sulfur plant	Vacuum distillation	TOTAL
Valves	Gas	500	2,36E-04	5,21E-04	97%	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	0,00E+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	
	Sampling Connections	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	**3.81**
				Total Controlled (STPY)		4.22	2.53	1.09	2.04	1.99	0.93	3.9	**16.70**

Adapted from Table 2-6. *Refinery and SOCMI Average Component Emission Factors* of Emissions Estimation Protocol for Petroleum Refineries, Version 3 (RTI, 2015). Emission factors used, based in a threshold of 500 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 SOCMI 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

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

	Average Weight Percent of Compound in Process Unit Streams[1]						
HAPs	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	2.8	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.

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

	Controlled Leak Emissions (HAP) in STPY								
HAPs	Crude Distillation	Hydrocracker	Catalytic reforming	Hydrotreat/ hydrorefining	Product blending	Sulfur plant	Vacuum distillation	Total Uncontrolled HAPs (STPY)	Total HAPs Controlled (lb/h)
1,3-Butadiene	4.22E-04	6.32E-04	9.78E-05	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	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	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	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	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	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	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	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	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	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	3.51E-03	1.05E-02	2.40E-03
	0.45	**0.30**	**0.60**	**0.15**	**0.00**	**0.00**	**0.01**	**1.51**	**0.35**

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		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-6 OF A-34	

SECTION 2: Results for Storage Tanks

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

			Emissions per Tank (pounds/year)				Emissions per Tank (STPY)			Total VOC Tank Emissions (STPY)		
	Qty.	Roof Type ->	IFR / External Self Supporting Roof[1]	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
CRUDE OIL	2.00	115 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			0.850			1.70E+00	
STRAGHT RUN DIESEL	1.00	63 ID X 60		804.84	804.84			0.402			4.02E-01	
VACUUM GASOIL	1.00	63 ID X 60		8.00	8.00			0.004			4.00E-03	
FUEL OIL	1.00	63 ID X 60		8.00	8.00			0.004			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			0.02			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 NESHAP requirements for storage tanks in the petroleum industry.

[2] Emission Estimates from EPA Tanks 4.09d modeled runs

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

	Emissions Factors for Petroleum Liquid Storage Tanks (lb/MMbbl)*			Emissions (lb/h)			STPY (Uncontrolled)			Control Efficiencies			STPY (Controlled)				
Chemical Name	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	TOTAL (STPY)	TOTAL (lb/h)
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	60%	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	60%	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	60%	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	60%	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	60%	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	60%	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	60%	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	60%	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	60%	60%	0%	0.00E+00	0.001	0.001	2.31E-03	5.28E-04
Hexane	84	420	480	1.93E-01	5.78E-01	4.40E-01	0.84	2.53E+00	1.93E+00	60%	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	60%	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	60%	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	60%	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	60%	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	60%	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	60%	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	60%	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	60%	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	60%	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	60%	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**	**0.45**	**3.82**	**4.28**		

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.

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		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-9 OF A-34	

SECTION 3: Results for Stationary Combustion

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

	Atmospheric Distillation Unit #1		Atmospheric Distillation Unit #2		Vacuum Distillation Unit		Hydrocraking (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-0301		112-H-1201		112-H-1202		105-H-0501	
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)	Emissions (lb/h)	Emission (STPY)	Emissions (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)	Emissions (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)
Carbon Monoxide	2.30E+00	1.01E+01	2.30E+00	1.01E+01	2.10E+00	9.20E+00	1.04E+00	4.56E+00	1.13E+00	4.95E+00	2.41E-01	1.05E+00
Lead	4.02E-05	1.76E-04	4.02E-05	1.76E-04	3.68E-05	1.61E-04	1.82E-05	7.98E-05	1.98E-05	8.66E-05	4.21E-06	1.85E-05
PM (Total)	3.29E-01	1.44E+00	3.29E-01	1.44E+00	3.00E-01	1.31E+00	1.49E-01	6.51E-01	1.61E-01	7.07E-01	3.44E-02	1.51E-01
PM (Condensable)	2.46E-01	1.08E+00	2.46E-01	1.08E+00	2.25E-01	9.86E-01	1.11E-01	4.88E-01	1.21E-01	5.30E-01	2.58E-02	1.13E-01
PM (Filterable)	8.21E-02	3.60E-01	8.21E-02	3.60E-01	7.50E-02	3.29E-01	3.72E-02	1.63E-01	4.03E-02	1.77E-01	8.60E-03	3.77E-02
NOx	5.17E-01	2.27E+00	5.17E-01	2.27E+00	4.73E-01	2.07E+00	2.34E-01	1.03E+00	2.54E-01	1.11E+00	2.58E-01	1.13E+00
SOx	4.83E-02	2.12E-01	4.83E-02	2.12E-01	4.41E-02	1.93E-01	2.19E-02	9.57E-02	2.37E-02	1.04E-01	5.06E-03	2.22E-02
VOC	4.43E-01	1.94E+00	4.43E-01	1.94E+00	4.04E-01	1.77E+00	2.00E-01	8.78E-01	2.18E-01	9.53E-01	4.64E-02	2.03E-01
Metal HAP (Total)	6.01E-04	2.63E-03	6.01E-04	2.63E-03	5.48E-04	2.40E-03	2.72E-04	1.19E-03	2.95E-04	1.29E-03	6.29E-05	2.75E-04
Org HAP (Total)	1.61E-01	7.03E-01	1.61E-01	7.03E-01	1.47E-01	6.42E-01	7.27E-02	3.18E-01	7.89E-02	3.46E-01	1.68E-02	7.37E-02
Org HAP (Controlled)	4.02E-02	1.76E-01	4.02E-02	1.76E-01	3.67E-02	1.61E-01	1.82E-02	7.96E-02	1.97E-02	8.64E-02	4.20E-03	1.84E-02

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

	Naphtha Hydrotreater (NHT)				Distillates Hydrotreater (DHT)				Catalytic Reformer Unit			
	Stabilizer Reboiler 105-H-0502		Splitter Reboiler 105-H-0503		Reactors Heater 110-H-1001		Splitter 110-H-1002		Reactor Heater 106-H-0601/2/3		Stabilizer Reboiler 106-H-0605	
Heat Capacity (MMBTU/h)	9.3		17.9		19.5		27.3		136.9	Total combined heaters duty	5.7	
SCR Control Device (YES/NO)?	NO		NO		NO		NO		YES		NO	
Best Combustion Practice (5 ppm)	YES		YES		YES		YES		YES		YES	
Criteria Pollutants	Emissions (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)	Emissions (lb/h)	Emission (STPY)	Emissions (lb/h)	Emission (STPY)	Emissions (lb/h)	Emission (STPY)	Emissions (lb/h)	Emission (STPY)
Carbon Monoxide	2.60E-01	1.14E+00	5.01E-01	2.20E+00	5.46E-01	2.39E+00	7.64E-01	3.35E+00	3.83E+00	1.68E+01	1.60E-01	6.99E-01
Lead	4.56E-06	2.00E-05	8.77E-06	3.84E-05	9.56E-06	4.19E-05	1.34E-05	5.86E-05	6.71E-05	2.94E-04	2.79E-06	1.22E-05
PM (Total)	3.72E-02	1.63E-01	7.16E-02	3.14E-01	7.80E-02	3.42E-01	1.09E-01	4.78E-01	5.48E-01	2.40E+00	2.28E-02	9.99E-02
PM (Condensable)	2.79E-02	1.22E-01	5.37E-02	2.35E-01	5.85E-02	2.56E-01	8.19E-02	3.59E-01	4.11E-01	1.80E+00	1.71E-02	7.49E-02
PM (Filterable)	9.30E-03	4.07E-02	1.79E-02	7.84E-02	1.95E-02	8.54E-02	2.73E-02	1.20E-01	1.37E-01	6.00E-01	5.70E-03	2.50E-02
NOx	2.79E-01	1.22E+00	5.37E-01	2.35E+00	5.85E-01	2.56E+00	8.19E-01	3.59E+00	8.62E-01	3.78E+00	1.71E-01	7.49E-01
SOx	5.47E-03	2.40E-02	1.05E-02	4.61E-02	1.15E-02	5.02E-02	1.61E-02	7.03E-02	8.05E-02	3.53E-01	3.35E-03	1.47E-02
VOC	5.01E-02	2.20E-01	9.65E-02	4.23E-01	1.05E-01	4.61E-01	1.47E-01	6.45E-01	7.38E-01	3.23E+00	3.07E-02	1.35E-01
Metal HAP (Total)	6.80E-05	2.98E-04	1.31E-04	5.73E-04	1.43E-04	6.25E-04	2.00E-04	8.74E-04	1.00E-03	4.38E-03	4.17E-05	1.83E-04
Org HAP (Total)	1.82E-02	7.97E-02	3.50E-02	1.53E-01	3.81E-02	1.67E-01	5.34E-02	2.34E-01	2.68E-01	1.17E+00	1.11E-02	4.88E-02
Org HAP (Controlled)	4.55E-03	1.99E-02	8.75E-03	3.83E-02	9.53E-03	4.18E-02	1.33E-02	5.85E-02	6.69E-02	2.93E-01	2.79E-03	1.22E-02

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		11.68	
SCR Control Device (YES/NO)?	NO		NO		NO		NO		NO	
Best Combustion Practice (5 ppm)	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)	Total Emissions (STPY)
Carbon Monoxide	6.16E-01	2.70E+00	6.16E-01	2.70E+00	3.27E-01	1.43E+00	3.27E-01	1.43E+00	3.27E-01	1.43E+00	76.16
Lead	1.08E-05	4.72E-05	1.08E-05	4.72E-05	5.72E-06	2.51E-05	5.72E-06	2.51E-05	5.72E-06	2.51E-05	1.33E-03
PM (Total)	8.80E-02	3.85E-01	8.80E-02	3.85E-01	4.67E-02	2.05E-01	4.67E-02	2.05E-01	4.67E-02	2.05E-01	10.88
PM (Condensable)	6.60E-02	2.89E-01	6.60E-02	2.89E-01	3.50E-02	1.53E-01	3.50E-02	1.53E-01	3.50E-02	1.53E-01	8.16
PM (Filterable)	2.20E-02	9.64E-02	2.20E-02	9.64E-02	1.17E-02	5.12E-02	1.17E-02	5.12E-02	1.17E-02	5.12E-02	2.72
NOx	6.60E-01	2.89E+00	6.60E-01	2.89E+00	3.50E-01	1.53E+00	3.50E-01	1.53E+00	3.50E-01	1.53E+00	34.51
SOx	1.29E-02	5.67E-02	1.29E-02	5.67E-02	6.87E-03	3.01E-02	6.87E-03	3.01E-02	6.87E-03	3.01E-02	1.60
VOC	1.19E-01	5.20E-01	1.19E-01	5.20E-01	6.30E-02	2.76E-01	6.30E-02	2.76E-01	6.30E-02	2.76E-01	14.67
Metal HAP (Total)	1.61E-04	7.05E-04	1.61E-04	7.05E-04	8.54E-05	3.74E-04	8.54E-05	3.74E-04	8.54E-05	3.74E-04	1.99E-02
Org HAP (Total)	4.30E-02	1.88E-01	4.30E-02	1.88E-01	2.28E-02	1.00E-01	2.28E-02	1.00E-01	2.28E-02	1.00E-01	5.32
Org HAP (Controlled)	1.08E-02	4.71E-02	1.08E-02	4.71E-02	5.71E-03	2.50E-02	5.71E-03	2.50E-02	5.71E-03	2.50E-02	1.33

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 STPY	**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 I 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, PM2.5 or PM1 emissions.

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

			EMERGENCY GENERATOR SET						
			216-EG-1601A		216-EG-1601B		216-EG-1601C		
Criteria Pollutants	Emission Factor		Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)	Total Emissions Gen Set (STPY)
	lb/HP-hr	lb/MMBTU							
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)		0.0573	3.32	0.17	3.3	0.2	3.3	0.2	4.98E-01
PM 10 (Filterable)		0.0496	2.87	0.14	2.9	0.1	2.9	0.1	4.31E-01
PM 2.5 (Total)		0.0479	2.78	0.14	2.8	0.1	2.8	0.1	4.16E-01
PM 2.5(Filterable)		0.0479	2.78	0.14	2.8	0.1	2.8	0.1	4.16E-01
PM (Condensable)		0.0077	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

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

			FIREWATER PUMPS						
			212-P-1201 A		212-P-1201 B		212-P-1201 C		
Criteria Pollutants	Emission Factor		Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)	Total Emissions FWP (STPY)
	lb/HP-hr	lb/MMBTU							
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-fuel 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"

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		SHEET: A-15 OF A-34	

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

		EMERGENCY GENERATOR SETx3		FIREWATER PUMPSx3	
Volatile HAPS	lb/MMBTU	lb/hr	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"

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		SHEET: A-16 OF A-34	

SECTION 4: Results for Process Vents

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		SHEET: A-17 OF A-34	

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

		Catalytic Reformer Unit	
	Emissions Factor (lb/Mbbl fresh feed)	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 naphtalene		1.62E-06	

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		SHEET: A-18 OF A-34	

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

		Catalytic Reformer Unit	
	Emissions Factor (lb/Mbbl fresh feed)	Emission (lb/h)	Emission (STPY)
HAP			
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)

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		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/h sulfur	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)	4,149.7	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	67.1550	401.3185								
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	0.978							
				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.

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		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.

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		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-21 OF A-34	

SECTION 5: Flares

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

						Emissions (lb/h)							
					EF (lb/MMBTU)*	CO	Pb	PM total	PM COND	PM FILT	NOX	SO2	VOC
Tag	Flare	# Pilots	NG Flow/Pilot	NG SCF/h	MMBTU/h	0.0280000	0.0000005	0.0040000	0.0030000	0.0010000	0.0300000	0.0005882	0.0053922
207-FL-1701	Enclosed HC Operating Flare	12	100	1200	1.224	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-1702	Acid Flare	2	100	200	0.204	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-1703	HC Emergency Flare 1	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
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 I, Chapter 1: External Combustion Sources.

Table A5-2 – Total Flare HAP Emissions [a]

Compound	Emission Factor (tons/yr/bbl/cd)	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**

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

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		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-23 OF A-34	

SECTION 6: Wastewater Treatment System

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	167,942	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	3.365	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

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 (STPY) 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 7-9. *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

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		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-26 OF A-34	

SECTION 7: Cooling Towers

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

			For 1 cell		For 4 cells	
Emission	Emission Factor* (lb/Mgal)	TDS Concentration (ppm)	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)

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		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-28 OF A-34	

SECTION 8: Product Loading

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.

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		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: A-30 OF A-34	

SECTION 9: Fugitive Dust

Meridian Energy Group Inc.	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	vepica USA
		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 / day	0.04 mile / Round Trip	365 day / year	=	2,349	VMT / 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

Meridian Energy Group Inc.	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	vepica USA
		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	ton	=	7.78E-04	Ton PM 2.5
			VMT	d	year	2000 lb			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	ton	=	3.17E-03	Ton PM TOT
			VMT	d	year	2000 lb			Year
	0.003lb	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

Meridian Energy Group Inc.	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	vepica USA
		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	=	4.42E-05	lb PM 2.5
				VMT	d	24 h			h
			0.00003 lb	37.88 VMT	365 day	ton	=	1.94E-04	Ton PM 2.5
			VMT	d	year	2000 lb			Year
	0.00003 lb	37.88 VMT	d	h	kg	1000 g	=	5.57E-06	g PM 2.5
	VMT	d	24 h	3600 s	2.206 lb	s			s

Meridian Energy Group Inc.	EMISSIONS INVENTORY	VEPICA CODE: P-5715043-01-001-18042-I001	vepica USA
		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								

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		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 Indentification 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

Meterological 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) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Crude oil (RVP 5)	Jan	30.90	24.94	36.87	43.84	1.5709	N/A	N/A	50.0000			207.00	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 4: RVP=5

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

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

Month:	January	February	March	April	May	June	July	August	September	October	November	December
Rim Seal Losses (lb):	3.4568	3.8010	4.4754	5.3621	6.2266	6.9539	7.4116	7.0488	6.0270	5.1682	4.2114	3.5887
Seal Factor A (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
Seal Factor B (lb-mole/ft-yr (mph)^n):	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000
Value of Vapor Pressure Function:	0.0301	0.0331	0.0389	0.0466	0.0541	0.0605	0.0644	0.0613	0.0524	0.0449	0.0366	0.0312
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.5709	1.7173	1.9992	2.3601	2.7017	2.9814	3.1539	3.0174	2.6237	2.2821	1.8896	1.6272
Tank Diameter (ft):	115.0000	115.0000	115.0000	115.0000	115.0000	115.0000	115.0000	115.0000	115.0000	115.0000	115.0000	115.0000
Vapor Molecular Weight (lb/lb-mole):	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000
Product Factor:	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000
Withdrawal Losses (lb):	194.6791	194.6791	194.6791	194.6791	194.6791	194.6791	194.6791	194.6791	194.6791	194.6791	194.6791	194.6791
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.):	23,406,964.333323	406,964.333323	406,964.333323	406,964.333323	406,964.333323	406,964.333323	406,964.333323	406,964.333323	406,964.333323	406,964.333323	406,964.333323	406,964.3333
Shell Clingage Factor (bbl/1000 sqft):	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060
Average Organic Liquid Density (lb/gal):	7.1000	7.1000	7.1000	7.1000	7.1000	7.1000	7.1000	7.1000	7.1000	7.1000	7.1000	7.1000
Tank Diameter (ft):	115.0000	115.0000	115.0000	115.0000	115.0000	115.0000	115.0000	115.0000	115.0000	115.0000	115.0000	115.0000
Deck Fitting Losses (lb):	2.6853	2.9526	3.4766	4.1653	4.8369	5.4019	5.7574	5.4756	4.6819	4.0147	3.2715	2.7878
Value of Vapor Pressure Function:	0.0301	0.0331	0.0389	0.0466	0.0541	0.0605	0.0644	0.0613	0.0524	0.0449	0.0366	0.0312
Vapor Molecular Weight (lb/lb-mole):	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000
Product Factor:	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000
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
Deck Seam Length Factor(ft/sqft):	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):	115.0000	115.0000	115.0000	115.0000	115.0000	115.0000	115.0000	115.0000	115.0000	115.0000	115.0000	115.0000
Vapor Molecular Weight (lb/lb-mole):	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000
Product Factor:	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000	0.4000
Total Losses (lb):	200.8212	201.4327	202.6311	204.2065	205.7426	207.0348	207.8481	207.2034	205.3880	203.8620	202.1619	201.0555

Roof Fitting/Status	Quantity	Roof Fitting Loss Factors KFa(lb-mole/yr)	KFb(lb-mole/(yr mph^n))	m	Losses(lb)
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1	1.60	0.00	0.00	1.4803
Automatic Gauge Float Well/Bolted Cover, Gasketed	1	2.80	0.00	0.00	2.5905
Roof Leg or Hanger Well/Fixed	39	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	39.7827
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1	6.20	1.20	0.94	5.7361

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

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawl Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
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 Indentification 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

Meterological 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) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
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	1.1601	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):	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000
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):	6.0558	6.0558	6.0558	6.0558	6.0558	6.0558	6.0558	6.0558	6.0558	6.0558	6.0558	6.0558
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.):	2,472,422.4160	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
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):	6.4000	6.4000	6.4000	6.4000	6.4000	6.4000	6.4000	6.4000	6.4000	6.4000	6.4000	6.4000
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):	5.3099	5.3099	5.5965	6.7079	8.1167	9.1815	9.8046	9.3134	7.8065	6.4736	5.3099	5.3099
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 Molecular Weight (lb/lb-mole):	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000
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
Deck Seam Length Factor(ft/sqft):	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):	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000	80.0000
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):	13.9811	13.9811	14.4088	16.0676	18.1703	19.7595	20.6896	19.9565	17.7073	15.7180	13.9811	13.9811

Roof Fitting/Status	Quantity	Roof Fitting Loss Factors KFa(lb-mole/yr)	KFb(lb-mole/(yr mph^n))	m	Losses(lb)
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1	1.60	0.00	0.00	2.5188
Automatic Gauge Float Well/Bolted Cover, Gasketed	1	2.80	0.00	0.00	4.4078
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	67.6919
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1	6.20	1.20	0.94	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

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

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification 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

Meterological 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) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 7.8)	Jan	30.90	24.94	36.87	43.84	2.1175	N/A	N/A	68.0000			92.00	Optior 4: RVP=7.8, ASTM Slope=3
Gasoline (RVP 7.8)	Feb	34.98	28.04	41.91	43.84	2.3194	N/A	N/A	68.0000			92.00	Optior 4: RVP=7.8, ASTM Slope=3
Gasoline (RVP 7.8)	Mar	42.09	33.80	50.39	43.84	2.7093	N/A	N/A	68.0000			92.00	Optior 4: RVP=7.8, ASTM Slope=3
Gasoline (RVP 7.8)	Apr	50.10	39.90	60.29	43.84	3.2102	N/A	N/A	68.0000			92.00	Optior 4: RVP=7.8, ASTM Slope=3
Gasoline (RVP 7.8)	May	56.81	45.06	68.55	43.84	3.6857	N/A	N/A	68.0000			92.00	Optior 4: RVP=7.8, ASTM Slope=3
Gasoline (RVP 7.8)	Jun	61.81	49.29	74.32	43.84	4.0761	N/A	N/A	68.0000			92.00	Optior 4: RVP=7.8, ASTM Slope=3
Gasoline (RVP 7.8)	Jul	64.71	51.53	77.88	43.84	4.3173	N/A	N/A	68.0000			92.00	Optior 4: RVP=7.8, ASTM Slope=3
Gasoline (RVP 7.8)	Aug	62.42	50.31	74.54	43.84	4.1264	N/A	N/A	68.0000			92.00	Optior 4: RVP=7.8, ASTM Slope=3
Gasoline (RVP 7.8)	Sep	55.34	45.27	65.40	43.84	3.5770	N/A	N/A	68.0000			92.00	Optior 4: RVP=7.8, ASTM Slope=3
Gasoline (RVP 7.8)	Oct	48.45	40.33	56.58	43.84	3.1018	N/A	N/A	68.0000			92.00	Optior 4: RVP=7.8, ASTM Slope=3
Gasoline (RVP 7.8)	Nov	39.43	33.50	45.36	43.84	2.5576	N/A	N/A	68.0000			92.00	Optior 4: RVP=7.8, ASTM Slope=3
Gasoline (RVP 7.8)	Dec	32.50	27.06	37.95	43.84	2.1952	N/A	N/A	68.0000			92.00	Optior 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)^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:	0.0414	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):	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
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	22.6217	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
Deck Seam Length Factor(ft/sqft):	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	50.3388	45.7712	40.7208	37.4865

Roof Fitting/Status	Quantity	Roof Fitting Loss Factors KFa(lb-mole/yr)	KFb(lb-mole/(yr mph^n))	m	Losses(lb)
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1	1.60	0.00	0.00	7.1214
Automatic Gauge Float Well/Bolted Cover, Gasketed	1	2.80	0.00	0.00	12.4624
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	191.3864
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1	6.20	1.20	0.94	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

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

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification 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

Meterological 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) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
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	20.7858	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 (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:	0.1015	0.1125	0.1348	0.1662	0.1583	0.1806	0.1953	0.1836	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	6.3627	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 (gal/mo.):	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	0.1836	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
Deck Seam Length Factor(ft/sqft):	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	86.5334	87.1852	73.9186	65.8083

Roof Fitting/Status	Quantity	Roof Fitting Loss Factors KFa(lb-mole/yr)	KFb(lb-mole/(yr mph^n))	m	Losses(lb)
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1	1.60	0.00	0.00	14.4595
Automatic Gauge Float Well/Bolted Cover, Gasketed	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. Actuation, 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

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawl Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
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 Indentification 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

Meterological 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) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calcuations
Jet kerosene	Jan	30.90	24.94	36.87	43.84	0.0041	N/A	N/A	130.0000			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			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			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			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			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			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			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			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			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			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			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			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)^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:	0.0001	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
Deck Seam Length Factor(ft/sqft):	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	Roof Fitting Loss Factors KFa(lb-mole/yr)	KFb(lb-mole/(yr mph^n))	m	Losses(lb)
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1	1.60	0.00	0.00	0.0236
Automatic Gauge Float Well/Bolted Cover, Gasketed	1	2.80	0.00	0.00	0.0414
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	0.6351
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1	6.20	1.20	0.94	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

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

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification 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

Meterological 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) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
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-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	12.3566	8.0394	4.1466	4.0158
Vapor Space Volume (cu ft):	42,602.3525	42,602.3525	42,602.3525	42,602.3525	42,602.3525	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	0.9945	0.9949	0.9960	0.9969	0.9978	0.9978
Tank Vapor Space Volume:												
Vapor Space Volume (cu ft):	42,602.3525	42,602.3525	42,602.3525	42,602.3525	42,602.3525	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												
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 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
Daily Avg. Liquid Surface Temp. (deg. R):	490.5714	494.6481	501.7622	509.7657	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	1,558.7475	1,888.7083	2,096.8374	2,152.6770	1,833.8206	1,343.3212	900.7295	543.8008	431.4872
Vapor Space Expansion Factor												
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	40.2550	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	0.0056	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	509.7657	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	504.9429	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												
Vented Vapor Saturation Factor:	0.9978	0.9978	0.9975	0.9967	0.9958	0.9950	0.9945	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 (gal/mo.):	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

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

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

Identification

User Identification:	203-T-015
City:	Belfield
State:	North Dakota
Company:	Meridian
Type of Tank:	Vertical Fixed Roof Tank
Description:	ULSD

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

Meterological 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) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
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	0.9959	0.9968	0.9977	0.9977
Tank Vapor Space Volume:												
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
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 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
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):	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 (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												
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 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
Daily Avg. Liquid Surface Temp. (deg. R):	490.5714	494.6481	501.7622	509.7657	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	1,558.7475	1,888.7083	2,096.8374	2,152.6770	1,833.8206	1,343.3212	900.7295	543.8008	431.4872
Vapor Space Expansion Factor												
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	40.2550	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	0.0056	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	509.7657	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	504.9429	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												
Vented Vapor Saturation Factor:	0.9977	0.9977	0.9975	0.9967	0.9957	0.9949	0.9943	0.9948	0.9959	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	0.0056	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	138.6559	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	0.0056	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

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

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification 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/VGO

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

Meterological 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) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
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	0.0001	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	0.1994	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	42,602.3525	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:												
Vapor Space Volume (cu ft):	42,602.3525	42,602.3525	42,602.3525	42,602.3525	42,602.3525	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												
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 Molecular Weight (lb/lb-mole):	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 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	515.9347	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	56.9500	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):	503.9258	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 Absorptance (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 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	1,558.7475	1,888.7083	2,096.8374	2,152.6770	1,833.8206	1,343.3212	900.7295	543.8008	431.4872
Vapor Space Expansion Factor												
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):	24.9098	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	515.9347	508.8579	499.6358	492.6486
Daily Min. Liquid Surface Temp. (deg R):	484.8751	487.9997	493.7771	499.9050	505.0822	509.3284	511.5711	510.3280	505.2627	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	526.7067	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												
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

Working Losses (lb):	0.3454	0.3454	0.3972	0.5387	0.6578	0.8015	0.9027	0.8177	0.6272	0.5041	0.3454	0.3454
Vapor Molecular Weight (lb/lb-mole):	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 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
Net Throughput (gal/mo.):	4,290,356.0000	4,290,356.0000	4,290,356.0000	4,290,356.0000	4,290,356.0000	4,290,356.0000	4,290,356.0000	4,290,356.0000	4,290,356.0000	4,290,356.0000	4,290,356.0000	4,290,356.0000
Annual Turnovers:	41.4815	41.4815	41.4815	41.4815	41.4815	41.4815	41.4815	41.4815	41.4815	41.4815	41.4815	41.4815
Turnover Factor:	0.8899	0.8899	0.8899	0.8899	0.8899	0.8899	0.8899	0.8899	0.8899	0.8899	0.8899	0.8899
Maximum Liquid Volume (gal):	1,241,137.2100	1,241,137.2100	1,241,137.2100	1,241,137.2100	1,241,137.2100	1,241,137.2100	1,241,137.2100	1,241,137.2100	1,241,137.2100	1,241,137.2100	1,241,137.2100	1,241,137.2100
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):	0.3896	0.3923	0.4682	0.6513	0.8187	1.0008	1.1443	1.0190	0.7527	0.5886	0.3864	0.3849

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

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

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification 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

Meterological 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) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Gasoline (RVP 15.0)	Jan	30.90	24.94	36.87	43.84	4.6376	N/A	N/A	60.0000			92.00	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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)^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:	0.1015	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	42.6382	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
Deck Seam Length Factor(ft/sqft):	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	59.7970	49.9295	39.7972	33.6029

Roof Fitting/Status	Quantity	Roof Fitting Loss Factors KFa(lb-mole/yr)	KFb(lb-mole/(yr mph^n))	m	Losses(lb)
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1	1.60	0.00	0.00	16.1109
Automatic Gauge Float Well/Bolted Cover, Gasketed	1	2.80	0.00	0.00	28.1940
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	432.9792
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1	6.20	1.20	0.94	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

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

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

Identification

User Identification:	203-T-028
City:	Belfield
State:	North Dakota
Company:	Meridian
Type of Tank:	Vertical Fixed Roof Tank
Description:	Heavy Slops

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

Meterological 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) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
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	1.1601	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:												
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
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												
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 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):	0.0043	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	56.9500	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	1,558.7475	1,888.7083	2,096.8374	2,152.6770	1,833.8206	1,343.3212	900.7295	543.8008	431.4872
Vapor Space Expansion Factor												
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												
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

Working Losses (lb):	2.3168	2.3168	2.3168	2.3168	2.3168	2.3168	2.3168	2.3168	2.3168	2.3168	2.3168	2.3168
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):	0.0043	0.0043	0.0043	0.0043	0.0043	0.0043	0.0043	0.0043	0.0043	0.0043	0.0043	0.0043
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
Annual Turnovers:	23.0932	23.0932	23.0932	23.0932	23.0932	23.0932	23.0932	23.0932	23.0932	23.0932	23.0932	23.0932
Turnover 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
Maximum Liquid Volume (gal):	91,277.0000	91,277.0000	91,277.0000	91,277.0000	91,277.0000	91,277.0000	91,277.0000	91,277.0000	91,277.0000	91,277.0000	91,277.0000	91,277.0000
Maximum Liquid Height (ft):	27.0000	27.0000	27.0000	27.0000	27.0000	27.0000	27.0000	27.0000	27.0000	27.0000	27.0000	27.0000
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
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):	3.4769	3.3646	3.4769	3.4395	3.4769	3.4395	3.4769	3.4769	3.4395	3.4769	3.4395	3.4769

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

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

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification 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

Meterological 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) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
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	14.8808	12.4828	9.9594	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)^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:	0.0826	0.0913	0.1090	0.1333	0.1583	0.1806	0.1953	0.1836	0.1524	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	6.3627	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	0.1836	0.1524	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
Deck Seam Length Factor(ft/sqft):	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	Roof Fitting Loss Factors KFa(lb-mole/yr)	KFb(lb-mole/(yr mph^n))	m	Losses(lb)
Access Hatch (24-in. Diam.)/Bolted Cover, Gasketed	1	1.60	0.00	0.00	13.2690
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. Actuation, 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

	Losses(lbs)				
Components	Rim Seal Loss	Withdrawl Loss	Deck Fitting Loss	Deck Seam Loss	Total Emissions
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	vepica USA
		COMPANY CODE: TBD	
		ISSUE: 1 DATE: 03/23/17	
		SHEET: OF	

APPENDIX C ENGINEERING DATA

vepica USA

CALCULATION NOTES

Job No: N/A

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

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

vepica USA	CALCULATION NOTES	Job No: P-5715043-01	
CODE: N/A	UNIT: N/A	Spc. No.:	
	LOCATION: N/A	Sh. 1 of 3	Rev. G

1. PREMISES

- Site Conditions:
  Relative Humidity: 66 % RH
  Pressure: 0 psig
  Temperature (for efficiency): 60 °F
- Radiant Duty Heat loss: 1.5 %
- Heat Efficiency: 80 %
- Excess Air: 20 %

- Fuel Gas Composition (% mass):

Hydrogen	23.2
Methane	13.4
Ethane	27.0
Propane	17.8
Butane	18.6
	100.0

2. DISTILLATION UNIT

- Tag: 101-H-0101				- Fuel Gas:	2978.6	lb/h
- Stack Height:	127.6 ft			- Flue Gas:	75585.3	lb/h
- Stack Diameter (ID):	6' 3 1/2"	6.3	ft	- Flue Gas Temp:	790.2	°F
- Stack Area:	31.1 ft^2			- Density:	0.0296	lb/ft^3
				- Flue Gas Vel:	22.8	ft/s
- Process Duty:	65.7 MM BTU/hr					
- Duty (Heater Fuel Gas):	82.13 MM BTU/hr					
- Tag: 102-H-0201				- Fuel Gas:	2978.6	lb/h
- Stack Height:	127.6 ft			- Flue Gas:	75585.3	lb/h
- Stack Diameter (ID):	6' 3 1/2"	6.3	ft	- Flue Gas Temp:	790.2	°F
- Stack Area:	31.1 ft^2			- Density:	0.0296	lb/ft^3
				- Flue Gas Vel:	22.8	ft/s
- Process Duty:	65.7 MM BTU/hr					
- Duty (Heater Fuel Gas):	82.13 MM BTU/hr					

3. VACUUM UNIT

- Tag: 103-H-0301				- Fuel Gas:	2720.2	lb/h
- Stack Height:	125.0 ft			- Flue Gas:	69027.7	lb/h
- Stack Diameter (ID):	6' 6"	6.5	ft	- Flue Gas Temp:	790.2	°F
- Stack Area:	33.2 ft^2			- Density:	0.0296	lb/ft^3
				- Flue Gas Vel:	19.5	ft/s
- Process Duty:	60.0 MM BTU/hr					
- Duty (Heater Fuel Gas):	75.00 MM BTU/hr					

4. NHDT

- Tag: 105-H-0501				- Fuel Gas:	311.9	lb/h
- Stack Height:	91.0 ft			- Flue Gas:	7915.2	lb/h
- Stack Diameter (ID):	2' 5"	2.4	ft	- Flue Gas Temp:	790.2	°F
- Stack Area:	4.6 ft^2			- Density:	0.0296	lb/ft^3
				- Flue Gas Vel:	16.2	ft/s
- Process Duty:	6.9 MM BTU/hr					
- Duty (Heater Fuel Gas):	8.60 MM BTU/hr					

vepica USA	CALCULATION NOTES	Job No: P-5715043-01	
CODE: N/A	UNIT: N/A	Spc. No.:	
	LOCATION: N/A	Sh. 2 of 3	Rev. G

- Tag: 105-H-0502
- Stack Height: 91.0 ft
- Stack Diameter (ID): 2' 3 3/4" 2.3 ft
- Stack Area: 4.2 ft^2
- Process Duty: 7.4 MM BTU/hr
- Duty (Heater Fuel Gas): 9.30 MM BTU/hr
- Fuel Gas: 337.3 lb/h
- Flue Gas: 8559.4 lb/h
- Flue Gas Temp: 790.2 °F
- Density: 0.0296 lb/ft^3
- Flue Gas Vel: 19.1 ft/s

'- Tag: 105-H-0503
- Stack Height: 105.0 ft
- Stack Diameter (ID): 3' 6" 3.5 ft
- Stack Area: 9.6 ft^2
- Process Duty: 14.3 MM BTU/hr
- Duty (Heater Fuel Gas): 17.90 MM BTU/hr
- Fuel Gas: 649.2 lb/h
- Flue Gas: 16474.6 lb/h
- Flue Gas Temp: 790.2 °F
- Density: 0.0296 lb/ft^3
- Flue Gas Vel: 16.1 ft/s

5. CCR REFORMER

- Tag: 106-H-0601
- Stack Height: 130.0 ft
- Stack Diameter (ID): 7' 5 1/4" 7.4 ft
- Stack Area: 43.4 ft^2
- Process Duty: 109.5 MM BTU/hr
- Duty (Heater Fuel Gas): 136.9 MM BTU/hr
- Fuel Gas: 4965.3 lb/h
- Flue Gas: 125998 lb/h
- Flue Gas Temp: 790.2 °F
- Density: 0.0296 lb/ft^3
- Flue Gas Vel: 27.2 ft/s

- Tag: 106-H-0605
- Stack Height: 42.0 ft
- Stack Diameter (ID): 2' 2.0 ft
- Stack Area: 3.1 ft^2
- Process Duty: 4.56 MM BTU/hr
- Duty (Heater Fuel Gas): 5.70 MM BTU/hr
- Fuel Gas: 206.7 lb/h
- Flue Gas: 5246.1 lb/h
- Flue Gas Temp: 790.2 °F
- Density: 0.0296 lb/ft^3
- Flue Gas Vel: 15.7 ft/s

6. DIESEL HDT

- Tag: 110-H-1001
- Stack Height: 96.0 ft
- Stack Diameter (ID): 2' 9" 2.8 ft
- Stack Area: 5.9 ft^2
- Process Duty: 15.6 MM BTU/hr
- Duty (Heater Fuel Gas): 19.50 MM BTU/hr
- Fuel Gas: 707.3 lb/h
- Flue Gas: 17947.2 lb/h
- Flue Gas Temp: 790.2 °F
- Density: 0.0296 lb/ft^3
- Flue Gas Vel: 28.4 ft/s

- Tag: 110-H-1002
- Stack Height: 91.0 ft
- Stack Diameter (ID): 3' 6" 3.5 ft
- Stack Area: 9.6 ft^2
- Process Duty: 21.84 MM BTU/hr
- Duty (Heater Fuel Gas): 27.30 MM BTU/hr
- Fuel Gas: 990.2 lb/h
- Flue Gas: 25126.1 lb/h
- Flue Gas Temp: 790.2 °F
- Density: 0.0296 lb/ft^3
- Flue Gas Vel: 24.5 ft/s

vepica USA	CALCULATION NOTES	Job No: P-5715043-01	
CODE:	UNIT: N/A	Spc. No.:	
N/A	LOCATION: N/A	Sh. 3 of 3	Rev. G

7. HYDROCRACKER (HYK)

- Tag: 112-H-1201				- Fuel Gas:	1347.8	lb/h
- Stack Height:	100.0 ft			- Flue Gas:	34200.9	lb/h
- Stack Diameter (ID):	4'	4.0	ft	- Flue Gas Temp:	790.0	°F
- Stack Area:	12.6	ft^2		- Density:	0.0296	lb/ft^3
				- Flue Gas Vel:	25.5	ft/s
- Process Duty:	29.7	MM BTU/hr				
- Duty (Heater Fuel Gas):	37.16	MM BTU/hr				
- Tag: 112-H-1202				- Fuel Gas:	1463.1	lb/h
- Stack Height:	100.0 ft			- Flue Gas:	37127.7	lb/h
- Stack Diameter (ID):	4'	4.0	ft	- Flue Gas Temp:	790.4	°F
- Stack Area:	12.6	ft^2		- Density:	0.0296	lb/ft^3
				- Flue Gas Vel:	27.7	ft/s
- Process Duty:	32.3	MM BTU/hr				
- Duty (Heater Fuel Gas):	40.34	MM BTU/hr				

vepica USA	CALCULATION NOTES	
		Job No: P-5715043-01
CODE:	UNIT: Boiler	Spc. No.:
N/A	LOCATION: N/A	Sh. 1 of 1 Rev. G

Boiler

- Site Conditions:
  Relative Humidity: 66 % RH
  Pressure: 0 psig
  Temperature (for efficiency): 60 °F
- Radiant Duty Heat loss: 1.5 %
- Heat Efficiency: 93 %
- Excess Air: 12 %

- Fuel Gas Composition (% mass):

Hydrogen	23.2
Methane	13.4
Ethane	27.0
Propane	17.8
Butane	18.6
	100.0

- Tag: High Pressure Steam Boiler
- Boiler Capacity: 15000 lb/hr

- 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				

- Tag: Medium Pressure Steam Boiler
- Boiler Capacity: 10350 lb/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				

vepica USA	CALCULATION NOTES	
		Job No: P-5715043-01
CODE:	UNIT: N/A	Spc. No.:
N/A	LOCATION: N/A	Sh. 1 of 3 Rev. G

1. PREMISES

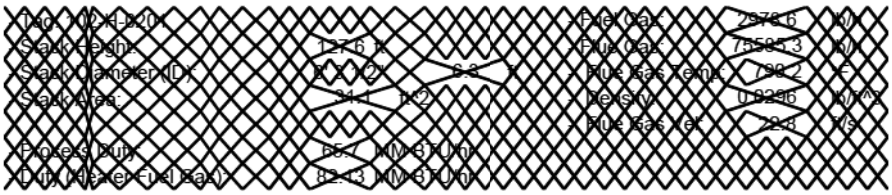
- Site Conditions:
  Relative Humidity: 66 % RH
  Pressure: 0 psig
  Temperature (for efficiency): 60 °F
- Radiant Duty Heat loss: 1.5 %
- Heat Efficiency: 80 %
- Excess Air: 20 %

- Fuel Gas Composition (% mass):

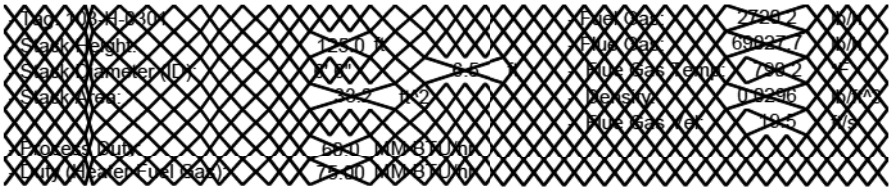
Hydrogen	23.2
Methane	13.4
Ethane	27.0
Propane	17.8
Butane	18.6
	100.0

2. DISTILLATION UNIT

- Tag: 101-H-0101				- Fuel Gas:	2978.6	lb/h
- Stack Height:	127.6 ft			- Flue Gas:	75585.3	lb/h
- Stack Diameter (ID):	6' 3 1/2"	6.3	ft	- Flue Gas Temp:	790.2	°F
- Stack Area:	31.1	ft^2		- Density:	0.0296	lb/ft^3
				- Flue Gas Vel:	22.8	ft/s
- Process Duty:	65.7	MM BTU/hr				
- Duty (Heater Fuel Gas):	82.13	MM BTU/hr				



3. VACUUM UNIT



4. NHDT

- Tag: 105-H-0501				- Fuel Gas:	156.0	lb/h
- Stack Height:	91.0 ft			- Flue Gas:	3957.6	lb/h
- Stack Diameter (ID):	2' 5"	2.4	ft	- Flue Gas Temp:	790.2	°F
- Stack Area:	4.6	ft^2		- Density:	0.0296	lb/ft^3
				- Flue Gas Vel:	8.1	ft/s
- Process Duty:	3.4	MM BTU/hr				
- Duty (Heater Fuel Gas):	4.30	MM BTU/hr				

vepica USA	CALCULATION NOTES	Job No: P-5715043-01	
CODE: N/A	UNIT: N/A	Spc. No.:	
	LOCATION: N/A	Sh. 2 of 3	Rev. G

- Tag: 105-H-0502
- Stack Height: 91.0 ft
- Stack Diameter (ID): 2' 3 3/4" 2.3 ft
- Stack Area: 4.2 ft^2
- Process Duty: 4.64 MM BTU/hr
- Duty (Heater Fuel Gas): 5.80 MM BTU/hr
- Fuel Gas: 210.4 lb/h
- Flue Gas: 5338.1 lb/h
- Flue Gas Temp: 790.2 °F
- Density: 0.0296 lb/ft^3
- Flue Gas Vel: 11.9 ft/s

'- Tag: 105-H-0503
- Stack Height: 105.0 ft
- Stack Diameter (ID): 3' 6" 3.5 ft
- Stack Area: 9.6 ft^2
- Process Duty: 8.96 MM BTU/hr
- Duty (Heater Fuel Gas): 11.20 MM BTU/hr
- Fuel Gas: 406.2 lb/h
- Flue Gas: 10308.1 lb/h
- Flue Gas Temp: 790.2 °F
- Density: 0.0296 lb/ft^3
- Flue Gas Vel: 10.1 ft/s

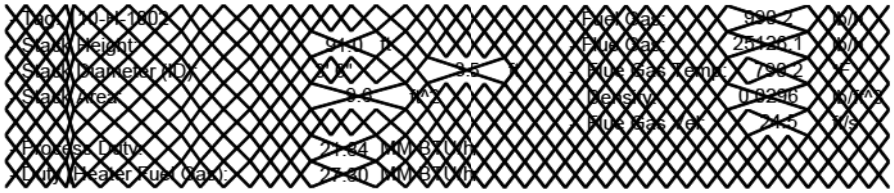
5. SR REFORMER

- Tag: 106-H-0601
- Stack Height: 130.0 ft
- Stack Diameter (ID): 7' 5 1/4" 7.4 ft
- Stack Area: 43.4 ft^2
- Process Duty: 32.64 MM BTU/hr
- Duty (Heater Fuel Gas): 40.80 MM BTU/hr
- Fuel Gas: 1479.8 lb/h
- Flue Gas: 37551 lb/h
- Flue Gas Temp: 790.2 °F
- Density: 0.0296 lb/ft^3
- Flue Gas Vel: 8.1 ft/s

- Tag: 106-H-0605
- Stack Height: 42.0 ft
- Stack Diameter (ID): 2' 2.0 ft
- Stack Area: 3.1 ft^2
- Process Duty: 2.08 MM BTU/hr
- Duty (Heater Fuel Gas): 2.60 MM BTU/hr
- Fuel Gas: 94.3 lb/h
- Flue Gas: 2393.0 lb/h
- Flue Gas Temp: 790.2 °F
- Density: 0.0296 lb/ft^3
- Flue Gas Vel: 7.1 ft/s

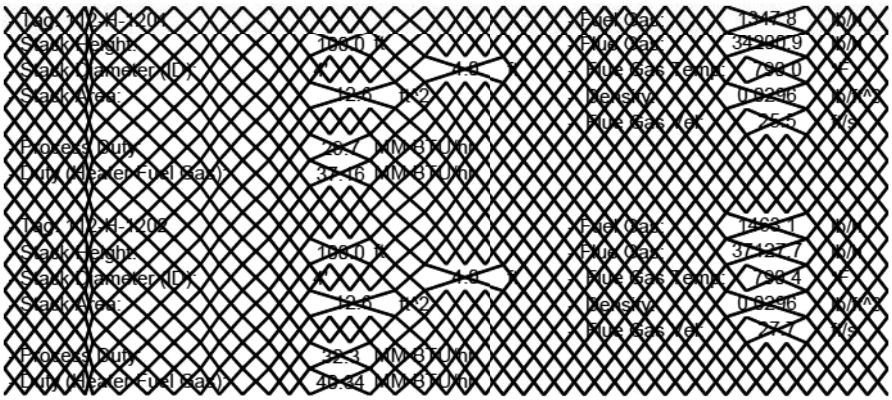
6. DIESEL HDT

- Tag: 110-H-1001
- Stack Height: 96.0 ft
- Stack Diameter (ID): 2' 9" 2.8 ft
- Stack Area: 5.9 ft^2
- Process Duty: 15.6 MM BTU/hr
- Duty (Heater Fuel Gas): 19.50 MM BTU/hr
- Fuel Gas: 707.3 lb/h
- Flue Gas: 17947.2 lb/h
- Flue Gas Temp: 790.2 °F
- Density: 0.0296 lb/ft^3
- Flue Gas Vel: 28.4 ft/s



vepica USA	CALCULATION NOTES		
		Job No: P-5715043-01	
CODE:	UNIT: N/A	Spc. No.:	
N/A	LOCATION: N/A	Sh. 3 of 3	Rev. G

7. HYDROCRACKER (HYK)



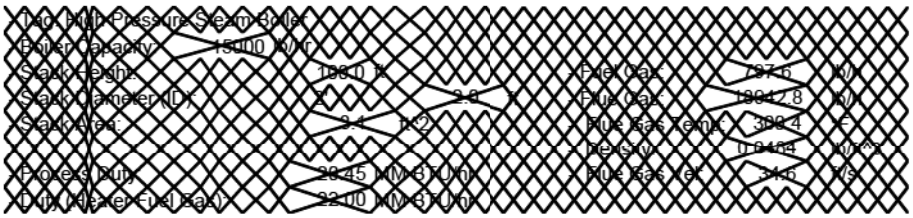
vepica USA	CALCULATION NOTES	
		Job No: P-5715043-01
CODE:	UNIT: Boiler	Spc. No.:
N/A	LOCATION: N/A	Sh. 1 of 1 Rev. G

Boiler

- Site Conditions:
  Relative Humidity: 66 % RH
  Pressure: 0 psig
  Temperature (for efficiency): 60 °F
- Radiant Duty Heat loss: 1.5 %
- Heat Efficiency: 93 %
- Excess Air: 12 %

- Fuel Gas Composition (% mass):

Hydrogen	23.2
Methane	13.4
Ethane	27.0
Propane	17.8
Butane	18.6
	100.0



- Tag: Medium Pressure Steam Boiler
- Boiler Capacity: 10350 lb/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				

vepica USA

Utility Requirements
Davis Refinery Phase 2

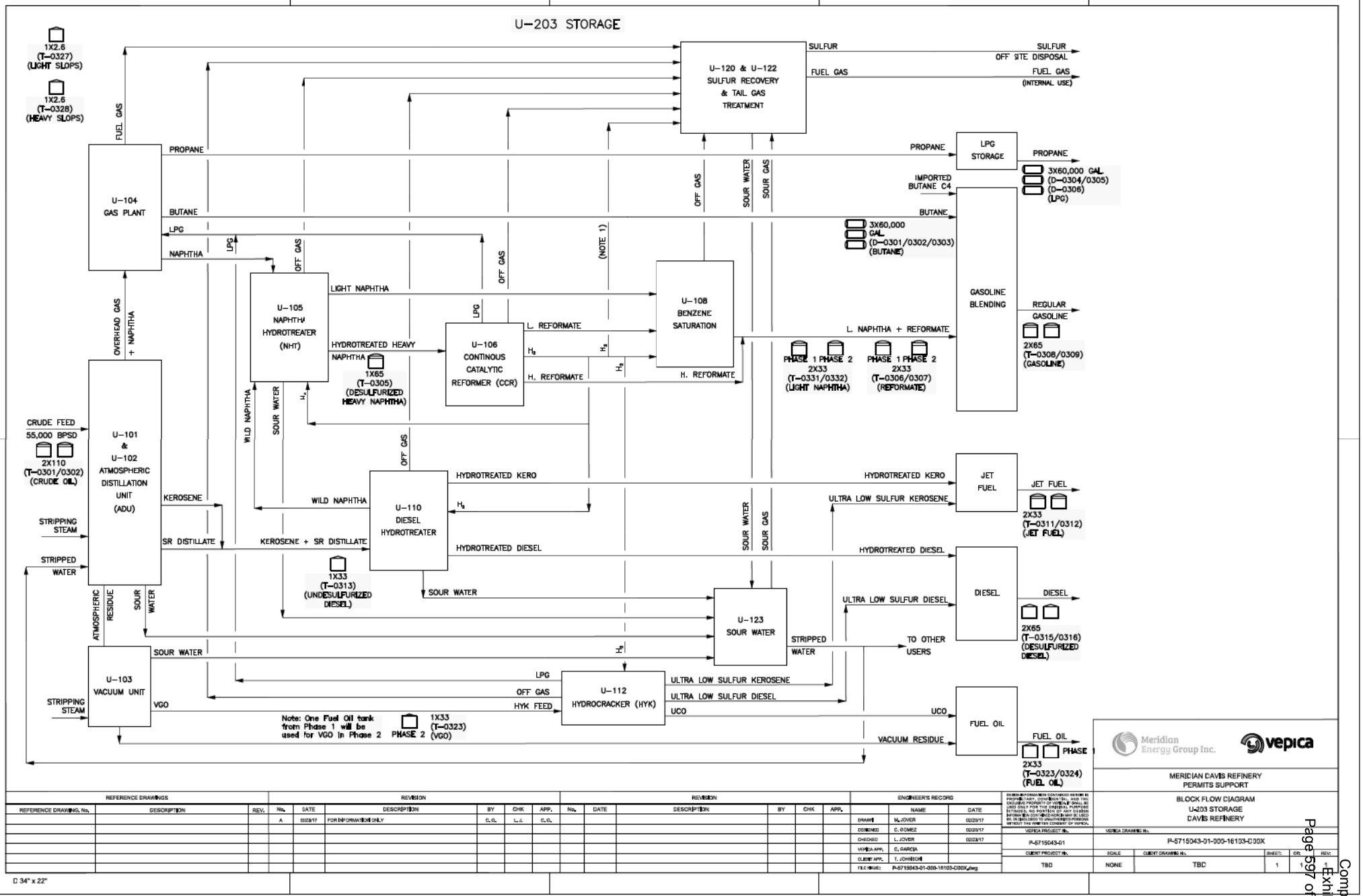
		ADU A	ADU B	Gas Plant A	Gas Plant B	Vacuum	NHT	CCR Reformer	BenFreeC w/Splitter	Diesel HT	Hydrocracker	SWSU	SRU	BFW/Steam /Condensate	Storage
Notes							(2)	(3)(5)			(6)				
Unit Feed Rate	*BPSD*	27,500	27,500	9,500	9,500	16,800	18,205	16,128	8,322	19,525	14,380				
Utilities											0				
HP Steam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

6- Steam balance based on a back-pressure recycle compressor producing MP Steam



APPENDIX D – VENDOR DATA

Project:	7118	Date:	2/23/2016
Client:	Meridian	Revision:	7
Location:	North Dakota		

Axens IFP Group Technologies

vepica USA

Phase 2 Permit and Utilities Information - Hydrocracker Scheme

		NHT + Splitter	CCR Reformer	BenFreeC w/Splitter	DHT + Splitter	Hydrocracker Max Steam Gen.	Hydrocracker Min FG Consumption
Notes		(2)	(3)(5)			(6)	(6)
Unit Feed Rate	*BPSD*	18,205	16,128	8,322	19,525	14,380	14,380
Utilities							
HP Steam	*lb/hr*	0	0	0	0	25,658	25,453
MP Steam	*lb/hr*	0	0	16,727	4,881	-26,653	-21,322
LP Steam	*lb/hr*	0	0	416	0	-6,133	-2,760
Electricity	*kW*	1045	4339	371	3510	3669	3,596
Cooling Water (4)	*gpm*	0	1,954	332	0	2,309	4,640
Fuel Gas (1)	*MMBTU/hr*	35.7	142.6	0.0	46.8	77.5	60.9
Process Water	*lb/hr*	4,915	7,500	0	1,027	8,055	8,055
Fresh Caustic (100 wt%)	*lb/hr*	0	0	0	0	0	0
Acid	*lb/hr*	0	0	0	0	0	0
Waste Effluents		0	0	0	0	0	0
Sour Wash Water	*lb/hr*	4,670	0	0	976	9,746	9,746
H2S Content	*wppm*	315	0	0	18,183	9,775	9,775
Spent Caustic	*lb/hr*	0	0	0	0	0	0
Max Flare Loading	*lb/hr*	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 + HC1 + C12

N2	vol %	82	to	100
CO2	vol %	17	to	0
O2	vol %	1	to	0
HC1 + C12	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.