From:	efilingmail@tylerhost.net
To:	Hamre, John G.
Subject:	Filing Accepted for Case: 08-2018-CV-02937; Environmental Law and Policy Center, et al. vs. North Dakota Public Service Commission, et al.; Envelope Number: 3293135
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Filing Accepted

Envelope Number: 3293135
Case Number: 08-2018-CV-02937
Case Style: Environmental Law and Policy Center, et al. vs. North Dakota Public Service Commission, et al.

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Filing Details	
Court	Burleigh County - South Central District
Case Number	08-2018-CV-02937
Case Style	Environmental Law and Policy Center, et al. vs. North Dakota Public Service Commission, et al.
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Filed By	John Hamre
Filing Attorney	Illona Jeffcoat-Sacco

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				Utility Boiler			
r Petroleum Refineries, Version 3, RTI International.		Tag	Boiler 2		flue gas (lb/h)	58,549.50	Tag
tors for Boilers and Process Heaters Firing Various Fuels		202-PK-0201A	Heat input (MMBtu/h)	60	density (lb/ft3)	0.05	202-PK-0201B
Process Heaters Firing. External Combustion, Natural Refinery Gas (lb/MMBtu)		19,914.80	Emission (lb/h)	Emission (us tpy)	flue gas (ft3/h)	1,194,887.76	19,914.80
					T (°F)	294.2	
					T(K)	418.82	
		Conc. (ppmv)			Conc. (lb/ft3)	Conc. (mg/m3)	Conc. (ppmv)
	5.20E-07	1.18E-04	3.12E-05	1.37E-04	2.61E-11	4.19E-04	1.18E-04
	2.00E-07	7.39E-05	1.20E-05	5.26E-05	1.00E-11	1.61E-04	7.39E-05
	1.30E-07	3.99E-04	7.80E-06	3.42E-05	6.53E-12	1.05E-04	3.99E-04
	1.10E-06	2.71E-04	6.60E-05	2.89E-04	5.52E-11	8.86E-04	2.71E-04
	2.80E-07	1.49E-04	1.68E-05	7.36E-05	1.41E-11	2.25E-04	1.49E-04
	1.40E-06	7.45E-04	8.40E-05	3.68E-04	7.03E-11	1.13E-03	7.45E-04
	8.20E-08	3.85E-05	4.92E-06	2.15E-05	4.12E-12	6.60E-05	3.85E-05
	3.70E-07	1.86E-04	2.22E-05	9.72E-05	1.86E-11	2.98E-04	1.86E-04
	2.50E-07	3.45E-05	1.50E-05	6.57E-05	1.26E-11	2.01E-04	3.45E-05
	2.10E-06	9.90E-04	1.26E-04	5.52E-04	1.05E-10	1.69E-03	9.90E-04
	8.80E-07	3.08E-04	5.28E-05	2.31E-04	4.42E-11	7.08E-04	3.08E-04
	-	**3.31E-03**	**4.39E-04**	**1.92E-03**	**1.95E-10**	**5.89E-03**	**3.31E-03**
APs		Conc. (ppmv)			Conc. (lb/ft3)	Conc. (mg/m3)	Conc. (ppmv)
	1.20E-05	1.88E-03	1.80E-04	7.88E-04	1.51E-10	2.42E-03	1.88E-03
	1.70E-05	2.10E-03	2.55E-04	1.12E-03	2.13E-10	3.42E-03	2.10E-03
	2.10E-06	1.86E-04	3.15E-05	1.38E-04	2.64E-11	4.23E-04	1.86E-04
	2.20E-08	6.66E-07	3.30E-07	1.45E-06	2.76E-13	4.43E-06	6.66E-07
	1.20E-06	5.65E-05	1.80E-05	7.88E-05	1.51E-11	2.42E-04	5.65E-05
	1.60E-05	1.04E-03	2.40E-04	1.05E-03	2.01E-10	3.22E-03	1.04E-03
	7.40E-05	1.70E-02	1.11E-03	4.86E-03	9.29E-10	1.49E-02	1.70E-02
	1.80E-03	1.44E-01	2.70E-02	1.18E-01	2.26E-08	3.62E-01	1.44E-01
	3.30E-06	2.48E-04	4.95E-05	2.17E-04	4.14E-11	6.64E-04	2.48E-04
	2.50E-05	1.63E-03	3.75E-04	1.64E-03	3.14E-10	5.03E-03	1.63E-03
		1.69E-01	2.93E-02	1.28E-01	2.45E-08	3.93E-01	1.69E-01
cs (excluding dioxin/furans)		Conc. (ppmv)			Conc. (lb/ft3)	Conc. (mg/m3)	Conc. (ppmv)
	2.40E-09	1.08E-07	3.60E-08	1.58E-07	3.01E-14	4.83E-07	1.08E-07
	6.50E-09	2.95E-07	9.75E-08	4.27E-07	8.16E-14	1.31E-06	2.95E-07
	4.70E-09	1.82E-07	7.05E-08	3.09E-07	5.90E-14	9.46E-07	1.82E-07

		Utility Boiler					
r Petroleum Refineries, Version 3, RTI International.		Tag	Boiler 2		flue gas (lb/h)	58,549.50	Tag
tors for Boilers and Process Heaters Firing Various Fuels		202-PK-0201A	Heat input (MMBtu/h)	60	density (lb/ft3)	0.05	202-PK-0201B
Process Heaters Firing. External Combustion, Natural Refinery Gas (lb/MMBtu)		19,914.80	Emission (lb/h)	Emission (us tpy)	flue gas (ft3/h)	1,194,887.76	19,914.80
					T (°F)	294.2	
					T(K)	418.82	
		Conc. (ppmv)			Conc. (lb/ft3)	Conc. (mg/m3)	Conc. (ppmv)
	1.30E-09	3.25E-08	1.95E-08	8.54E-08	1.63E-14	2.62E-07	3.25E-08
	1.70E-08	4.66E-07	2.55E-07	1.12E-06	2.13E-13	3.42E-06	4.66E-07
	1.60E-09	4.85E-08	2.40E-08	1.05E-07	2.01E-14	3.22E-07	4.85E-08
	1.20E-09	2.98E-08	1.80E-08	7.88E-08	1.51E-14	2.42E-07	2.98E-08
	1.60E-08	4.32E-07	2.40E-07	1.05E-06	2.01E-13	3.22E-06	4.32E-07
	2.90E-09	9.92E-08	4.35E-08	1.91E-07	3.64E-14	5.84E-07	9.92E-08
	2.70E-09	1.12E-07	4.05E-08	1.77E-07	3.39E-14	5.43E-07	1.12E-07
	7.10E-08	1.78E-06	1.07E-06	4.66E-06	8.91E-13	1.43E-05	1.78E-06
	1.80E-09	4.64E-08	2.70E-08	1.18E-07	2.26E-14	3.62E-07	4.64E-08
	2.40E-08	1.17E-06	3.60E-07	1.58E-06	3.01E-13	4.83E-06	1.17E-06
	6.00E-07	3.24E-05	9.00E-06	3.94E-05	7.53E-12	1.21E-04	3.24E-05
	1.70E-08	6.60E-07	2.55E-07	1.12E-06	2.13E-13	3.42E-06	6.60E-07
	4.00E-06	2.94E-04	6.00E-05	2.63E-04	5.02E-11	8.05E-04	2.94E-04
	4.90E-09	1.68E-07	7.35E-08	3.22E-07	6.15E-14	9.86E-07	1.68E-07
	4.26E-06	**3.02E-04**	**6.39E-05**	**2.80E-04**	**5.35E-11**	**8.57E-04**	**3.02E-04**
		3.34E-04	7.29E-05	3.19E-04	6.10E-11	9.78E-04	3.34E-04
			2.93E-02	**1.28E-01**			
terest		Conc. (ppmv)			Conc. (lb/ft3)	Conc. (mg/m3)	Conc. (ppmv)
	4.30E-06	8.66E-04	2.58E-04	1.13E-03	2.16E-10	3.46E-03	8.66E-04
	2.10E-03	1.00E+00	1.26E-01	5.52E-01	1.05E-07	1.69E+00	1.00E+00
	8.30E-07	3.61E-04	4.98E-05	2.18E-04	4.17E-11	6.68E-04	3.61E-04
	3.00E-03	2.76E+00	1.80E-01	7.88E-01	1.51E-07	2.42E+00	2.76E+00
	8.50E-05	6.90E-02	5.10E-03	2.23E-02	4.27E-09	6.84E-02	6.90E-02
	1.10E-06	3.17E-04	6.60E-05	2.89E-04	5.52E-11	8.86E-04	3.17E-04
	6.40E-07	5.72E-04	3.84E-05	1.68E-04	3.21E-11	5.15E-04	5.72E-04
	2.30E-06	1.25E-03	1.38E-04	6.04E-04	1.15E-10	1.85E-03	1.25E-03
	2.80E-05	1.18E-02	1.68E-03	7.36E-03	1.41E-09	2.25E-02	1.18E-02

2. AP 42, Fifth Edition, Volume IChapter 1: External Comb

						FCC N	
r Petroleum Refineries, Version 3, RTI International.		er 3	flue gas (lb/h)	58,549.50	Tag		
tors for Boilers and Process Heaters Firing Various Fuels		5	density (lb/ft3)	0.05	202-PK-0201C	Heat input (MMBtu/h)	17.48
Process Heaters Firing. External Combustion, Natural Refinery Gas (lb/MMBtu)		Emission (us tpy)	flue gas (ft3/h)	1,194,887.76	19,914.80	Emission (lb/h)	Emission (us tpy)
			T (°F)	294.2			
			T(K)	418.82			
			Conc. (lb/ft3)	Conc. (mg/m3)	Conc. (ppmv)		
	5.20E-07	1.14E-05	2.18E-12	3.49E-05	9.85E-06	9.09E-06	3.98E-05
	2.00E-07	4.38E-06	8.37E-13	1.34E-05	6.15E-06	3.50E-06	1.53E-05
	1.30E-07	2.85E-06	5.44E-13	8.72E-06	3.33E-05	2.27E-06	9.95E-06
	1.10E-06	2.41E-05	4.60E-12	7.38E-05	2.26E-05	1.92E-05	8.42E-05
	2.80E-07	6.13E-06	1.17E-12	1.88E-05	1.24E-05	4.89E-06	2.14E-05
	1.40E-06	3.07E-05	5.86E-12	9.39E-05	6.21E-05	2.45E-05	1.07E-04
	8.20E-08	1.80E-06	3.43E-13	5.50E-06	3.21E-06	1.43E-06	6.28E-06
	3.70E-07	8.10E-06	1.55E-12	2.48E-05	1.55E-05	6.47E-06	2.83E-05
	2.50E-07	5.48E-06	1.05E-12	1.68E-05	2.87E-06	4.37E-06	1.91E-05
	2.10E-06	4.60E-05	8.79E-12	1.41E-04	8.25E-05	3.67E-05	1.61E-04
	8.80E-07	1.93E-05	3.68E-12	5.90E-05	2.57E-05	1.54E-05	6.74E-05
	-	**1.60E-04**	**1.63E-11**	**4.91E-04**	**2.76E-04**	**1.28E-04**	**5.60E-04**
APs			Conc. (lb/ft3)	Conc. (mg/m3)	Conc. (ppmv)		
	1.20E-05	6.57E-05	1.26E-11	2.01E-04	1.57E-04	5.24E-05	2.30E-04
	1.70E-05	9.31E-05	1.78E-11	2.85E-04	1.75E-04	7.43E-05	3.25E-04
	2.10E-06	1.15E-05	2.20E-12	3.52E-05	1.55E-05	9.18E-06	4.02E-05
	2.20E-08	1.20E-07	2.30E-14	3.69E-07	5.55E-08	9.61E-08	4.21E-07
	1.20E-06	6.57E-06	1.26E-12	2.01E-05	4.71E-06	5.24E-06	2.30E-05
	1.60E-05	8.76E-05	1.67E-11	2.68E-04	8.69E-05	6.99E-05	3.06E-04
	7.40E-05	4.05E-04	7.74E-11	1.24E-03	1.42E-03	3.23E-04	1.42E-03
	1.80E-03	9.86E-03	1.88E-09	3.02E-02	1.20E-02	7.87E-03	3.45E-02
	3.30E-06	1.81E-05	3.45E-12	5.53E-05	2.06E-05	1.44E-05	6.32E-05
	2.50E-05	1.37E-04	2.62E-11	4.19E-04	1.36E-04	1.09E-04	4.79E-04
		1.07E-02	2.04E-09	3.27E-02	1.41E-02	8.52E-03	3.73E-02
cs (excluding dioxin/furans)			Conc. (lb/ft3)	Conc. (mg/m3)	Conc. (ppmv)		
	2.40E-09	1.31E-08	2.51E-15	4.03E-08	8.97E-09	1.05E-08	4.59E-08
	6.50E-09	3.56E-08	6.80E-15	1.09E-07	2.46E-08	2.84E-08	1.24E-07
	4.70E-09	2.57E-08	4.92E-15	7.88E-08	1.52E-08	2.05E-08	9.00E-08

								FCC N
r Petroleum Refineries, Version 3, RTI International.		er 3	flue gas (lb/h)	58,549.50	Tag			
tors for Boilers and Process Heaters Firing Various Fuels		5	density (lb/ft3)	0.05	202-PK-0201C	Heat input (MMBtu/h)	17.48	
Process Heaters Firing. External Combustion, Natural Refinery Gas (lb/MMBtu)		Emission (us tpy)	flue gas (ft3/h)	1,194,887.76	19,914.80	Emission (lb/h)	Emission (us tpy)	
			T (°F)	294.2				
			T(K)	418.82				
			Conc. (lb/ft3)	Conc. (mg/m3)	Conc. (ppmv)			
	1.30E-09	7.12E-09	1.36E-15	2.18E-08	2.71E-09	5.68E-09	2.49E-08	
	1.70E-08	9.31E-08	1.78E-14	2.85E-07	3.88E-08	7.43E-08	3.25E-07	
	1.60E-09	8.76E-09	1.67E-15	2.68E-08	4.04E-09	6.99E-09	3.06E-08	
	1.20E-09	6.57E-09	1.26E-15	2.01E-08	2.48E-09	5.24E-09	2.30E-08	
	1.60E-08	8.76E-08	1.67E-14	2.68E-07	3.60E-08	6.99E-08	3.06E-07	
	2.90E-09	1.59E-08	3.03E-15	4.86E-08	8.26E-09	1.27E-08	5.55E-08	
	2.70E-09	1.48E-08	2.82E-15	4.53E-08	9.36E-09	1.18E-08	5.17E-08	
	7.10E-08	3.89E-07	7.43E-14	1.19E-06	1.48E-07	3.10E-07	1.36E-06	
	1.80E-09	9.86E-09	1.88E-15	3.02E-08	3.87E-09	7.87E-09	3.45E-08	
	2.40E-08	1.31E-07	2.51E-14	4.03E-07	9.73E-08	1.05E-07	4.59E-07	
	6.00E-07	3.29E-06	6.28E-13	1.01E-05	2.70E-06	2.62E-06	1.15E-05	
	1.70E-08	9.31E-08	1.78E-14	2.85E-07	5.50E-08	7.43E-08	3.25E-07	
	4.00E-06	2.19E-05	4.18E-12	6.71E-05	2.45E-05	1.75E-05	7.66E-05	
	4.90E-09	2.68E-08	5.13E-15	8.22E-08	1.40E-08	2.14E-08	9.38E-08	
	4.26E-06	**2.33E-05**	**4.46E-12**	**7.14E-05**	**2.52E-05**	**1.86E-05**	**8.15E-05**	
		2.66E-05	5.08E-12	8.15E-05	2.79E-05	2.12E-05	9.30E-05	
		1.07E-02				**8.55E-03**	**3.74E-02**	
nterest			Conc. (lb/ft3)	Conc. (mg/m3)	Conc. (ppmv)			
	4.30E-06	1.13E-03	2.16E-10	3.46E-03	8.66E-04	7.52E-05	3.29E-04	
	2.10E-03	5.52E-01	1.05E-07	1.69E+00	1.00E+00	3.67E-02	1.61E-01	
	8.30E-07	2.18E-04	4.17E-11	6.68E-04	3.61E-04	1.45E-05	6.35E-05	
	3.00E-03	7.88E-01	1.51E-07	2.42E+00	2.76E+00	5.24E-02	2.30E-01	
	8.50E-05	2.23E-02	4.27E-09	6.84E-02	6.90E-02	1.49E-03	6.51E-03	
	1.10E-06	2.89E-04	5.52E-11	8.86E-04	3.17E-04	1.92E-05	8.42E-05	
	6.40E-07	1.68E-04	3.21E-11	5.15E-04	5.72E-04	1.12E-05	4.90E-05	
	2.30E-06	6.04E-04	1.15E-10	1.85E-03	1.25E-03	4.02E-05	1.76E-04	
	2.80E-05	7.36E-03	1.41E-09	2.25E-02	1.18E-02	4.89E-04	2.14E-03	

2. AP 42, Fifth Edition, Volume IChapter 1: External Comb

				TOTALS		
r Petroleum Refineries, Version 3, RTI International.		15,503.00	Tag			
tors for Boilers and Process Heaters Firing Various Fuels		0.03	114-H-1401			
Process Heaters Firing. External Combustion, Natural Refinery Gas (lb/MMBtu)		521,986.53	8,699.78			
		784.3				
		691.09				
		Conc. (mg/m3)	Conc. (ppmv)	Boilers (US tpy)	Heaters (US tpy)	Total US tpy
	5.20E-07	2.79E-04	1.30E-04	**2.8E-04**	**1.4E-03**	**1.7E-03**
	2.00E-07	1.07E-04	8.13E-05	**1.1E-04**	**5.4E-04**	**6.5E-04**
	1.30E-07	6.98E-05	4.39E-04	**7.1E-05**	**3.5E-04**	**4.2E-04**
	1.10E-06	5.91E-04	2.98E-04	**6.0E-04**	**3.0E-03**	**3.6E-03**
	2.80E-07	1.50E-04	1.64E-04	**1.5E-04**	**7.6E-04**	**9.1E-04**
	1.40E-06	7.52E-04	8.20E-04	**7.7E-04**	**3.8E-03**	**4.6E-03**
	8.20E-08	4.40E-05	4.24E-05	**4.5E-05**	**2.2E-04**	**2.7E-04**
	3.70E-07	1.99E-04	2.05E-04	**2.0E-04**	**1.0E-03**	**1.2E-03**
	2.50E-07	1.34E-04	3.79E-05	**1.4E-04**	**6.8E-04**	**8.2E-04**
	2.10E-06	1.13E-03	1.09E-03	**1.1E-03**	**5.7E-03**	**6.9E-03**
	8.80E-07	4.72E-04	3.39E-04	**4.8E-04**	**2.4E-03**	**2.9E-03**
	-	**3.93E-03**	**3.65E-03**	**4.0E-03**	**2.0E-02**	**2.39E-02**
APs		Conc. (mg/m3)	Conc. (ppmv)	Boilers (US tpy)	Heaters (US tpy)	Total US tpy
	1.20E-05	1.61E-03	2.07E-03	**1.6E-03**	**8.2E-03**	**9.8E-03**
	1.70E-05	2.28E-03	2.31E-03	**2.3E-03**	**1.2E-02**	**1.4E-02**
	2.10E-06	2.82E-04	2.05E-04	**2.9E-04**	**1.4E-03**	**1.7E-03**
	2.20E-08	2.95E-06	7.33E-07	**3.0E-06**	**1.5E-05**	**1.8E-05**
	1.20E-06	1.61E-04	6.21E-05	**1.6E-04**	**8.2E-04**	**9.8E-04**
	1.60E-05	2.15E-03	1.15E-03	**2.2E-03**	**1.1E-02**	**1.3E-02**
	7.40E-05	9.93E-03	1.88E-02	**1.0E-02**	**5.0E-02**	**6.0E-02**
	1.80E-03	2.42E-01	1.59E-01	**2.5E-01**	**1.2E+00**	**1.5E+00**
	3.30E-06	4.43E-04	2.73E-04	**4.5E-04**	**2.2E-03**	**2.7E-03**
	2.50E-05	3.36E-03	1.79E-03	**3.4E-03**	**1.7E-02**	**2.0E-02**
		2.62E-01	1.86E-01	**2.7E-01**	**1.3E+00**	**1.59E+00**
cs (excluding dioxin/furans)		Conc. (mg/m3)	Conc. (ppmv)	Boilers (US tpy)	Heaters (US tpy)	Total US tpy
	2.40E-09	3.22E-07	1.18E-07	**3.3E-07**	**1.6E-06**	**2.0E-06**
	6.50E-09	8.72E-07	3.25E-07	**8.9E-07**	**4.4E-06**	**5.3E-06**
	4.70E-09	6.31E-07	2.01E-07	**6.4E-07**	**3.2E-06**	**3.8E-06**

				TOTALS		
r Petroleum Refineries, Version 3, RTI International.		15,503.00	Tag			
tors for Boilers and Process Heaters Firing Various Fuels		0.03	114-H-1401			
Process Heaters Firing. External Combustion, Natural Refinery Gas (lb/MMBtu)		521,986.53	8,699.78			
		784.3				
		691.09				
		Conc. (mg/m3)	Conc. (ppmv)	Boilers (US tpy)	Heaters (US tpy)	Total US tpy
	1.30E-09	1.74E-07	3.58E-08	**1.8E-07**	**8.8E-07**	**1.1E-06**
	1.70E-08	2.28E-06	5.13E-07	**2.3E-06**	**1.2E-05**	**1.4E-05**
	1.60E-09	2.15E-07	5.33E-08	**2.2E-07**	**1.1E-06**	**1.3E-06**
	1.20E-09	1.61E-07	3.28E-08	**1.6E-07**	**8.2E-07**	**9.8E-07**
	1.60E-08	2.15E-06	4.75E-07	**2.2E-06**	**1.1E-05**	**1.3E-05**
	2.90E-09	3.89E-07	1.09E-07	**4.0E-07**	**2.0E-06**	**2.4E-06**
	2.70E-09	3.62E-07	1.24E-07	**3.7E-07**	**1.8E-06**	**2.2E-06**
	7.10E-08	9.53E-06	1.96E-06	**9.7E-06**	**4.8E-05**	**5.8E-05**
	1.80E-09	2.42E-07	5.11E-08	**2.5E-07**	**1.2E-06**	**1.5E-06**
	2.40E-08	3.22E-06	1.28E-06	**3.3E-06**	**1.6E-05**	**2.0E-05**
	6.00E-07	8.05E-05	3.56E-05	**8.2E-05**	**4.1E-04**	**4.9E-04**
	1.70E-08	2.28E-06	7.26E-07	**2.3E-06**	**1.2E-05**	**1.4E-05**
	4.00E-06	5.37E-04	3.23E-04	**5.5E-04**	**2.7E-03**	**3.3E-03**
	4.90E-09	6.58E-07	1.84E-07	**6.7E-07**	**3.3E-06**	**4.0E-06**
	4.26E-06	**5.72E-04**	**3.32E-04**	**Boilers (US tpy)**	**Heaters (US tpy)**	**Total US tpy**
		6.52E-04	3.68E-04	**6.7E-04**	**3.3E-03**	**4.0E-03**
				2.68E-01	**1.33E+00**	**1.596E+00**
terest		Conc. (mg/m3)	Conc. (ppmv)	Boilers (US tpy)	Heaters (US tpy)	Total US tpy
	4.30E-06	2.31E-03	9.53E-04	**3.4E-03**	**1.2E-02**	**1.5E-02**
	2.10E-03	1.13E+00	1.10E+00	**1.7E+00**	**5.7E+00**	**7.4E+00**
	8.30E-07	4.46E-04	3.98E-04	**6.5E-04**	**2.3E-03**	**2.9E-03**
	3.00E-03	1.61E+00	3.04E+00	**2.4E+00**	**8.2E+00**	**1.1E+01**
	8.50E-05	4.56E-02	7.59E-02	**6.7E-02**	**2.3E-01**	**3.0E-01**
	1.10E-06	5.91E-04	3.49E-04	**8.7E-04**	**3.0E-03**	**3.9E-03**
	6.40E-07	3.44E-04	6.29E-04	**5.0E-04**	**1.7E-03**	**2.2E-03**
	2.30E-06	1.23E-03	1.37E-03	**1.8E-03**	**6.3E-03**	**8.1E-03**
	2.80E-05	1.50E-02	1.30E-02	**2.2E-02**	**7.6E-02**	**9.8E-02**

2. AP 42, Fifth Edition, Volume IChapter 1: External Comb

Operating hours/year	8,760		
Maximum Operating Coke Burn-off	8,614	lb/h	Based on FCCU Licensor Data
Unit Fresh Feed rate (bbl/d)	14376	bbl/d	
	14.376	Mbbl/d	
Nickel E-cat (mg/kg)	1,200	PPM (mg/kg)	
C_{Nickel} (in the fines) (kg/kg)	96	PPM (mg/kg)	

	Uncontrolled			Controlled			
Criteria Pollutants	Emission Factors (lb/Mbbl Fresh Feed)	Emissions (lb/h) Uncontrolled	Emission (STPY) Uncontrolled	Contol Device	Control %	Emissions (lb/h) Controlled	Emission (STPY) Controlled
CO*	0	0	0	BCP	100%	0	0
Lead (Ratio to Nickel Concentration)	0.08	4.63E-04	2.03E-03	BCP	99%	4.63E-06	2.03E-05
PM10 Primary	-	11.448	50.1	Wet Scrubber or Tri-Mer	98.0%	0.229	1.003
PM condensable	-	3.876	17.0	Wet Scrubber or Tri-Mer	98.0%	0.078	0.340
PM2.5 filterable	-	6.55	28.7	Wet Scrubber or Tri-Mer	98.0%	0.131	0.573
PM2.5 Primary	-	10.42	45.7	Wet Scrubber or Tri-Mer	98.0%	0.208	0.913
PM10 filterable	-	7.572	33.2	Wet Scrubber or Tri-Mer	98.0%	0.151	0.663
NOx	71	42.53	186.3	COP-NP or Tri-Mer	98%	0.851	3.73
SO_2	***	151.80	664.9	Wet Scrubber or Dry Sorbent	99%	1.52	6.65
VOC**	220	131.78	577.2	Flue Gas Recirculation	99%	1.32	5.77
Total HAP	-	4.85	5.39	BCP		2.70E-01	0.87

* Based on FCCU regenerator design for complete carbon burn operation
** Based on FCCU flue gas capture and recirculation design for complete combustion
*** Based on FCCU Licensor Data
BCP - Best Combustion Practices
COP-NP - Non-Platinum CO combustion promoter

CALCULATIONS

METAL HAP

E_{Nickel} 0.025 ton Enickel / year

Example: $E_{Antimony}$ 0.025 Ton Enickel / year × 0.065 EAntimony / Enickel = 0.002 ton Eantimony / year

		Uncontrolled		Controlled			
HAP	Emission Ratio	Emission (lb/h)	STPY	Control Device Yes/No?	Control %	Emission (STPY),	lb/h
E_{nickel}	1	5.79E-03	2.54E-02	Yes	99%	2.54E-04	5.79E-05
$E_{antimony}$	0.065	3.76E-04	1.65E-03	Yes	99%	1.65E-05	3.76E-06
$E_{arsenic}$	0.01	5.79E-05	2.54E-04	Yes	99%	2.54E-06	5.79E-07
$E_{beryllium}$	0.003	1.74E-05	7.61E-05	Yes	99%	7.61E-07	1.74E-07
$E_{cadmium}$	0.013	7.53E-05	3.30E-04	Yes	99%	3.30E-06	7.53E-07
$E_{chromium}$	0.25	1.45E-03	6.34E-03	Yes	99%	6.34E-05	1.45E-05
E_{cobalt}	0.052	3.01E-04	1.32E-03	Yes	99%	1.32E-05	3.01E-06
$E_{manganese}$	0.13	7.53E-04	3.30E-03	Yes	99%	3.30E-05	7.53E-06
$E_{selenium}$	0.025	1.45E-04	6.34E-04	Yes	99%	6.34E-06	1.45E-06
$E_{vanadium}$ ***	1.32	7.64E-03	3.35E-02	Yes	99%	3.35E-04	7.64E-05
E_{zinc} ***	0.74	4.28E-03	1.88E-02	Yes	99%	1.88E-04	4.28E-05
		2.09E-02	9.15E-02		**Total Metal HAP**	9.15E-04	2.09E-04

Assumptions

Rate of circulation of catalyst is equal to the coke burnoff rate

Calculations

Maximum Operating Coke Burn-off	8,614	lb/h
Nickel E-cat (mg/kg)	1,200	PPM (mg/kg)

PM Calculation

PM Filterable 0.90 lb / 1000 lb Coke

0.9 lb / 1000 lb-Coke BO × 8614 lb Coke / h × 8760 h / year = 33.96 STPY PM_{FIL} / Year

PM Condensable 0.45 lb / 1000 lb Coke

0.45 lb / 1000 lb-Coke BO × lb Coke / h × 8760 h / year = 16.98 ton PM_{FIL} / Year

PM Primary = PM Filterable + PM Condensable = 50.93 ton PM Primary / year

PM Sulfate = PM_{FIL} - $PM_{NONSULF}$

$PM_{NONSULF}$ 0.70 lb / 1000 lb Coke

0.7 lb / 1000 lb-Coke BO × 8614 lb Coke / h × 8760 h / year = 26.41 ton $PM_{NONSULF}$ / Year

PM Sulfate = PM Filterable - PM Non Sulfate

PM Sulfate = 7.5 ton PM Sulfate / year

PM10-Filterable

PM10-Fil Fraction 0.97

0.97 × 26.41 ST PM nonsulf / year + 7.5 ST PM SUL / year = 33.16 ton PM10 Fil / year

PM2.5-Filterable

PM10-Fil Fraction 0.80

0.80 × 26.41 ST PM nonsulf / year + 7.5 ST PM SUL / year = 28.67 ton PM10 Fil / year

PM2.5PRI

PM2.5-Pri = P<2.5FIL + PM Condensable = 45.65 ton PM2.5 PRI / year

Calculation of CNi

CNi 1,200 mg / kg

Fraction PM FIL <2.5 0.80

26.41 ton PMNONSULF / Year

0.8 × 1200 mg / kg = 960 mg / kg

26.41 ton nonsulfate × 960 mg / kg × kg / 1 E06 mg = 0.025 ton Enickel / year

Organic HAP Emissions

Maximum Operating Coke Burn-off 8,614 **lb Coke/h**

8.614 1000 lb Coke / h

Example

Acetaldehyde: 8614 lb Coke / h × 0.0013 lb / 1000 lb Coke = 0.0112 lb / h

PAH

	Uncontrolled			Controlled			
	EF (lb/1000 lb-Coke)	Emission (lb/h)	STPY	Control	Control Efficiency	STPY	lb/h
Acetaldehyde	0.0013	1.12E-02	4.90E-02			4.90E-02	1.12E-02
Acetone	1.60E-04	1.38E-03	6.04E-03			6.04E-03	1.38E-03
Acrolein	6.60E-05	5.69E-04	2.49E-03			2.49E-03	5.69E-04
Benzene	1.10E-03	9.48E-03	4.15E-02			4.15E-02	9.48E-03
Bromomethane	1.40E-04	1.21E-03	5.28E-03			5.28E-03	1.21E-03
1,3-Butadiene	2.00E-06	1.72E-05	7.55E-05			7.55E-05	1.72E-05
Ethylbenzene	1.60E-05	1.38E-04	6.04E-04			6.04E-04	1.38E-04
Formaldehyde	0.016	1.38E-01	6.04E-01			6.04E-01	1.38E-01
Methylene chloride	4.40E-04	3.79E-03	1.66E-02			1.66E-02	3.79E-03
Phenol	5.70E-04	4.91E-03	2.15E-02			2.15E-02	4.91E-03
Toluene	2.10E-04	1.81E-03	7.92E-03			7.92E-03	1.81E-03
Trichlorofluoromethane	1.60E-04	1.38E-03	6.04E-03			6.04E-03	1.38E-03
Xylene	2.10E-04	1.81E-03	7.92E-03			7.92E-03	1.81E-03
Acenaphthene	2.20E-07	1.90E-06	8.30E-06			8.30E-06	1.90E-06
Acenaphthylene	7.80E-06	6.72E-05	2.94E-04			2.94E-04	6.72E-05
Anthracene	6.70E-06	5.77E-05	2.53E-04			2.53E-04	5.77E-05
Benzo(a)anthracene	3.80E-08	3.27E-07	1.43E-06			1.43E-06	3.27E-07
Benzo(a)pyrene	7.10E-07	6.12E-06	2.68E-05			2.68E-05	6.12E-06
Benzo(b)fluoranthene	2.40E-07	2.07E-06	9.06E-06			9.06E-06	2.07E-06
Benzo(e)pyrene	3.30E-08	2.84E-07	1.25E-06			1.25E-06	2.84E-07
Benzo(g,h,i)perylene	3.10E-07	2.67E-06	1.17E-05			1.17E-05	2.67E-06
Benzo(k)fluoranthene	1.80E-07	1.55E-06	6.79E-06			6.79E-06	1.55E-06
Chrysene	2.30E-07	1.98E-06	8.68E-06			8.68E-06	1.98E-06
Dibenz(a,h)anthracene	2.80E-07	2.41E-06	1.06E-05			1.06E-05	2.41E-06
Fluoranthene	6.10E-06	5.25E-05	2.30E-04			2.30E-04	5.25E-05
Fluorene	2.40E-06	2.07E-05	9.06E-05			9.06E-05	2.07E-05

Indeno(1,2,3-cd)pyrene	3.00E-07	2.58E-06	1.13E-05			1.13E-05	2.58E-06
2-Methylnaphthalene	1.80E-06	1.55E-05	6.79E-05			6.79E-05	1.55E-05
Naphthalene	7.00E-05	6.03E-04	2.64E-03			2.64E-03	6.03E-04
Phenanthrene	1.60E-05	1.38E-04	6.04E-04			6.04E-04	1.38E-04
Pyrene	2.20E-07	1.90E-06	8.30E-06			8.30E-06	1.90E-06
PAH (without Naphtalene)		3.06E-04	1.34E-03			1.34E-03	3.06E-04
Pentachlorodibenzofurans	3.20E-11	2.76E-10	1.21E-09			1.21E-09	2.76E-10
Hexachlorodibenzofuran	6.30E-11	5.43E-10	2.38E-09			2.38E-09	5.43E-10
Heptachlorodibenzo-p-dioxin	5.60E-11	4.82E-10	2.11E-09			2.11E-09	4.82E-10
Carbon disulfide	3.70E-05	3.19E-04	1.40E-03			1.40E-03	3.19E-04
Hydrogen chloride	0.11	9.48E-01	4.15E+00	Dry Sorbent	98%	8.30E-02	1.90E-02
Hydrogen cyanide****	0.43	3.70E+00	3.70E-01	BCP	98%	7.41E-03	7.41E-02
Mercury	6.00E-06	5.17E-05	2.26E-04		98%	4.53E-06	1.03E-06
		4.83	5.30		**Total Organic HAP**	**8.65E-01**	**2.70E-01**
Ammonia	0.57	4.91E+00	2.15E+01			2.15E+01	4.91E+00

REFERENCES

All calculations were based on the Table 5-4 of the Emissions Estimation Protocol for Petroleum Refineries, Version 3, RTI International (unless noted otherwise)
Metal HAPs were calculated using the Equation 5-1 and Table 5-3 of the RTI Emissions Estimation Protocol.
* Calculated based on the TABLE 5,1-1. AP 42, Fifth Edition, Volume IChapter 1: External Combustion Sources.
** Overall, less than 1% weight of total hydrocarbon emissions is methane.
Neg: negligible.
*** Vanadium and zinc are not HAPs, but are included here as other pollutants of interest.
****: HCN emissions considered to be emitted only in startup and shutdownoperations, which means a factor of 200 hours/year

Reformer 2 Capacity (Mbbl/d) 3.96
Reformer 1 Capacity (Mbbl/d) 8.76
Operating hours/year* 672 Four weeks of catalyst regeneration per reactor per year

		Reformer 2		Reformer 1		Notes
	Emissions Factor (lb/Mbbl fresh feed)	Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)	
Dioxins/PCBs						
Dioxin toxic equivalents (TEQ)b	5.70E-09	9.41E-10	3.16E-10	2.08E-09	6.99E-10	
Total polychlorinated biphenyls (PCB)	2.60E-06	4.29E-07	1.44E-07	9.49E-07	3.19E-07	
Semi-volatile and Non-volatile Organic HAP						Except dioxins, furans, and PCB
Naphthalene	3.50E-05	5.78E-06	1.94E-06	1.28E-05	4.29E-06	Not in the Section 112 list of HAP
2-Methylnaphthalene	1.30E-06	2.15E-07	7.21E-08	4.75E-07	1.59E-07	Not in the Section 112 list of HAP
Acenaphthylene	3.00E-08	4.95E-09	1.66E-09	1.10E-08	3.68E-09	Not in the Section 112 list of HAP
Acenaphthene	4.30E-08	7.10E-09	2.38E-09	1.57E-08	5.27E-09	Not in the Section 112 list of HAP
Fluorene	2.00E-07	3.30E-08	1.11E-08	7.30E-08	2.45E-08	Not in the Section 112 list of HAP
Phenanthrene	6.10E-07	1.01E-07	3.38E-08	2.23E-07	7.48E-08	Not in the Section 112 list of HAP
Anthracene	9.10E-08	1.50E-08	5.05E-09	3.32E-08	1.12E-08	Not in the Section 112 list of HAP
Fluoranthene	1.00E-07	1.65E-08	5.54E-09	3.65E-08	1.23E-08	Not in the Section 112 list of HAP
Pyrene	1.50E-08	2.48E-09	8.32E-10	5.48E-09	1.84E-09	Not in the Section 112 list of HAP
Benzo(a)anthracene	9.00E-10	1.49E-10	4.99E-11	3.29E-10	1.10E-10	Not in the Section 112 list of HAP
Benzo(b)fluoranthene	1.50E-09	2.48E-10	8.32E-11	5.48E-10	1.84E-10	Not in the Section 112 list of HAP
Benzo(k)fluoranthene	7.50E-10	1.24E-10	4.16E-11	2.74E-10	9.20E-11	Not in the Section 112 list of HAP
Benzo(e)pyrene	2.90E-09	4.79E-10	1.61E-10	1.06E-09	3.56E-10	Not in the Section 112 list of HAP
Benzo(g,h,i)perylene	4.00E-09	6.60E-10	2.22E-10	1.46E-09	4.91E-10	Not in the Section 112 list of HAP
Chrysene	2.90E-09	4.79E-10	1.61E-10	1.06E-09	3.56E-10	Not in the Section 112 list of HAP
Dibenzo(a,h)anthracene	7.80E-10	1.29E-10	4.32E-11	2.85E-10	9.57E-11	Not in the Section 112 list of HAP
Indeno(1,2,3-c,d)pyrene	1.70E-09	2.81E-10	9.42E-11	6.21E-10	2.08E-10	Not in the Section 112 list of HAP
Total SV-NV Organic HAPs			**2.07E-06**		**4.59E-06**	
PAH without naphtalene		3.97E-07		8.78E-07		
HAP						
Benzene	0.004	6.60E-04	2.22E-04	1.46E-03	4.91E-04	
Toluene	0.0096	1.58E-03	5.32E-04	3.50E-03	1.18E-03	
Xylene	0.007	1.16E-03	3.88E-04	2.56E-03	8.58E-04	
Total SV-NV Organic HAPs			**1.14E-03**		**2.53E-03**	
THC (Total Hydrocarbons)*	0.24	3.96E-02	**1.33E-02**	8.76E-02	**2.94E-02**	
Other Inorganic HAPs						
Hydrogen Chloride	4.2	0.69	2.33E-01	1.53	0.52	Controlled by Best Operation Practices
Chlorine	0.23	0.04	1.28E-02	0.08	0.03	Controlled by Best Operation Practices
			0.25		**0.54**	
		Total HAPs	**2.47E-01**		**5.46E-01**	

Reference 1:
Calculations based on the Table 5-6 of the Emissions Estimation Protocol for Petroleum Refineries, Version 3, RTI International.
Reference 2:
*Total hydrocarbons may be used as a surrogate for VOC. Total hydrocarbons are presented on an as propane basis.

SRU UNIT: LO-CAT ® (licensed by MERICHEM)			**LTPD**	**10.14**
Capacity (MMSCFD)	9.4			
Operating hours/year	8,760			
Number of Vents:	2			
to be directed to a Thermal Oxidizer				
Molar Flow combined	597.6	lbmol/h		
STD Vapor Volumetric Flow				
Combined	5.442	MMSCFD	para ppmv es este	
Component	Combined Mole%	Molar Flow (lbmol/h)		
H2	0.1722	1.0292		
C1	0.4742	2.8335		
Ethylene	0.3566	2.1310		
C2	0.4245	2.5370		
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		T2 (°F)	68
Density (lb/ft3)	0.0413			
Volume flow (ft3/h)	389,370.46			
SCFM (68°F, 14 psi)	3,917.22	0.978		

Flue Gas Component	**Molar Flow (lbmol/h)**	**MW**	**lb/hr**	**STPY**	**Conc. (lb/ft3)**	**Conc. (mg/m3)**	**Conc. (ppmv)**
C1	0.001	16.04	0.02	0.07	4.24E-08	6.80E-01	1.69E+00
Ethylene	0.003	28.05	0.08	0.35	2.04E-07	3.27E+00	4.65E+00
C2	0.002	30.07	0.06	0.28	1.65E-07	2.64E+00	3.50E+00
C3	0.003	44.1	0.11	0.49	2.87E-07	4.61E+00	4.16E+00
iC4	0.001	58.12	0.06	0.27	1.56E-07	2.50E+00	1.72E+00
nC4	0.000	58.12	0.01	0.04	2.63E-08	4.22E-01	2.90E-01
Sum VOC	0.010	35.17	**0.34**	**1.50**	8.81E-07	1.41E+01	16.0
SO2	0.0007	64.1	0.04	**0.20**	1.16E-07	1.85E+00	1.15

	Emission Factor *** (lb/MMBtu, LHV basis)	Emission (lb/h)	Emission (US tpy)	Conc. (lb/ft3)	Conc. (mg/m3)	Conc. (ppmv)
Carbon monoxide	0.31	4.91E-01	**2.15E+00**	1.26032E-06	2.02E+01	**28.7**
Nitrogen oxides	0.068	1.08E-01	**4.71E-01**	2.76457E-07	4.43E+00	**3.84**

Operating hours/year (purge and B.S.) - Flare pilot Emissions 168

Refinery capacity

55,000	bbl/d
55	Mbbl/d
0.055	MMbbl/d

Blowdown Operations (1)

Blowdown hours 168

Criteria Pollutant	lb/Mbbl Refinery Capacity	Blowdown Emission (lb/h)	Blowdown Emission (STPY)
Carbon monoxide (CAS No. 630-08-0)	4.3	9.9	0.828
Nitrogen oxides	19	43.5	3.658
SOX	27	61.9	5.198
VOC	0.8	1.8	0.154
SOOT ($PM_{2.5}$-FIL) from Lightly smoking flares (2)	0.027	0.1	0.005

Reference 1: "Emissions Estimation Protocol for Petroleum Refineries, Table 5-12 *"Default Emission Factors for Blowdown Systems"*

Assumption: Controlled emissions of a blowdown system with vapor recovery and flaring

Reference 2: "Emissions Estimation Protocol for Petroleum Refineries, Table 6-3 *"Emission Factors for Soot from Flares"*

Calculated using the LHV energy consumption-based emission factor

		BAT*
Vacuum feed bbl/day	26,000.00	0
Operating hours/year	8,760	

	Emissions Factor(lb/Mbbl of vacuum feed)*	Vacuum feed Mbbl/day	Emission (lb/d)	Emission (TPY)
Total hydrocarbons	0	0	0	0.00

Total hydrocarbon may be estimated as a surrogate for VOC. (Overall, less than 1 weight % of total hydrocarbon emissions is methane.)
Emission factors based on Table 5.1-1, AP-42, Chapter 5.1: Petroleum Refining.
*The purge is recovered and sent to fuel gas system (that's within the design), and those emissions are 0.
Any equipment leaks leading to the vacuum system are accounted in the LDAR program.

Refinery capacity

	55,000	bbl/d
	55	Mbbl/d
	0.055	MMbbl/d

Number of flares	4		Number of pilots	20
Fuel Gas to Pilots (SCF/h) (each pilot)	100	scf/h		
Flare hours	168	h		
		year		

Case: Normal operation	
Heating Value (MMBTU / SCF) (Natural Gas)=	0.00052
Fuel Gas to Pilots (SCF/h) (each flare)	100
LHV (MMBTU/h)	1.04

	HC Emergency Flare 1	HC Emergency Flare 2	Acid Flare	Enclosed HC Operating Flare
Number of Pilots	3	3	2	12
LHV (MMBTU/h)	0.156	0.156	0.104	0.624

Flare HAP

FOR 168 Hours of flaring

HAP	Emission Factor (tons/yr/bbl/d)	Emission (TPY)	lb/h-flaring
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 HAP (TPY)		4.56E-05	5.42E-04

MBBL	9.0 E-06 Ton-(	2000 lb	y
d	yr-Mbbl	ton	8760 h-flaring

0.000113 lb	h-flaring	ton
h-flaring	yr	2000 lb

Reference: "Emissions Estimation Protocol for Petroleum Refineries, Table 6-4 *"Flare General Emission Factors"*

Flare Pilot Operations

	8760	h
		y
Conversion	1020	BTU / SCF

Pilot Emissions (lb/h)

				Emissions (lb/h)				
				EF (lb/MMBTU)*	CO	Pb	PM total	PM COND
Flare	# Pilots	NG Flow/Pilot	NG SCF/h	MMBTU/h	0.0280000	0.0000005	0.0040000	0.0030000
HC Emergency Flare 1	3	100	300	0.306	8.57E-03	1.50E-07	1.22E-03	9.18E-04
HC Emergency Flare 2	3	100	300	0.306	8.57E-03	1.50E-07	1.22E-03	9.18E-04
Acid Flare	2	100	200	0.204	5.71E-03	1.00E-07	8.16E-04	6.12E-04
Enclosed HC Operating Flare	12	100	1200	1.224	3.43E-02	6.00E-07	4.90E-03	3.67E-03
				Total (lb/h)	**5.71E-02**	**1.00E-06**	**8.16E-03**	**6.12E-03**
				Total (STPY)	**0.25**	**4.38E-06**	**0.04**	**0.03**

				Emissions (lb/h)				
				EF (lb/MMBTU)*	PM FILT	NOX	SO2	VOC
Flare	# Pilots	NG Flow/Pilot	NG SCF/h	MMBTU/h	0.0010000	0.0300000	0.0005882	0.0053922
HC Emergency Flare 1	3	100	300	0.306	3.06E-04	9.18E-03	1.80E-04	1.65E-03
HC Emergency Flare 2	3	100	300	0.306	3.06E-04	9.18E-03	1.80E-04	1.65E-03
Acid Flare	2	100	200	0.204	2.04E-04	6.12E-03	1.20E-04	1.10E-03
Enclosed HC Operating Flare	12	100	1200	1.224	1.22E-03	3.67E-02	7.20E-04	6.60E-03
				Total (lb/h)	**2.04E-03**	**6.12E-02**	**1.20E-03**	**1.10E-02**
				Total (STPY)	**0.01**	**0.27**	**0.01**	**0.05**

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

DATA

Operating Hours	8760	yr
Charge	55,000.00	bbl/day
Water Density	8.34	lb/gal

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	115,644	21	20.254	1.013
Alkylation unit	5,388	6	-	3	-	-
Catalytic reforming	12,720	1.5	-	106	-	-
Hydrotreating/hydrorefining	47,418	2.6	-	6.3	-	-
Catalytic cracking	14,376	2.4	-	13	-	-
Product blending	32,221	2.9	-	24	-	-
Sulfur plant*	11.37	9.7	110.3	0.8	0.001	0.000
Isomerization	3,362	1.5	-	33	-	-
Tank drawdown	110,586	0.02	2,212	188	3.468	0.173
* Estimated from process data for the desalter.				**Total**	**23.72**	1.186

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

** WWTP engineering data

*** Assumes VSEP pretreatment or similar pretreatment of inflow into API (or in lieu of API)

95% Assumed Efficiency

YES	Pretreatment Control *** Yes/No?

CALCULATIONS

Mass Flow Benzene $1.19 \frac{\text{lb}}{\text{day}}$

Example

	Benzene Mass Ratio			Mass Flow lb/d	
Toluene	3.3	1.19 lb / day	=	3.91	Toluene lb / day

	Benzene Mass Ratio (b)	Mass Flow (lb/d)	Mass Fraction Table 7-10 BWON (C)	Emissions (STPY)	Emissions (STPY) Controlled	Emissions (lb/h) Controlled
Total VOC	81	96.08	0.6	10.52	**10.52**	**2.40**
2,2,4- Trimethylpentane	1.97	2.34	0.55	0.23	**1.06E-01**	**2.41E-02**
Benzene	1	1.19	0.25	0.05	**2.44E-02**	**5.56E-03**
Biphenyl	0.034	0.04	0.031	2.28E-04	**1.03E-04**	**2.34E-05**
Cresols	0.25	0.30	0	0.00E+00	**0.00E+00**	**0.00E+00**
Cumene	0.37	0.44	0.24	0.02	**8.65E-03**	**1.97E-03**
Ethylbenzene	0.88	1.04	0.22	0.04	**1.89E-02**	**4.31E-03**
Hexane	3.5	4.15	0.55	0.42	**1.88E-01**	**4.28E-02**
Methyl tertiary-butyl ether	0.58	0.69	0.091	0.01	**5.14E-03**	**1.17E-03**
Naphthalene	0.29	0.34	0.098	0.01	**2.77E-03**	**6.32E-04**
Phenol	0.18	0.21	0	0.00	**0.00E+00**	**0.00E+00**
Styrene	0.58	0.69	0.64	0.08	**3.62E-02**	**8.26E-03**
Toluene	3.3	3.91	0.19	0.14	**6.11E-02**	**1.39E-02**
Xylene	3.6	4.27	0.21	0.16	**7.36E-02**	**1.68E-02**
1,3-Butadiene	0.0006	0.00	0.75	0.00	**4.38E-05**	**1.00E-05**
			Total HAP (Uncontrolled)	1.16	5.24E-01	1.20E-01
			Total HAP (Controlled)	0.524		

55% Efficiency by use of activated carbon filters in API Separator

PROPOSED CONTROL OF HAP TO THE WWTS

The HAP contribution exceeds the 10 TPY limit for this pollutant. Existing technology can remove the benzene directly from the streams that are contributing the highest load.

The technology can remove at a minimum 90% of the benzene. The Catalytic Reformer and the Product Blending process sewers would have to be segregated and lifted to the pretreatment unit prior to discharge to the WWTS

The efficiency must be at least 82% to achieve the reduction in emissions necessary

(a) Table 7-8. Model Process Unit Characteristics for Petroleum Refinery Wastewater

(b) Table 7-9. Refinery Wastewater Contaminant Concentrations as a Ratio to Benzene

(c) Table 7-10. Default Mass Emission Factors for Refinery Wastewater Collection and Treatment Systems

Tables adpted from the Emissions Estimation Protocol for Petroleum Refineries, Version 3, RTI International.

Design Cooling Water Circulation Rate (Mgpm): 3 Three cells, 1,500 gpm each, two operating one on standby

Operating hours/year 8760

Water density 8.34 lb/gal

Emission	Emission Factor* (lb/Mgal)	TDS Concentration (ppm)	Emission (lb/h)	Emission (STPY)
VOC	0.006	-	8.10E-02	3.55E-01
PM10	0.0315	14,279	4.25E-01	1.86E+00

*Emission Factos shown here correspond only to induced draft, counter flow.

PM Emission Calculation

Water Drift Factor (lb/Mgal) 625.5

0.005% of drift factor for a water loss of 0.075 GPM

$$\frac{625.5\ \text{lb H2O Drift}}{\text{Mgal}} \times \frac{3\ \text{Mgal H2O}}{\text{minute}} = 1876.5\ \frac{\text{lb H2O Drift}}{\text{minute}}$$

$$\frac{1876.5\ \text{lb H2O}}{\text{minute}} \times \frac{60\ \text{minute}}{\text{hour}} \times \frac{\text{gal}}{8.3378\ \text{lb}} = 13503.56\ \frac{\text{gal Drift}}{\text{hour}}$$

$$\frac{13503.56\ \text{gal Drift}}{\text{hour}} \times \frac{0.0315\ \text{lb PM}}{\text{Mgal}} \times \frac{\text{Mgal}}{1000\ \text{gal}} = 4.25\text{E-}01\ \frac{\text{lb PM}}{\text{hour}}$$

$$\frac{0.0315\ \text{lb}}{\text{Mgal}} \times \frac{\text{kg}}{2.206\ \text{lb}} \times \frac{1\ \text{E06 mg}}{\text{kg}} \times \frac{\text{ppm}}{\text{mg}} = 14279\ \text{ppm}$$

VOC Calculation

$$\frac{625.5\ \text{lb H2O Drift}}{\text{Mgal}} \times \frac{\text{Mgal H2O}}{\text{minute}} = 1876.5\ \frac{\text{lb H2O Drift}}{\text{minute}}$$

$$\frac{1876.5\ \text{lb H2O}}{\text{minute}} \times \frac{60\ \text{minute}}{\text{hour}} \times \frac{\text{gal}}{8.3378\ \text{lb}} = 13503.56\ \frac{\text{gal Drift}}{\text{hour}}$$

$$\frac{13503.56\ \text{gal Drift}}{\text{hour}} \times \frac{0.006\ \text{lb PM}}{\text{Mgal}} \times \frac{\text{Mgal}}{1000\ \text{gal}} = 8.10\text{E-}02\ \frac{\text{lb PM}}{\text{hour}}$$

Operating hours/year: 5840 (2 - 8 hr shifts per day)

Refinery production	bbl/d	gal/d	Notes	gal/year
Crude oil	55,000	2,310,000		20,075,000
Gasoline	22,666	951,962	Including offspec gasoline/naphtha and light slop	8,272,999
Jet Kerosene	6,349	266,648		2,317,294
Diesel	8,327	349,745	Including offspec diesel/fuel oil	3,039,446
Fuel Oil	3,797	159,474	Including heavy slop	1,385,905

Description	EF (lb/Mgal)1	Uncontrolled Emissions (lb/h)	Uncontrolled Emissions (TPY)	Control Device	% Efficiency	Actual Emissions (TPY)	Actual Emissions (lb/h)
Crude oil	2	193	562	NG Assisted Flare or VRU	99.85%	0.83	0.19
Gasoline+butane	5	198	579	NG Assisted Flare or VRU	99.85%	0.86	0.20
Jet Kerosene	0.016	0.2	0.5	None	0.00%	0.52	0.12
Diesel No. 2	0.014	0.2	0.6	None	0.00%	0.60	0.14
Fuel Oil No. 6	0.0001	0.001	0.002	None	0%	0.002	0.0004
	Totals	391	1,142			2.81	0.64

Reference 1

AP-42 Table 5.2-5 TOTAL UNCONTROLLED ORGANIC EMISSION FACTORS FOR PETROLEUM LIQUID RAIL TANK CARS AND TANK TRUCKS, AP 42, Fifth Edition, Volume I Chapter 5: Transportation And Marketing Of Petroleum Liquids.

Operating hours/year: 5840 (2 - 8 hr shifts per day)

Refinery production	bbl/d	gal/d	Notes	gal/year
Crude oil	-	-		-
Gasoline+butane	9,555	401,321	Including offspec gasoline/naphtha and light slop	3,487,666
Jet Kerosene	2,116	88,883		772,431
Diesel	2,776	116,582	Including offspec diesel/fuel oil	1,013,149
Fuel Oil	-	-	Including heavy slop	-

Description	EF (lb/Mgal)1	Uncontrolled Emissions (lb/h)	Uncontrolled Emissions (TPY)	Control Device	% Efficiency	Actual Emissions (TPY)	Actual Emissions (lb/h)
Crude oil	2	-	-	None	0%	0.0	0.0
Gasoline+butane	5	84	244	NG Assisted Flare or VRU	99.85%	0.36	0.1
Jet Kerosene	0.016	0.1	0.2	None	0%	0.17	0.0
Diesel No. 2	0.014	0.1	0.2	None	0%	0.20	0.0
Fuel Oil No. 6	0.0001	-	-	None	0%	0.00	0.0
	Totals	84	245			0.73	0.17

Reference 1

AP-42 Table 5.2-5 TOTAL UNCONTROLLED ORGANIC EMISSION FACTORS FOR PETROLEUM LIQUID RAIL TANK CARS AND TANK TRUCKS, AP 42, Fifth Edition, Volume I Chapter 5: Transportation And Marketing Of Petroleum Liquids.

BASIS

It is assumed that crude oil inlet is via rails, not trucking. Also, it is assumed that 25% of liquid products (excep fuel oil) are loaded and transported via trucking; actual emissions might be lower, since in the future more volume may be transported via railroad.

Refinery production	bbl/d	gal/d	Notes	Truck Capacity (gallon)	trips/day
Gasoline+butane	9,555	401,321	Including offspec gasoline/naphtha and light slop	10000	40
Jet Kerosene	2,116	88,883		8000	11
Diesel	2,776	116,582	Including offspec diesel/fuel oil	6000	19
LPG	1,500	63,000	Including heavy slop	6000	11
				Total	81

Truck Round Trip Distance/trip 0.0379 mile

5280 feet / mile

200 feet traveled

TRUCK LOADING VMT

81 Trip / day	0.04 mile / Round Trip	365 day / year	=	1,120	VMT / year
			=	3.07	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

PM 2.5 Emissions

0.001 lb / VMT	3.07 VMT / d	d / 24 h	=	8.47E-05	lb PM 2.5 / h		
0.001 lb / VMT	3.07 VMT / d	365 day / year	ton / 2000 lb	=	3.71E-04	Ton PM 2.5 / Year	
0.001 lb / VMT	3.07 VMT / d	d / 24 h	h / 3600 s	kg / 2.206 lb	1000 g / s	=	1.07E-05 g PM 2.5 / s

PM 10 Emissions

0.003 lb / VMT	3.07 VMT / d	d / 24 h	=	3.45E-04	lb PM TOT / h		
0 lb / VMT	3.07 VMT / d	365 day / year	ton / 2000 lb	=	1.51E-03	Ton PM TOT / Year	
0.003lb / VMT	3.07 VMT / d	d / 24 h	h / 3600 s	kg / 2.206 lb	1000 g / s	=	5.37E-04 g PM TOT / 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

Vehicle Miles Traveled

$$\frac{200\ \text{Trip}}{\text{day}} \times \frac{0.19\ \text{mile}}{\text{Round Trip}} \times \frac{365\ \text{day}}{\text{year}} = 13{,}826\ \frac{\text{VMT}}{\text{year}}$$

$$= 37.88\ \frac{\text{VMT}}{\text{d}}$$

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

$$\frac{0.000028\ \text{lb}}{\text{VMT}} \times \frac{37.88\ \text{VMT}}{\text{d}} \times \frac{\text{d}}{24\ \text{h}} = 4.42\text{E-}05\ \frac{\text{lb PM 2.5}}{\text{h}}$$

$$\frac{0.00003\ \text{lb}}{\text{VMT}} \times \frac{37.88\ \text{VMT}}{\text{d}} \times \frac{365\ \text{day}}{\text{year}} \times \frac{\text{ton}}{2000\ \text{lb}} = 1.94\text{E-}04\ \frac{\text{Ton PM 2.5}}{\text{Year}}$$

$$\frac{0.00003\ \text{lb}}{\text{VMT}} \times \frac{37.88\ \text{VMT}}{\text{d}} \times \frac{\text{d}}{24\ \text{h}} \times \frac{\text{h}}{3600\ \text{s}} \times \frac{\text{kg}}{2.206\ \text{lb}} \times \frac{1000\ \text{g}}{\text{s}} = 5.57\text{E-}06\ \frac{\text{g PM 2.5}}{\text{s}}$$

PM 10 Emissions

$$\frac{0.0001142\ \text{lb}}{\text{VMT}} \times \frac{37.88\ \text{VMT}}{\text{d}} \times \frac{\text{d}}{24\ \text{h}} = 1.80\text{E-}04\ \frac{\text{lb PM TOT}}{\text{h}}$$

$$\frac{0.00011\ \text{lb}}{\text{VMT}} \times \frac{37.88\ \text{VMT}}{\text{d}} \times \frac{365\ \text{day}}{\text{year}} \times \frac{\text{ton}}{2000\ \text{lb}} = 7.89\text{E-}04\ \frac{\text{Ton PM TOT}}{\text{Year}}$$

$$\frac{0.00011\ \text{lb}}{\text{VMT}} \times \frac{37.88\ \text{VMT}}{\text{d}} \times \frac{\text{d}}{24\ \text{h}} \times \frac{\text{h}}{3600\ \text{s}} \times \frac{\text{kg}}{2.206\ \text{lb}} \times \frac{1000\ \text{g}}{\text{s}} = 2.27\text{E-}05\ \frac{\text{g PM TOT}}{\text{s}}$$

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

Spent Catalyst Handling

Data

8.614	ton catalyst/14 day
14	day maintenance schedule
70000	bbl/day

Calculations

Spent Catalyst Production

$$\frac{8.614\ \text{ton}}{} \times \frac{2000\ \text{lb}}{\text{ton}} \times \frac{}{14\ \text{day}} = 1231\ \frac{\text{lb PM}}{\text{day}}$$

Percentage of catalyst suspended in the air during transfer into the bi 15%

$$\frac{1230.6\ \text{lb}}{\text{day}} \times \frac{15\%}{} = 184.59\ \frac{\text{lb PM}}{\text{day}}$$

Controlled Emissions 95% efficiency

$$\frac{184.6\ \text{lb}}{\text{day}} \times \frac{\text{day}}{70000\ \text{bbl}} \times \frac{(1-0.95)}{} = 1.32\text{E-}04\ \frac{\text{lb PM}}{\text{bbl}}$$

Emissions for 365 day operation, 55 000 barrel/day

$$\frac{0.0001\ \text{lb}}{\text{bbl}} \times \frac{55000\ \text{bbl}}{\text{day}} \times \frac{365\ \text{day}}{\text{year}} = 2646.83\ \frac{\text{lb PM}}{\text{year}}$$

$$\frac{2646.8\text{lb}}{\text{year}} \times \frac{\text{yr}}{2000\ \text{lb}} = 1.32\ \frac{\text{ton PM}}{\text{year}}$$

Fuel consumption (gph)	**423**	**Content (MMBTU/gal)**	**0.137**	**MMBTUh**	**57.96**	**consumption (gph)**	**33.33**	**Content (MMBTU/gal)**	**0.137**	**MMBTUh**	**4.57**								
	216-EG-1601A		**216-EG-1601B**		**216-EG-1601C**		**212-P-1201 A**		**212-P-1201 B**		**212-P-1201 C**								
	Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)	Emission (lb/h)	Emission (STPY)	Total Emissions Gen Set (lb/h)	Total Emissions Gen Set (STPY)	Total Emissions FWP (lb/h)	To Emis FWP
BTU																
	25.8	1.29	25.8	1.3	25.8	1.3	3.3	0.17	3.3	0.2	3.3	0.2	77.44	3.87	9.90	0.
	3.29	0.16	3.29	0.16	3.29	0.16	0.42	0.02	0.42	0.02	0.42	0.02	9.86	0.49	1.26	0.
73	3.32	0.17	3.3	0.2	3.3	0.2	0.26	0.01	0.26	0.01	0.26	0.01	9.96	4.98E-01	7.85E-01	3.93
96	2.87	0.14	2.9	0.1	2.9	0.1	0.23	0.01	0.23	0.01	0.23	0.01	8.62	4.31E-01	6.80E-01	3.40
79	2.78	0.14	2.8	0.1	2.8	0.1	0.22	0.01	0.22	0.01	0.22	0.01	8.33	4.16E-01	6.56E-01	3.28
79	2.78	0.14	2.8	0.1	2.8	0.1	0.22	0.01	0.22	0.01	0.22	0.01	8.33	4.16E-01	6.56E-01	3.28
77	0.45	0.02	0.4	0.0	0.4	0.0	0.04	0.00	0.04	0.00	0.04	0.00	1.34	6.69E-02	1.06E-01	5.28
	61.0	3.05	61.0	3.1	61.0	3.1	7.8	0.39	7.80	0.39	7.80	0.39	183.05	9.15	23.40	1.
	1.90E-02	9.49E-04	1.90E-02	9.49E-04	1.90E-02	9.49E-04	2.43E-03	1.21E-04	2.43E-03	1.21E-04	2.43E-03	1.21E-04	5.70E-02	2.85E-03	7.28E-03	3.64
	3.31	0.17	3.31	0.17	3.31	0.17	0.42	0.02	0.42	0.02	0.42	0.02	9.93	4.96E-01	1.27	6.35
	2.53E-01	1.26E-02	2.53E-01	1.26E-02	2.53E-01	1.26E-02	1.99E-02	9.97E-04	1.99E-02	9.97E-04	1.99E-02	9.97E-04	7.59E-01	3.79E-02	5.98E-02	2.99

ary 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 FACT

RGENCY GENERATOR SET x 3 Engines

r	Emission (STPY)	lb/hr	Emission (STPY)
-02	2.25E-03	1.35E-01	6.75E-03
-02	8.14E-04	4.89E-02	2.44E-03
-02	5.59E-04	3.36E-02	1.68E-03
-01	8.09E-03	4.85E-01	2.43E-02
-03	2.29E-04	1.37E-02	6.86E-04
-03	7.30E-05	4.38E-03	2.19E-04
-04	2.28E-05	1.37E-03	6.85E-05
-01	**1.20E-02**	**7.22E-01**	**3.61E-02**
-03	3.77E-04	2.26E-02	1.13E-03
-04	2.68E-05	1.61E-03	8.03E-05
-04	1.36E-05	8.14E-04	4.07E-05
-04	3.71E-05	2.23E-03	1.11E-04
-03	1.18E-04	7.09E-03	3.55E-04
-05	3.56E-06	2.14E-04	1.07E-05
-04	1.17E-05	7.01E-04	3.50E-05
-04	1.08E-05	6.45E-04	3.23E-05
-05	1.80E-06	1.08E-04	5.41E-06
-05	4.43E-06	2.66E-04	1.33E-05
-05	3.22E-06	1.93E-04	9.65E-06
-05	6.32E-07	3.79E-05	1.90E-06
-05	7.45E-07	4.47E-05	2.23E-06
-05	1.20E-06	7.20E-05	3.60E-06
-05	1.00E-06	6.02E-05	3.01E-06
-05	1.61E-06	9.67E-05	4.83E-06
-02	**6.14E-04**	**3.69E-02**	**1.84E-03**

FIREWATER PUMPS x 3 Engines

Volatile HAPS	lb/MMBTU	lb/hr	Emission (STPY)	lb/hr	Emission (STPY)
Benzene	7.76E-04	3.54E-03	1.77E-04	1.06E-02	5.32E-04
Toluene	2.81E-04	1.28E-03	6.42E-05	3.85E-03	1.93E-04
Xylene	1.93E-04	8.82E-04	4.41E-05	2.64E-03	1.32E-04
Propylene	2.79E-03	1.27E-02	6.37E-04	3.82E-02	1.91E-03
Formaldehyd	7.89E-05	3.60E-04	1.80E-05	1.08E-03	5.41E-05
Acetaldehyde	2.52E-05	1.15E-04	5.76E-06	3.45E-04	1.73E-05
Acrolein	7.88E-06	3.60E-05	1.80E-06	1.08E-04	5.40E-06
TOTAL VOLATILE HAPS		**1.90E-02**	**9.48E-04**	**5.69E-02**	**2.84E-03**
PAHs					
Naphthalene	1.30E-04	5.94E-04	2.97E-05	1.78E-03	8.91E-05
Acenaphthyle	9.23E-06	4.22E-05	2.11E-06	1.26E-04	6.32E-06
Acenaphthen	4.68E-06	2.14E-05	1.07E-06	6.41E-05	3.21E-06
Fluorene	1.28E-05	5.85E-05	2.92E-06	1.75E-04	8.77E-06
Phenanthren	4.08E-05	1.86E-04	9.32E-06	5.59E-04	2.80E-05
Anthracene	1.23E-06	5.62E-06	2.81E-07	1.69E-05	8.43E-07
Fluoranthene	4.03E-06	1.84E-05	9.20E-07	5.52E-05	2.76E-06
Pyrene	3.71E-06	1.69E-05	8.47E-07	5.08E-05	2.54E-06
Benz(a)anthr	6.22E-07	2.84E-06	1.42E-07	8.52E-06	4.26E-07
Chrysene	1.53E-06	6.99E-06	3.49E-07	2.10E-05	1.05E-06
Benzo(b)fluor	1.11E-06	5.07E-06	2.54E-07	1.52E-05	7.61E-07
Benzo(k)fluor	2.18E-07	9.96E-07	4.98E-08	2.99E-06	1.49E-07
Benzo(a)pyre	2.57E-07	1.17E-06	5.87E-08	3.52E-06	1.76E-07
Indeno(1,2,3-	4.14E-07	1.89E-06	9.46E-08	5.67E-06	2.84E-07
Dibenz(a,h)ar	3.46E-07	1.58E-06	7.90E-08	4.74E-06	2.37E-07
Benzo(g,h,l)p	5.56E-07	2.54E-06	1.27E-07	7.62E-06	3.81E-07
TOTAL PAH	**2.12E-04**	**9.68E-04**	**4.84E-05**	**2.91E-03**	**1.45E-04**

ary 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 UNCONT

Meridian Energy Group Inc.	**EMISSIONS INVENTORY**	**VEPICA CODE:** P-5715043-01-001-18042-I001	vepica USA
		COMPANY CODE: TBD	
		ISSUE: 0 **DATE:** 09/23/16	
		SHEET: **OF**	

TANKS 4.09d SOFTWARE 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-0005
City:	Belfield
State:	North Dakota
Company:	Meridian
Type of Tank:	Internal Floating Roof Tank
Description:	Desulfurized Heavy Naphtha

Tank Dimensions

Diameter (ft):	63.00
Volume (gallons):	1,399,104.00
Turnovers:	26.78
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	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-0005 - 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 6)	Jan	30.90	24.94	36.87	43.84	1.5461	N/A	N/A	69.0000			92.00	Option 4: RVP=6, ASTM Slope=3
Gasoline (RVP 6)	Feb	34.98	28.04	41.91	43.84	1.6990	N/A	N/A	69.0000			92.00	Option 4: RVP=6, ASTM Slope=3
Gasoline (RVP 6)	Mar	42.09	33.80	50.39	43.84	1.9957	N/A	N/A	69.0000			92.00	Option 4: RVP=6, ASTM Slope=3
Gasoline (RVP 6)	Apr	50.10	39.90	60.29	43.84	2.3789	N/A	N/A	69.0000			92.00	Option 4: RVP=6, ASTM Slope=3
Gasoline (RVP 6)	May	56.81	45.06	68.55	43.84	2.7449	N/A	N/A	69.0000			92.00	Option 4: RVP=6, ASTM Slope=3
Gasoline (RVP 6)	Jun	61.81	49.29	74.32	43.84	3.0465	N/A	N/A	69.0000			92.00	Option 4: RVP=6, ASTM Slope=3
Gasoline (RVP 6)	Jul	64.71	51.53	77.88	43.84	3.2334	N/A	N/A	69.0000			92.00	Option 4: RVP=6, ASTM Slope=3
Gasoline (RVP 6)	Aug	62.42	50.31	74.54	43.84	3.0855	N/A	N/A	69.0000			92.00	Option 4: RVP=6, ASTM Slope=3
Gasoline (RVP 6)	Sep	55.34	45.27	65.40	43.84	2.6611	N/A	N/A	69.0000			92.00	Option 4: RVP=6, ASTM Slope=3
Gasoline (RVP 6)	Oct	48.45	40.33	56.58	43.84	2.2958	N/A	N/A	69.0000			92.00	Option 4: RVP=6, ASTM Slope=3
Gasoline (RVP 6)	Nov	39.43	33.50	45.36	43.84	1.8800	N/A	N/A	69.0000			92.00	Option 4: RVP=6, ASTM Slope=3
Gasoline (RVP 6)	Dec	32.50	27.06	37.95	43.84	1.6048	N/A	N/A	69.0000			92.00	Option 4: RVP=6, ASTM Slope=3

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

203-T-0005 - Internal Floating Roof Tank
Belfield, North Dakota

Month:	January	February	March	April	May	June	July	August	September	October	November	December
Rim Seal Losses (lb):	3.2120	3.5512	4.2211	5.1115	5.9891	6.7339	7.2056	6.8316	5.7857	4.9159	3.9581	3.3418
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:	0.0296	0.0327	0.0388	0.0470	0.0551	0.0620	0.0663	0.0629	0.0532	0.0452	0.0364	0.0308
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	1.5461	1.6990	1.9957	2.3789	2.7449	3.0465	3.2334	3.0855	2.6611	2.2958	1.8800	1.6048
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):	69.0000	69.0000	69.0000	69.0000	69.0000	69.0000	69.0000	69.0000	69.0000	69.0000	69.0000	69.0000
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):	9.3472	9.3472	9.3472	9.3472	9.3472	9.3472	9.3472	9.3472	9.3472	9.3472	9.3472	9.3472
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.):	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500
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):	9.1092	10.0710	11.9711	14.4961	16.9850	19.0973	20.4350	19.3741	16.4082	13.9415	11.2250	9.4772
Value of Vapor Pressure Function:	0.0296	0.0327	0.0388	0.0470	0.0551	0.0620	0.0663	0.0629	0.0532	0.0452	0.0364	0.0308
Vapor Molecular Weight (lb/lb-mole):	69.0000	69.0000	69.0000	69.0000	69.0000	69.0000	69.0000	69.0000	69.0000	69.0000	69.0000	69.0000
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):	69.0000	69.0000	69.0000	69.0000	69.0000	69.0000	69.0000	69.0000	69.0000	69.0000	69.0000	69.0000
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):	21.6684	22.9694	25.5394	28.9548	32.3212	35.1784	36.9878	35.5529	31.5410	28.2046	24.5302	22.1662

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	5.1610
Automatic Gauge Float Well/Bolted Cover, Gasketed	1	2.80	0.00	0.00	9.0318
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	138.7026
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1	6.20	1.20	0.94	19.9990

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-0005 - 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 6)	60.86	112.17	172.59	0.00	345.61

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

Identification

User Identification:	203-T-0006
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:	46.90
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-0006 - 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 4: RVP=7.8, ASTM Slope=3

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

203-T-0006 - 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):	16.3698	16.3698	16.3698	16.3698	16.3698	16.3698	16.3698	16.3698	16.3698	16.3698	16.3698	16.3698
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.):	5,468,164.8000	5,468,164.8000	5,468,164.8000	5,468,164.8000	5,468,164.8000	5,468,164.8000	5,468,164.8000	5,468,164.8000	5,468,164.8000	5,468,164.8000	5,468,164.8000	5,468,164.8000
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):	33.3860	35.1636	38.6840	43.3859	48.0529	52.0433	54.5859	52.5685	46.9681	42.3505	37.3001	34.0658

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-0006 - 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	196.44	238.14	0.00	518.55

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

Identification

User Identification:	203-T-0008
City:	Belfield
State:	North Dakota
Company:	Meridian
Type of Tank:	Internal Floating Roof Tank
Description:	Gasoline (RVP 13-15)

Tank Dimensions

Diameter (ft):	88.00
Volume (gallons):	2,729,832.00
Turnovers:	55.73
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	27
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-0008 - 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 13)	May	56.81	45.06	68.55	43.84	6.5424	N/A	N/A	62.0000			92.00	Option 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	Option 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	Option 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	Option 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	Option 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	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-0008 - 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):	27.1708	27.1708	27.1708	27.1708	27.1708	27.1708	27.1708	27.1708	27.1708	27.1708	27.1708	27.1708
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.):	12,677,794.7500	12,677,794.7500	12,677,794.7500	12,677,794.7500	12,677,794.7500	12,677,794.7500	12,677,794.7500	12,677,794.7500	12,677,794.7500	12,677,794.7500	12,677,794.7500	12,677,794.7500
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):	67.7610	72.1562	81.1000	93.6350	92.6036	101.8228	107.8979	103.0641	90.1582	90.8099	77.5434	69.4330

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	27	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-0008 - 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)	119.54	190.20	242.70	0.00	552.44
Gasoline (RVP 13)	118.70	135.85	240.99	0.00	495.55

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

Identification

User Identification:	203-T-0011
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:	23.28
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-0011 - 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-0011 - Internal Floating Roof Tank
Belfield, North Dakota

Month:	January	February	March	April	May	June	July	August	September	October	November	December
Rim Seal Losses (lb):	1.8723	1.8723	1.9734	2.3653	2.8621	3.2375	3.4572	3.2840	2.7527	2.2827	1.8723	1.8723
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):	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):	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):	9.2863	9.2863	9.2863	9.2863	9.2863	9.2863	9.2863	9.2863	9.2863	9.2863	9.2863	9.2863
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.):	2,714,261.7500	2,714,261.7500	2,714,261.7500	2,714,261.7500	2,714,261.7500	2,714,261.7500	2,714,261.7500	2,714,261.7500	2,714,261.7500	2,714,261.7500	2,714,261.7500	2,714,261.7500
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):	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):	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):	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):	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):	16.4686	16.4686	16.8562	18.3595	20.2651	21.7053	22.5482	21.8838	19.8455	18.0426	16.4686	16.4686

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-0011 - 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)	29.70	111.44	84.24	0.00	225.38

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

Identification

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

Tank Dimensions

Shell Height (ft):		60.00
Diameter (ft):		63.00
Liquid Height (ft) :		50.00
Avg. Liquid Height (ft):		20.00
Volume (gallons):		1,165,934.57
Turnovers:		27.61
Net Throughput(gal/yr):		32,196,066.00
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
Belfied, 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	All	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-013 - Vertical Fixed Roof Tank
Belfied, North Dakota

Annual Emission Calcaulations	
Standing Losses (lb):	326.4459
Vapor Space Volume (cu ft):	129,885.2211
Vapor Density (lb/cu ft):	0.0001
Vapor Space Expansion Factor:	0.0684
Vented Vapor Saturation Factor:	0.9907
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	129,885.2211
Tank Diameter (ft):	63.0000
Vapor Space Outage (ft):	41.6667
Tank Shell Height (ft):	60.0000
Average Liquid Height (ft):	20.0000
Roof Outage (ft):	1.6667
Roof Outage (Cone Roof)	
Roof Outage (ft):	1.6667
Roof Height (ft):	5.0000
Roof Slope (ft/ft):	0.1600
Shell Radius (ft):	31.5000
Vapor Density	
Vapor Density (lb/cu ft):	0.0001
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0043
Daily Avg. Liquid Surface Temp. (deg. R):	507.9647
Daily Average Ambient Temp. (deg. F):	41.5958
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	503.5058
Tank Paint Solar Absorptance (Shell):	0.5400
Tank Paint Solar Absorptance (Roof):	0.5400
Daily Total Solar Insulation Factor (Btu/sqft day):	1,276.2450
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0684
Daily Vapor Temperature Range (deg. R):	36.8348
Daily Vapor Pressure Range (psia):	0.0029
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0043
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0031
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0060
Daily Avg. Liquid Surface Temp. (deg R):	507.9647
Daily Min. Liquid Surface Temp. (deg R):	498.7560
Daily Max. Liquid Surface Temp. (deg R):	517.1734
Daily Ambient Temp. Range (deg. R):	24.3583
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9907
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0043
Vapor Space Outage (ft):	41.6667

Working Losses (lb):	424.6534
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0043
Annual Net Throughput (gal/yr.):	32,196,066.0000
Annual Turnovers:	27.6140
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	1,165,934.5742
Maximum Liquid Height (ft):	50.0000
Tank Diameter (ft):	63.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	751.0993

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

Emissions Report for: Annual

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

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	424.65	326.45	751.10

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

Identification

User Identification:	203-T-0015
City:	Belfield
State:	North Dakota
Company:	Meridian
Type of Tank:	Vertical Fixed Roof Tank
Description:	Desulfurized Diesel

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:	56.44
Net Throughput(gal/yr):	128,404,080.00
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)	0.15

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-0015 - 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	All	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-0015 - Vertical Fixed Roof Tank
Belfield, North Dakota

Annual Emission Calcaulations	
Standing Losses (lb):	210.2319
Vapor Space Volume (cu ft):	83,122.3527
Vapor Density (lb/cu ft):	0.0001
Vapor Space Expansion Factor:	0.0684
Vented Vapor Saturation Factor:	0.9969
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	83,122.3527
Tank Diameter (ft):	88.0000
Vapor Space Outage (ft):	13.6667
Tank Shell Height (ft):	60.0000
Average Liquid Height (ft):	48.0000
Roof Outage (ft):	1.6667
Roof Outage (Cone Roof)	
Roof Outage (ft):	1.6667
Roof Height (ft):	5.0000
Roof Slope (ft/ft):	0.1500
Shell Radius (ft):	44.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0001
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0043
Daily Avg. Liquid Surface Temp. (deg. R):	507.9647
Daily Average Ambient Temp. (deg. F):	41.5958
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	503.5058
Tank Paint Solar Absorptance (Shell):	0.5400
Tank Paint Solar Absorptance (Roof):	0.5400
Daily Total Solar Insulation Factor (Btu/sqft day):	1,276.2450
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0684
Daily Vapor Temperature Range (deg. R):	36.8348
Daily Vapor Pressure Range (psia):	0.0029
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0043
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0031
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0060
Daily Avg. Liquid Surface Temp. (deg R):	507.9647
Daily Min. Liquid Surface Temp. (deg R):	498.7560
Daily Max. Liquid Surface Temp. (deg R):	517.1734
Daily Ambient Temp. Range (deg. R):	24.3583
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9969
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0043
Vapor Space Outage (ft):	13.6667

Working Losses (lb):	1,182.4095
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0043
Annual Net Throughput (gal/yr.):	128,404,080.0000
Annual Turnovers:	56.4443
Turnover Factor:	0.6982
Maximum Liquid Volume (gal):	2,274,879.6529
Maximum Liquid Height (ft):	50.0000
Tank Diameter (ft):	88.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	1,392.6414

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

Emissions Report for: Annual

203-T-0015 - Vertical Fixed Roof Tank
Belfield, North Dakota

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	1,182.41	210.23	1,392.64

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

Identification

User Identification:	203-T-0017
City:	Belfield
State:	North Dakota
Company:	Meridian
Type of Tank:	Vertical Fixed Roof Tank
Description:	Vacuum Gas Oil

Tank Dimensions

Shell Height (ft):	60.00
Diameter (ft):	63.00
Liquid Height (ft) :	50.00
Avg. Liquid Height (ft):	20.00
Volume (gallons):	1,165,934.57
Turnovers:	39.05
Net Throughput(gal/yr):	45,530,100.00
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-0017 - 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	All	48.29	39.09	57.50	43.84	0.0000	0.0000	0.0000	190.0000			387.00	Option 1: VP40 = .00002 VP50 = .00003

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

203-T-0017 - Vertical Fixed Roof Tank
Belfield, North Dakota

Annual Emission Calcaulations	
Standing Losses (lb):	3.1880
Vapor Space Volume (cu ft):	129,885.2211
Vapor Density (lb/cu ft):	0.0000
Vapor Space Expansion Factor:	0.0682
Vented Vapor Saturation Factor:	0.9999
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	129,885.2211
Tank Diameter (ft):	63.0000
Vapor Space Outage (ft):	41.6667
Tank Shell Height (ft):	60.0000
Average Liquid Height (ft):	20.0000
Roof Outage (ft):	1.6667
Roof Outage (Cone Roof)	
Roof Outage (ft):	1.6667
Roof Height (ft):	5.0000
Roof Slope (ft/ft):	0.1600
Shell Radius (ft):	31.5000
Vapor Density	
Vapor Density (lb/cu ft):	0.0000
Vapor Molecular Weight (lb/lb-mole):	190.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0000
Daily Avg. Liquid Surface Temp. (deg. R):	507.9647
Daily Average Ambient Temp. (deg. F):	41.5958
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	503.5058
Tank Paint Solar Absorptance (Shell):	0.5400
Tank Paint Solar Absorptance (Roof):	0.5400
Daily Total Solar Insulation Factor (Btu/sqft day):	1,276.2450
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0682
Daily Vapor Temperature Range (deg. R):	36.8348
Daily Vapor Pressure Range (psia):	0.0000
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0000
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0000
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0000
Daily Avg. Liquid Surface Temp. (deg R):	507.9647
Daily Min. Liquid Surface Temp. (deg R):	498.7560
Daily Max. Liquid Surface Temp. (deg R):	517.1734
Daily Ambient Temp. Range (deg. R):	24.3583
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9999
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0000
Vapor Space Outage (ft):	41.6667

Working Losses (lb):	5.4485
Vapor Molecular Weight (lb/lb-mole):	190.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0000
Annual Net Throughput (gal/yr.):	45,530,100.0000
Annual Turnovers:	39.0503
Turnover Factor:	0.9349
Maximum Liquid Volume (gal):	1,165,934.5742
Maximum Liquid Height (ft):	50.0000
Tank Diameter (ft):	63.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	8.6365

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

Emissions Report for: Annual

203-T-0017 - Vertical Fixed Roof Tank
Belfield, North Dakota

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Residual oil no. 6	5.45	3.19	8.64

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

Identification

User Identification:	203-T-0018
City:	Belfield
State:	North Dakota
Company:	Meridian
Type of Tank:	Internal Floating Roof Tank
Description:	FCC Naphtha

Tank Dimensions

Diameter (ft):	63.00
Volume (gallons):	1,399,104.00
Turnovers:	26.78
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-0018 - 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-0018 - Internal Floating Roof Tank
Belfield, North Dakota

Month:	January	February	March	April	May	June	July	August	September	October	November	December
Rim Seal Losses (lb):	9.5894	10.6278	12.7408	15.7022	18.8346	21.7009	23.6354	22.0930	18.0870	15.0347	11.9005	9.9845
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):	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):	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):	9.3472	9.3472	9.3472	9.3472	9.3472	9.3472	9.3472	9.3472	9.3472	9.3472	9.3472	9.3472
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.):	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500
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):	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):	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):	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):	46.1320	50.1152	58.2205	69.5803	81.5963	92.5912	100.0121	94.0955	78.7286	67.0201	54.9973	47.6473

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-0018 - 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)	189.93	112.17	538.64	0.00	840.74

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

Identification

User Identification:	203-T-0020
City:	Belfield
State:	North Dakota
Company:	Meridian
Type of Tank:	Internal Floating Roof Tank
Description:	Alkylate

Tank Dimensions

Diameter (ft):	63.00
Volume (gallons):	1,399,104.00
Turnovers:	26.78
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-0020 - 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 10)	Jan	30.90	24.94	36.87	43.84	2.8523	N/A	N/A	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3
Gasoline (RVP 10)	Feb	34.98	28.04	41.91	43.84	3.1146	N/A	N/A	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3
Gasoline (RVP 10)	Mar	42.09	33.80	50.39	43.84	3.6191	N/A	N/A	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3
Gasoline (RVP 10)	Apr	50.10	39.90	60.29	43.84	4.2635	N/A	N/A	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3
Gasoline (RVP 10)	May	56.81	45.06	68.55	43.84	4.8723	N/A	N/A	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3
Gasoline (RVP 10)	Jun	61.81	49.29	74.32	43.84	5.3700	N/A	N/A	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3
Gasoline (RVP 10)	Jul	64.71	51.53	77.88	43.84	5.6768	N/A	N/A	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3
Gasoline (RVP 10)	Aug	62.42	50.31	74.54	43.84	5.4341	N/A	N/A	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3
Gasoline (RVP 10)	Sep	55.34	45.27	65.40	43.84	4.7335	N/A	N/A	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3
Gasoline (RVP 10)	Oct	48.45	40.33	56.58	43.84	4.1244	N/A	N/A	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3
Gasoline (RVP 10)	Nov	39.43	33.50	45.36	43.84	3.4231	N/A	N/A	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3
Gasoline (RVP 10)	Dec	32.50	27.06	37.95	43.84	2.9532	N/A	N/A	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3

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

203-T-0020 - Internal Floating Roof Tank
Belfield, North Dakota

Month:	January	February	March	April	May	June	July	August	September	October	November	December
Rim Seal Losses (lb):	5.9802	6.6046	7.8480	9.5249	11.2108	12.6714	13.6121	12.8650	10.8168	9.1539	7.3581	6.2188
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:	0.0575	0.0635	0.0755	0.0916	0.1078	0.1219	0.1309	0.1238	0.1041	0.0881	0.0708	0.0598
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.8523	3.1146	3.6191	4.2635	4.8723	5.3700	5.6768	5.4341	4.7335	4.1244	3.4231	2.9532
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):	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000
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):	9.3472	9.3472	9.3472	9.3472	9.3472	9.3472	9.3472	9.3472	9.3472	9.3472	9.3472	9.3472
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.):	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500	3,122,333.7500
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):	16.9598	18.7306	22.2567	27.0124	31.7935	35.9357	38.6037	36.4850	30.6763	25.9602	20.8673	17.6363
Value of Vapor Pressure Function:	0.0575	0.0635	0.0755	0.0916	0.1078	0.1219	0.1309	0.1238	0.1041	0.0881	0.0708	0.0598
Vapor Molecular Weight (lb/lb-mole):	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000
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):	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000
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):	32.2872	34.6825	39.4519	45.8845	52.3514	57.9543	61.5630	58.6972	50.8403	44.4613	37.5726	33.2023

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	9.6567
Automatic Gauge Float Well/Bolted Cover, Gasketed	1	2.80	0.00	0.00	16.8992
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	259.5234
Vacuum Breaker (10-in. Diam.)/Weighted Mech. Actuation, Gask.	1	6.20	1.20	0.94	37.4197

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-0020 - 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 10)	113.86	112.17	322.92	0.00	548.95

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

Identification

User Identification:	203-T-0022
City:	Belfield
State:	North Dakota
Company:	Meridian
Type of Tank:	Vertical Fixed Roof Tank
Description:	Diluent - Heavy Intermediates from FCC

Tank Dimensions

Shell Height (ft):	60.00
Diameter (ft):	63.00
Liquid Height (ft) :	50.00
Avg. Liquid Height (ft):	20.00
Volume (gallons):	1,165,934.57
Turnovers:	0.01
Net Throughput(gal/yr):	14,440.86
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-0022 - 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	All	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-0022 - Vertical Fixed Roof Tank
Belfield, North Dakota

Annual Emission Calcaulations	
Standing Losses (lb):	326.4459
Vapor Space Volume (cu ft):	129,885.2211
Vapor Density (lb/cu ft):	0.0001
Vapor Space Expansion Factor:	0.0684
Vented Vapor Saturation Factor:	0.9907
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	129,885.2211
Tank Diameter (ft):	63.0000
Vapor Space Outage (ft):	41.6667
Tank Shell Height (ft):	60.0000
Average Liquid Height (ft):	20.0000
Roof Outage (ft):	1.6667
Roof Outage (Cone Roof)	
Roof Outage (ft):	1.6667
Roof Height (ft):	5.0000
Roof Slope (ft/ft):	0.1600
Shell Radius (ft):	31.5000
Vapor Density	
Vapor Density (lb/cu ft):	0.0001
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0043
Daily Avg. Liquid Surface Temp. (deg. R):	507.9647
Daily Average Ambient Temp. (deg. F):	41.5958
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	503.5058
Tank Paint Solar Absorptance (Shell):	0.5400
Tank Paint Solar Absorptance (Roof):	0.5400
Daily Total Solar Insulation Factor (Btu/sqft day):	1,276.2450
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0684
Daily Vapor Temperature Range (deg. R):	36.8348
Daily Vapor Pressure Range (psia):	0.0029
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0043
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0031
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0060
Daily Avg. Liquid Surface Temp. (deg R):	507.9647
Daily Min. Liquid Surface Temp. (deg R):	498.7560
Daily Max. Liquid Surface Temp. (deg R):	517.1734
Daily Ambient Temp. Range (deg. R):	24.3583
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9907
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0043
Vapor Space Outage (ft):	41.6667

Working Losses (lb):	0.1905
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0043
Annual Net Throughput (gal/yr.):	14,440.8600
Annual Turnovers:	0.0124
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	1,165,934.5742
Maximum Liquid Height (ft):	50.0000
Tank Diameter (ft):	63.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	326.6363

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

Emissions Report for: Annual

203-T-0022 - Vertical Fixed Roof Tank
Belfield, North Dakota

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	0.19	326.45	326.64

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

Identification

User Identification:	203-T-0023
City:	Belfield
State:	North Dakota
Company:	Meridian
Type of Tank:	Vertical Fixed Roof Tank
Description:	Fuel Oil

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:	21.16
Net Throughput(gal/yr):	48,136,200.00
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-0023 - 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	All	48.29	39.09	57.50	43.84	0.0000	0.0000	0.0000	190.0000			387.00	Option 1: VP40 = .00002 VP50 = .00003

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

203-T-0023 - Vertical Fixed Roof Tank
Belfield, North Dakota

Annual Emission Calcaulations	
Standing Losses (lb):	2.0900
Vapor Space Volume (cu ft):	85,149.7272
Vapor Density (lb/cu ft):	0.0000
Vapor Space Expansion Factor:	0.0682
Vented Vapor Saturation Factor:	1.0000
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	85,149.7272
Tank Diameter (ft):	88.0000
Vapor Space Outage (ft):	14.0000
Tank Shell Height (ft):	60.0000
Average Liquid Height (ft):	48.0000
Roof Outage (ft):	2.0000
Roof Outage (Cone Roof)	
Roof Outage (ft):	2.0000
Roof Height (ft):	6.0000
Roof Slope (ft/ft):	0.1400
Shell Radius (ft):	44.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0000
Vapor Molecular Weight (lb/lb-mole):	190.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0000
Daily Avg. Liquid Surface Temp. (deg. R):	507.9647
Daily Average Ambient Temp. (deg. F):	41.5958
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	503.5058
Tank Paint Solar Absorptance (Shell):	0.5400
Tank Paint Solar Absorptance (Roof):	0.5400
Daily Total Solar Insulation Factor (Btu/sqft day):	1,276.2450
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0682
Daily Vapor Temperature Range (deg. R):	36.8348
Daily Vapor Pressure Range (psia):	0.0000
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0000
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0000
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0000
Daily Avg. Liquid Surface Temp. (deg R):	507.9647
Daily Min. Liquid Surface Temp. (deg R):	498.7560
Daily Max. Liquid Surface Temp. (deg R):	517.1734
Daily Ambient Temp. Range (deg. R):	24.3583
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	1.0000
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0000
Vapor Space Outage (ft):	14.0000

Working Losses (lb):	6.1614
Vapor Molecular Weight (lb/lb-mole):	190.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0000
Annual Net Throughput (gal/yr.):	48,136,200.0000
Annual Turnovers:	21.1599
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	2,274,879.6529
Maximum Liquid Height (ft):	50.0000
Tank Diameter (ft):	88.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	8.2515

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

Emissions Report for: Annual

203-T-0023 - Vertical Fixed Roof Tank
Belfield, North Dakota

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Residual oil no. 6	6.16	2.09	8.25

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

Identification

User Identification:	203-T-0031
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:	35.61
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-0031 - 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 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	Option 4: RVP=13, ASTM Slope=3

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

203-T-0031 - 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):	12.4292	12.4292	12.4292	12.4292	12.4292	12.4292	12.4292	12.4292	12.4292	12.4292	12.4292	12.4292
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.):	4,151,841.0833	4,151,841.0833	4,151,841.0833	4,151,841.0833	4,151,841.0833	4,151,841.0833	4,151,841.0833	4,151,841.0833	4,151,841.0833	4,151,841.0833	4,151,841.0833	4,151,841.0833
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):	43.3582	46.6403	53.2500	62.3442	71.7276	80.0825	85.5880	81.2075	69.5115	60.3128	50.6330	44.6093

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-0031 - 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	149.15	443.67	0.00	749.26

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

Identification

User Identification:	203-T-0033
City:	Belfield
State:	North Dakota
Company:	Meridian
Type of Tank:	Vertical Fixed Roof Tank
Description:	Light Slops

Tank Dimensions

Shell Height (ft):	30.00
Diameter (ft):	25.00
Liquid Height (ft) :	25.00
Avg. Liquid Height (ft):	9.00
Volume (gallons):	91,800.09
Turnovers:	22.96
Net Throughput(gal/yr):	2,107,875.00
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)	2.00
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-0033 - 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
Gasoline (RVP 10)	Jan	30.90	24.94	36.87	43.84	2.8523	2.5010	3.2426	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3
Gasoline (RVP 10)	Feb	34.98	28.04	41.91	43.84	3.1146	2.6793	3.6057	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3
Gasoline (RVP 10)	Mar	42.09	33.80	50.39	43.84	3.6191	3.0366	4.2888	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3
Gasoline (RVP 10)	Apr	50.10	39.90	60.29	43.84	4.2635	3.4572	5.2149	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3
Gasoline (RVP 10)	May	56.81	45.06	68.55	43.84	4.8723	3.8480	6.1049	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3
Gasoline (RVP 10)	Jun	61.81	49.29	74.32	43.84	5.3700	4.1949	6.7953	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3
Gasoline (RVP 10)	Jul	64.71	51.53	77.88	43.84	5.6768	4.3883	7.2515	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3
Gasoline (RVP 10)	Aug	62.42	50.31	74.54	43.84	5.4341	4.2818	6.8223	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3
Gasoline (RVP 10)	Sep	55.34	45.27	65.40	43.84	4.7335	3.8651	5.7521	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3
Gasoline (RVP 10)	Oct	48.45	40.33	56.58	43.84	4.1244	3.4887	4.8504	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3
Gasoline (RVP 10)	Nov	39.43	33.50	45.36	43.84	3.4231	3.0176	3.8716	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3
Gasoline (RVP 10)	Dec	32.50	27.06	37.95	43.84	2.9532	2.6217	3.3181	66.0000			92.00	Option 4: RVP=10, ASTM Slope=3

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

203-T-0033 - Vertical Fixed Roof Tank
Belfield, North Dakota

Month:	January	February	March	April	May	June	July	August	September	October	November	December
Standing Losses (lb):	304.8452	344.4657	517.7923	715.0558	972.7526	1,114.2779	1,293.3938	1,128.5821	779.9994	567.0135	337.2424	284.3041
Vapor Space Volume (cu ft):	10,635.6001	10,635.6001	10,635.6001	10,635.6001	10,635.6001	10,635.6001	10,635.6001	10,635.6001	10,635.6001	10,635.6001	10,635.6001	10,635.6001
Vapor Density (lb/cu ft):	0.0358	0.0387	0.0444	0.0514	0.0580	0.0633	0.0666	0.0640	0.0565	0.0499	0.0422	0.0369
Vapor Space Expansion Factor:	0.1105	0.1367	0.1825	0.2569	0.3354	0.3952	0.4430	0.3871	0.2783	0.1976	0.1236	0.1026
Vented Vapor Saturation Factor:	0.2339	0.2185	0.1940	0.1696	0.1516	0.1395	0.1330	0.1381	0.1554	0.1743	0.2028	0.2277
Tank Vapor Space Volume:												
Vapor Space Volume (cu ft):	10,635.6001	10,635.6001	10,635.6001	10,635.6001	10,635.6001	10,635.6001	10,635.6001	10,635.6001	10,635.6001	10,635.6001	10,635.6001	10,635.6001
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):	21.6667	21.6667	21.6667	21.6667	21.6667	21.6667	21.6667	21.6667	21.6667	21.6667	21.6667	21.6667
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):	9.0000	9.0000	9.0000	9.0000	9.0000	9.0000	9.0000	9.0000	9.0000	9.0000	9.0000	9.0000
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):	0.0358	0.0387	0.0444	0.0514	0.0580	0.0633	0.0666	0.0640	0.0565	0.0499	0.0422	0.0369
Vapor Molecular Weight (lb/lb-mole):	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.8523	3.1146	3.6191	4.2635	4.8723	5.3700	5.6768	5.4341	4.7335	4.1244	3.4231	2.9532
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:	0.1105	0.1367	0.1825	0.2569	0.3354	0.3952	0.4430	0.3871	0.2783	0.1976	0.1236	0.1026
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):	0.7416	0.9264	1.2522	1.7577	2.2569	2.6004	2.8632	2.5405	1.8870	1.3617	0.8540	0.6964
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):	2.8523	3.1146	3.6191	4.2635	4.8723	5.3700	5.6768	5.4341	4.7335	4.1244	3.4231	2.9532
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	2.5010	2.6793	3.0366	3.4572	3.8480	4.1949	4.3883	4.2818	3.8651	3.4887	3.0176	2.6217
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	3.2426	3.6057	4.2888	5.2149	6.1049	6.7953	7.2515	6.8223	5.7521	4.8504	3.8716	3.3181
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:	0.2339	0.2185	0.1940	0.1696	0.1516	0.1395	0.1330	0.1381	0.1554	0.1743	0.2028	0.2277
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	2.8523	3.1146	3.6191	4.2635	4.8723	5.3700	5.6768	5.4341	4.7335	4.1244	3.4231	2.9532
Vapor Space Outage (ft):	21.6667	21.6667	21.6667	21.6667	21.6667	21.6667	21.6667	21.6667	21.6667	21.6667	21.6667	21.6667

Working Losses (lb):	787.3207	859.7345	998.9842	1,176.8728	1,344.9144	1,482.2997	1,566.9657	1,499.9679	1,306.5805	1,138.4627	944.8849	815.1854
Vapor Molecular Weight (lb/lb-mole):	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000	66.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.8523	3.1146	3.6191	4.2635	4.8723	5.3700	5.6768	5.4341	4.7335	4.1244	3.4231	2.9532
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:	22.9616	22.9616	22.9616	22.9616	22.9616	22.9616	22.9616	22.9616	22.9616	22.9616	22.9616	22.9616
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):	91,800.0893	91,800.0893	91,800.0893	91,800.0893	91,800.0893	91,800.0893	91,800.0893	91,800.0893	91,800.0893	91,800.0893	91,800.0893	91,800.0893
Maximum Liquid Height (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
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):	1,092.1659	1,204.2001	1,516.7764	1,891.9285	2,317.6671	2,596.5776	2,860.3595	2,628.5501	2,086.5799	1,705.4762	1,282.1273	1,099.4895

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-0033 - Vertical Fixed Roof Tank
Belfield, North Dakota

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Gasoline (RVP 10)	13,922.17	8,359.72	22,281.90

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

Identification

User Identification:	203-T-0034
City:	Belfield
State:	North Dakota
Company:	Meridian
Type of Tank:	Vertical Fixed Roof Tank
Description:	Heavy Slop

Tank Dimensions

Shell Height (ft):	30.00
Diameter (ft):	25.00
Liquid Height (ft) :	25.00
Avg. Liquid Height (ft):	9.00
Volume (gallons):	91,800.09
Turnovers:	22.96
Net Throughput(gal/yr):	2,107,875.00
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)	2.00
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-0034 - 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	All	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-0034 - Vertical Fixed Roof Tank
Belfield, North Dakota

Annual Emission Calcaulations	
Standing Losses (lb):	26.8510
Vapor Space Volume (cu ft):	10,635.6001
Vapor Density (lb/cu ft):	0.0001
Vapor Space Expansion Factor:	0.0684
Vented Vapor Saturation Factor:	0.9951
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	10,635.6001
Tank Diameter (ft):	25.0000
Vapor Space Outage (ft):	21.6667
Tank Shell Height (ft):	30.0000
Average Liquid Height (ft):	9.0000
Roof Outage (ft):	0.6667
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.6667
Roof Height (ft):	2.0000
Roof Slope (ft/ft):	0.1600
Shell Radius (ft):	12.5000
Vapor Density	
Vapor Density (lb/cu ft):	0.0001
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0043
Daily Avg. Liquid Surface Temp. (deg. R):	507.9647
Daily Average Ambient Temp. (deg. F):	41.5958
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	503.5058
Tank Paint Solar Absorptance (Shell):	0.5400
Tank Paint Solar Absorptance (Roof):	0.5400
Daily Total Solar Insulation Factor (Btu/sqft day):	1,276.2450
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0684
Daily Vapor Temperature Range (deg. R):	36.8348
Daily Vapor Pressure Range (psia):	0.0029
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0043
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0031
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0060
Daily Avg. Liquid Surface Temp. (deg R):	507.9647
Daily Min. Liquid Surface Temp. (deg R):	498.7560
Daily Max. Liquid Surface Temp. (deg R):	517.1734
Daily Ambient Temp. Range (deg. R):	24.3583
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9951
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0043
Vapor Space Outage (ft):	21.6667

Working Losses (lb):	27.8020
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0043
Annual Net Throughput (gal/yr.):	2,107,875.0000
Annual Turnovers:	22.9616
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	91,800.0893
Maximum Liquid Height (ft):	25.0000
Tank Diameter (ft):	25.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	54.6531

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

Emissions Report for: Annual

203-T-0034 - Vertical Fixed Roof Tank
Belfield, North Dakota

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	27.80	26.85	54.65

Meridian Energy Group Inc.	**EMISSIONS INVENTORY**	**VEPICA CODE:** P-5715043-01-001-18042-I001 **COMPANY CODE:** TBD **ISSUE:** 0 **DATE:** 09/23/16 **SHEET:** **OF**

ENGINEERING CALCULATION NOTES

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

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:	2610.7	lb/h
- Stack Height:	127.6	ft			- Flue Gas:	66470.6	lb/h
- Stack Diameter (ID):	6' 3 1/2"		6.3	ft	- Flue Gas Temp:	787.7	°F
- Stack Area:	31.1	ft^2			- Density:	0.0296	lb/ft^3
					- Flue Gas Vel:	20.1	ft/s
- Process Duty:	57.6	MM BTU/hr					
- Duty (Heater Fuel Gas):	72.00	MM BTU/hr					
- Tag: 102-H-0201					- Fuel Gas:	2610.7	lb/h
- Stack Height:	127.6	ft			- Flue Gas:	66470.6	lb/h
- Stack Diameter (ID):	6' 3 1/2"		6.3	ft	- Flue Gas Temp:	787.7	°F
- Stack Area:	31.1	ft^2			- Density:	0.0296	lb/ft^3
					- Flue Gas Vel:	20.1	ft/s
- Process Duty:	57.6	MM BTU/hr					
- Duty (Heater Fuel Gas):	72.00	MM BTU/hr					

3. VACUUM UNIT

- Tag: 103-H-0301					- Fuel Gas:	2773.5	lb/h
- Stack Height:	125.0	ft			- Flue Gas:	70380.6	lb/h
- Stack Diameter (ID):	6' 6"		6.5	ft	- Flue Gas Temp:	600.4	°F
- Stack Area:	33.2	ft^2			- Density:	0.0349	lb/ft^3
					- Flue Gas Vel:	16.9	ft/s
- Process Duty:	65.0	MM BTU/hr					
- Duty (Heater Fuel Gas):	76.47	MM BTU/hr					
- Tag: 103-H-0302					- Fuel Gas:	2090.6	lb/h
- Stack Height:	120.0	ft			- Flue Gas:	53050.0	lb/h
- Stack Diameter (ID):	5' 1"		5.1	ft	- Flue Gas Temp:	600.1	°F
- Stack Area:	20.3	ft^2			- Density:	0.0349	lb/ft^3
					- Flue Gas Vel:	20.8	ft/s
- Process Duty:	49.0	MM BTU/hr					
- Duty (Heater Fuel Gas):	57.65	MM BTU/hr					

4. HN HDT

- Tag: 105-H-0501					- Fuel Gas:	498.5	lb/h
- Stack Height:	91.0	ft			- Flue Gas:	12195.0	lb/h
- Stack Diameter (ID):	3'		3.0	ft	- Flue Gas Temp:	787.7	°F
- Stack Area:	7.1	ft^2			- Density:	0.0296	lb/ft^3
					- Flue Gas Vel:	16.2	ft/s
- Process Duty:	11.0	MM BTU/hr					
- Duty (Heater Fuel Gas):	13.75	MM BTU/hr					

vepica USA	CALCULATION NOTES	
		Job No: N/A
CODE:	UNIT: N/A	Spc. No.:
N/A	LOCATION: N/A	Sh. 2 of 4 Rev. D

- Tag: 105-H-0502
- Stack Height: 91.0 ft
- Stack Diameter (ID): 3' 3.0 ft
- Stack Area: 7.1 ft^2

- Process Duty: 13.0 MM BTU/hr
- Duty (Heater Fuel Gas): 16.25 MM BTU/hr

- Fuel Gas: 589.2 lb/h
- Flue Gas: 14412.8 lb/h
- Flue Gas Temp: 787.7 °F
- Density: 0.0296 lb/ft^3
- Flue Gas Vel: 19.1 ft/s

5. LN HDT

- Tag: 111-H-1101
- Stack Height: 170.0 ft
- Stack Diameter (ID): 3' 6" 3.5 ft
- Stack Area: 9.6 ft^2

- Process Duty: 11.1 MM BTU/hr
- Duty (Heater Fuel Gas): 13.90 MM BTU/hr

- Fuel Gas: 504.0 lb/h
- Flue Gas: 12328.0 lb/h
- Flue Gas Temp: 793.1 °F
- Density: 0.0295 lb/ft^3
- Flue Gas Vel: 12.1 ft/s

6. CATALYTIC REFORMER #1

- Tag: 107-H-0701
- Stack Height: 120.0 ft
- Stack Diameter (ID): 6' 6.0 ft
- Stack Area: 28.3 ft^2

- Process Duty: 74.0 MM BTU/hr
- Duty (Heater Fuel Gas): 92.50 MM BTU/hr

- Fuel Gas: 3354.0 lb/h
- Flue Gas: 82042.0 lb/h
- Flue Gas Temp: 787.7 °F
- Density: 0.0296 lb/ft^3
- Flue Gas Vel: 27.2 ft/s

7. CATALYTIC REFORMER #2

- Tag: 106-H-0601
- Stack Height: 42.0 ft
- Stack Diameter (ID): 4' 4.0 ft
- Stack Area: 12.6 ft^2

- Process Duty: 33.4 MM BTU/hr
- Duty (Heater Fuel Gas): 41.73 MM BTU/hr

- Fuel Gas: 1513.0 lb/h
- Flue Gas: 37012.0 lb/h
- Flue Gas Temp: 786.2 °F
- Density: 0.0297 lb/ft^3
- Flue Gas Vel: 27.5 ft/s

8. DIESEL HDT

- Tag: 110-H-1001
- Stack Height: 96.0 ft
- Stack Diameter (ID): 2' 5 1/2" 2.5 ft
- Stack Area: 4.7 ft^2

- Process Duty: 13.0 MM BTU/hr
- Duty (Heater Fuel Gas): 16.25 MM BTU/hr

- Fuel Gas: 788.0 lb/h
- Flue Gas: 15342.0 lb/h
- Flue Gas Temp: 764.3 °F
- Density: 0.0316 lb/ft^3
- Flue Gas Vel: 28.4 ft/s

9. FCC NAPHTHA HDT

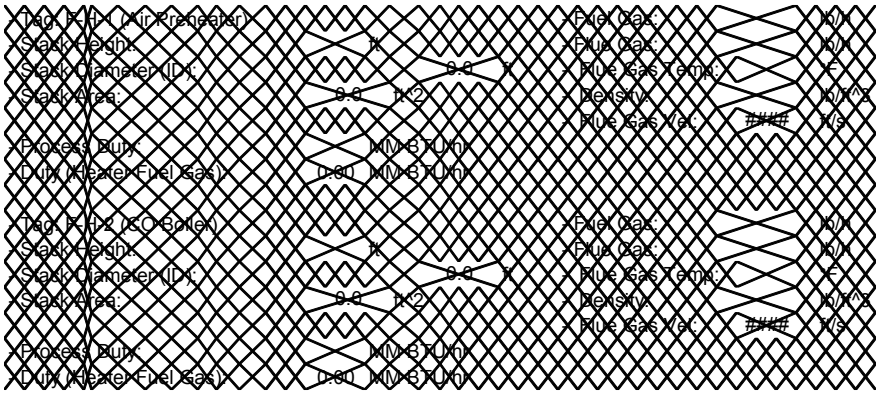
- Tag: 114-H-1401
- Stack Height: 91.0 ft
- Stack Diameter (ID): 3' 3.0 ft
- Stack Area: 7.1 ft^2

- Process Duty: 14.0 MM BTU/hr
- Duty (Heater Fuel Gas): 17.48 MM BTU/hr

- Fuel Gas: 633.0 lb/h
- Flue Gas: 15503.0 lb/h
- Flue Gas Temp: 784.3 °F
- Density: 0.0297 lb/ft^3
- Flue Gas Vel: 20.5 ft/s

vepica USA	CALCULATION NOTES	
		Job No: N/A
CODE:	UNIT: N/A	Spc. No.:
N/A	LOCATION: N/A	Sh. 3 of 4 Rev. D

10. FLUID CATALYTIC CRACKING (FCC)



- Tag: 112-H-1201					- Fuel Gas:	1028.0	lb/h
- Stack Height:	72.0	ft			- Flue Gas:	25145.0	lb/h
- Stack Diameter (ID):	5' 6"		5.5	ft	- Flue Gas Temp:	785.0	°F
- Stack Area:	23.8	ft^2			- Density:	0.0297	lb/ft^3
					- Flue Gas Vel:	9.9	ft/s
- Process Duty:	22.7	MM BTU/hr					
- Duty (Heater Fuel Gas):	28.35	MM BTU/hr					

11. ALKYLATION UNIT

- Tag: 118-H-1801					- Fuel Gas:	1178.4	lb/h
- Stack Height:	95.0	ft			- Flue Gas:	30004.1	lb/h
- Stack Diameter (ID):	4'		4.0	ft	- Flue Gas Temp:	785.5	°F
- Stack Area:	12.6	ft^2			- Density:	0.0296	lb/ft^3
					- Flue Gas Vel:	22.4	ft/s
- Process Duty:	67.4	MM BTU/hr					
- Duty (Heater Fuel Gas):	84.19	MM BTU/hr					

12. ISOMERIZATION UNIT

- Tag: 117-H-1701					- Fuel Gas:	59.8	lb/h
- Stack Height:	36.0	ft			- Flue Gas:	1463.0	lb/h
- Stack Diameter (ID):	2' 8"		2.7	ft	- Flue Gas Temp:	823.8	°F
- Stack Area:	5.6	ft^2			- Density:	0.0286	lb/ft^3
					- Flue Gas Vel:	2.5	ft/s
- Process Duty:	1.3	MM BTU/hr					
- Duty (Heater Fuel Gas):	1.65	MM BTU/hr					
- Tag: 117-H-1702					- Fuel Gas:	136.0	lb/h
- Stack Height:	46.0	ft			- Flue Gas:	3326.0	lb/h
- Stack Diameter (ID):	4' 7"		4.6	ft	- Flue Gas Temp:	787.7	°F
- Stack Area:	16.5	ft^2			- Density:	0.0296	lb/ft^3
					- Flue Gas Vel:	1.9	ft/s
- Process Duty:	3.0	MM BTU/hr					
- Duty (Heater Fuel Gas):	3.75	MM BTU/hr					

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

13. Kerosene HDT

- Tag: 125-H-2501
- Stack Height: 96.0 ft
- Stack Diameter (ID): 2' 5 1/2" 2.5 ft
- Stack Area: 4.7 ft^2

- Process Duty: 10.0 MM BTU/hr
- Duty (Heater Fuel Gas): 12.50 MM BTU/hr

- Fuel Gas: 607.0 lb/h
- Flue Gas: 11802.0 lb/h
- Flue Gas Temp: 764.3 °F
- Density: 0.0316 lb/ft^3
- Flue Gas Vel: 21.9 ft/s

vepica USA	CALCULATION NOTES		
		Job No: N/A	
CODE:	UNIT: Boiler	Spc. No.:	
N/A	LOCATION: N/A	Sh. 1 of 1	Rev. D

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 %

-Boiler Capacity
100,100 lb/h

- Fuel Gas Composition (% mass):

Hydrogen	23.2
Methane	13.4
Ethane	27.0
Propane	17.8
Butane	18.6
	100.0

- Tag: Boiler 1
- Stack Height: 100.0 ft
- Stack Diameter (ID): 36" 3.0 ft
- Stack Area: 7.1 ft^2
- Process Duty: 117.7 MM BTU/hr
- Duty (Heater Fuel Gas): 126.54 MM BTU/hr

- Fuel Gas: 4599.2 lb/h
- Flue Gas: 117099.0 lb/h
- Flue Gas Temp: 294.2 °F
- Density: 0.0490 lb/ft^3
- Flue Gas Vel: 93.9 ft/s

Exhibit C: Controls Technology Review

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VEPICA CODE :	P-5715043-01-001-18035-I001	**SHEET** 1	**OF** 26
COMPANY CODE:	TBD		
TITLE:	EMISSIONS INVENTORY – CONTROLS TECHNOLOGY REVIEW		

PROJECT Nº: P-5715043

NAME: PERMITTING SUPPORT – DAVIS REFINERY

CLIENT: MERIDIAN ENERGY GROUP INC.

LOCATION: BILLINGS COUNTY, NORTH DAKOTA

ISSUE	DATE	DESCRIPTION	PREPARED	REVIEWED	APPROVED VEPICA	APPROVED CLIENT
0	9/21/16	ISSUED FOR PTC	E. MARTINEZ (Zia) J. SOLANO	A. PENA-ISEA	C. GARCÍA	T.JOHNSON

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1. INTRODUCTION

Meridian Energy Group (MEG) has engaged VEPICA to develop an air permit application for construction of the 55,000 BPD (barrels per day) oil Davis Refinery in Billings County, North Dakota.

Based on the estimated emissions for the facility, the source qualifies as a synthetic minor source under North Dakota Air Quality regulations. As such, formal Best Available Control Technology (BACT) analysis is not applicable for the permitting of the facility. However, this Controls Technology Review generally follows BACT methods for identification of proposed controls. It should be noted that control requirements for a large portion of the air emissions sources for the Davis Refinery plant are specified by EPA regulation under New Source Performance Standards (NSPS), applicable Maximum Achievable Control Technology (MACT) and National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations and/or other applicable regulations.

Final emissions control technologies, control efficiencies, and emissions limits will be specified in permit issued by NDDoH for the Davis Refinery. Upon commencement of operation, Meridian will be required to show compliance with these specified limits and controls and will implement required sampling and reporting to show compliance with permit limits.

1.1. Document Scope

This Control Technologies Review includes a descriptive analysis of the most technologically feasible air pollution control equipment to be considered in the design of Davis Refinery. The determination of which specific technology qualifies and is finally selected as the applicable control to implement is made on a case-by-case basis for each pollutant for each emission unit.

Control selection to be implemented in the facilities design was made under the premise of its technical feasibility and the level of control that can reasonably be expected to be achieved in order to maintain emissions levels of the proposed Davis Refinery at synthetic minor source status. Since formal BACT analysis is not required, analysis for energy, environment and economic impacts was not conducted for proposed emission controls.

1.2. Methodology

While BACT analysis is not specifically required for the proposed Davis Refinery since it qualifies as a minor synthetic source, the methods used for emissions control technology selection have generally followed a BACT analysis approach.

EPA's 1990 Draft Edition of the New Source Review Workshop Manual (NSR Manual) sets forth a standardized procedure for determining BACT. This is the method used by most permitting agencies in the U.S. for compliance analysis. This method is considered to be a "top-down" approach and consists of the following five steps:

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1. Identify all control technologies
2. Eliminate technically infeasible options
3. Rank remaining control technologies by control effectiveness
4. Evaluate most effective controls and document results
5. Select BACT

BACT is based primarily on control effectiveness. If a technology providing lesser control is to be utilized, it must be demonstrated that, based on energy, environmental and economic impacts and other costs, it is the best choice.

As previously noted, since formal BACT analysis is not required due to the facility qualifying as a synthetic minor source, analysis for technical feasibility was only cursorily conducted by review of the U.S. EPA RACT/MACT/LAER Clearinghouse database as well as applicable permits from other facilities. In addition, coordination with equipment vendors and suppliers was undertaken for many of the emissions units to obtain project and emissions unit specific guarantees for proposed emissions rates. Analysis of energy, environment and economic impacts was not conducted for the proposed controls since in essentially all instances, the higher level of control available was the one selected.

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2. SUMMARY OF CONTROLLED AND UNCONTROLLED EMISSIONS

The inventory of emissions for the identified routine (non-emergency) emissions sources for the proposed Davis Refinery for both, the base case (uncontrolled) and post controls (controlled), are summarized in Tables 1 and 2, respectively for the Primary Operating Scenario (full project build-out) and the controlled emissions for the Alternative Operating Scenario are shown in Table 3. Controlled emission detailed calculations are included in the Emissions Inventory (Exhibit B of the permit application).

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Table 1. Davis Refinery Summary of Uncontrolled Emissions

	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	243.72	40.35
Tanks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.79	14.95
Stationary Combustion Sources	91.42	1.60E-03	13.06	3.26	13.06	3.26	9.79	97.95	1.92	17.61	6.41
Fluid Catalytic Cracking Unit	0.00	2.03E-03	50.14	33.16	45.65	28.67	16.98	186.28	664.88	577.20	5.39
Catalytic Reforming Unit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.79
Sulfur Recovery Plant	2.15	0.00	0.00	0.00	0.00	0.00	0.00	0.47	0.20	1.50	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	210.41	23.28
Cooling Towers	0.00	0.00	24.83	0.00	0.00	0.00	0.00	0.00	0.00	4.73	0.00
Rail Product Loading	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,713.49	0.00
Truck Product Loading	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	366.76	0.00
Fugitive Dust	0.00	0.00	1.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total STPY	**94.65**	**0.004**	**89.40**	**36.44**	**58.75**	**31.95**	**26.80**	**288.62**	**672.20**	**3,157.45**	**91.17**

Taken from Exhibit B- EMISSIONS INVENTORY FOR DAVIS REFINERY. VEPICA, 2016. Doc. N° P-5715043-01-001-18042-I001.

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Table 2: Davis Refinery Summary of Controlled Emissions – Primary Operating Scenario

	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	21.06	2.39
Tanks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.17	4.48
Stationary Combustion Sources	91.42	1.60E-03	8.00	2.00	8.00	2.00	6.00	46.40	1.92	17.61	1.62
Fluid Catalytic Cracking Unit	0.00	2.03E-05	1.00	0.66	0.91	0.57	0.34	3.73	6.65	5.77	0.87
Catalytic Reforming Unit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.79
Sulfur Recovery Plant	2.15	0.00	0.00	0.00	0.00	0.00	0.00	0.47	0.20	1.50	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	10.52	0.52
Cooling Towers	0.00	0.00	1.86	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.00
Rail Product Loading	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.81	0.00
Truck Product Loading	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.73	0.00
Fugitive Dust	0.00	0.00	1.33	0.00	5.65E-04	0.00	0.00	0.00	0.00	0.00	0.00
Total STPY	**94.65**	**1.62E-03**	**12.24**	**2.68**	**8.96**	**2.59**	**6.37**	**54.53**	**13.97**	**69.78**	**10.67**

Taken from Exhibit B- EMISSIONS INVENTORY FOR DAVIS REFINERY. VEPICA, 2016. Doc. N° P-5715043-01-001-18042-I001.

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Table 3: Davis Refinery Summary of Controlled Emissions – Alternative Operating Scenario, Phase I

	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	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.24	0.37
Tanks	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.32	2.24
Stationary Combustion Sources	33.82	0.0006	4.83	1.21	4.83	1.21	3.62	36.23	0.71	6.51	0.60
Fluid Catalytic Cracking Unit	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Catalytic Reforming Unit	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.55
Sulfur Recovery Plant	2.15	0.0000	0.00	0.00	0.00	0.00	0.00	0.47	0.20	0.64	0.00
Vacuum Systems	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Blowdown System	0.41	0.0000	0.00	0.00	0.00	0.00	0.00	1.83	2.60	0.08	0.00
Flares	0.21	3.72E-06	0.03	0.01	0.03	0.01	0.02	0.23	0.004	0.04	0.00
Wastewater	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.23	0.26
Cooling Towers	0.00	0.0000	0.93	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.00
Rail Product Loading	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.17	0.00
Truck Product Loading	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.00
Fugitive Dust	0.00	0.0000	0.00	0.00	3.13E-04	0.00	0.00	0.00	0.00	0.00	0.00
Total STPY	**36.59**	**0.0006**	**5.80**	**1.22**	**4.86**	**1.22**	**3.65**	**38.76**	**3.51**	**27.72**	**4.01**

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3. IDENTIFICATION OF APPLICABLE CONTROL TECHNOLOGIES

Analysis of technical feasibility was generally conducted by review of the U.S. EPA RACT/BACT/LAER Clearing House Databases, EPA guidance documents and general industry literature for each applicable pollutant source. In addition, coordination with equipment vendors and suppliers was undertaken for many of the emissions units to obtain project and emissions unit specific guidance on control implementation as well as guarantees for proposed emissions rates. Based on this review, identification of technically feasible controls and related typical emissions levels was identified. Literature sources are identified by note and references are included in Section 5 of this document

A list of feasible control technologies considered for implementation for each source category and for each applicable pollutant is presented in Tables 4a-4k. Where proposed controls can address multiple pollutants, discussion has been combined to reduce repetitiveness.

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Table 4a: Davis Refinery – Summary of Air Pollution Control Technology Analysis by Source Category
Leaks (Fugitive Emissions)

Technically Feasible Control Options	Identified Control Efficiency Ranges	Identified Emissions Ranges	Control Efficiency Used	Controlled Emission Factor Used
VOC's				
Applicable Feasible Technologies		**Selected Technologies – vapor recovery w/ enhanced LDAR (DIAL & OGI) initiated at 500 ppm detection**		
1.0 Gas collection manifold systems (vapor recovery). 2.0 Enhanced valve packing. 3.0 Low threshold on leak detection and repair detection down to 500 ppm. 4.0 LDAR (Leak, Detection and Repair) program with differential light absorption and ranging (DIAL) or optical gas imaging (OGI) technology.	1.0 95% \a 2.0 Inherent in process design 3.0 Inherent in LDAR system design 4.0 97% (valves), 93% pumps, 97% flanges, 97% open ended lines & sample points, (30% heavies) \b, \e	Specified by MACT and 40 CFR 63 Subpart CC, 40 CFR 60 Subpart GGG \c, \d	97% (valves), 93% pumps, 97% flanges, 97% open ended lines & sample points, (30% heavies) \b	500 ppm \d (per MACT std)

\a EPA Notification, [G.S.R 186(E), dt. 18th March, 2008]
\b TCEQ – Control Efficiencies for TCEQ Leak Detection and Repair Programs Revised 07/11 (APDG 6129v2)
\c RACT/BACT/LAER Clearinghouse for Petroleum Refining Equipment Fugitive Leaks
\d 40 CFR 63, Subpart CC & 40 CFR 60, Subpart GGG
\e EPA, Leak Detection and Repair – A Best Practices Guide, EPA-305-D-07-001 October 2007

The controls condition for addressing leaks across the refinery is structured around an aggressive LDAR program. In addition, the base condition for this project is that this is a new facility and thus piping and systems are designed to minimize potential for leaks, packing is new, as well as to allow for easy monitoring through LDAR. In addition sample ports are designed into the systems to eliminate open ended lines. Based on EPA Guidance Document, Leak Detection and Repair – A Best Practices Guide (2007), average control effectiveness of a well implemented LDAR program is over 80% across all areas of the plant with the majority of the plant exceeding 90% control efficiencies for VOC reductions. As shown in the calculation of the facility emissions, the average control efficiency across all areas of the plant that we are proposing is approximately 73% (see Emissions Inventory, Exhibit B). LDAR program will utilize optical sensors which will identify leaks well below 100 ppm, will be confirmed by Method 21 test immediately upon identification by optical meter and will require immediate repair. Optical sensing as well as repair when required will be ongoing and continuous throughout the plant.

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Table 4b: Davis Refinery – Summary of Applicable Air Pollution Control Technologies by Source Category
Tanks

Technically Feasible Control Options	Identified Control Efficiency Ranges	Identified Emissions Ranges	Control Efficiency Used	Controlled Emission Factor Used
VOC's / HAPs				
Applicable Feasible Technologies		**Selected Technologies – Double seal and wipers (NESHAP std) and Vapor Recovery System**		
1.0 Double Seal and Wipers (part of NESHAP std) 2.0 Vapor Recovery System to Product Recovery	1.0/2.0 (combined) 95 - 98% \a, \b	Limits specified by NESHAP and RACT	95% \a	Calculated using EPA TANKS for each tank unit
\a Control Techniques Guidelines for the Oil and Natural Gas Industry (Draft, 2015) \b 40 CFR 63, Subpart CC & 40 CFR 60, Subpart GGG				

Control requirements and control effectiveness for tanks are specified by 40 CFR Part 60 NSPS as well as by 40 CFR Part 61 and 63 (NESHAP). However, through system design, vapor recovery will be rerouted back to product instead of to flare systems.

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Table 4c: Davis Refinery – Summary of Applicable Air Pollution Control Technologies by Source Category
Stationary Sources (Process Heaters and Boilers)

Technically Feasible Control Options	Identified Control Efficiency Ranges	Identified Emissions Ranges	Control Efficiency Used	Controlled Emission Factor Used
CO				
Applicable Feasible Technologies		**Selected Technologies – Good Combustion Practices w/ Low NOx Burners**		
1.0 Regenerative Thermal Or Catalytic Oxidation 2.0 Low NOx Burner 3.0 Good Combustion Practices 4.0 Good Combustion Practices with Low NOx Burner	1.0 75 – 95% \a 2.0 25 - 75% \a 3.0 Base Case 4.0 96 – 99% \b, \c	1.0 0.008 lb/MMbtu 2.0 0.04 lb/MMbtu 3.0 0.08 lb/MMbtu 4.0 0.02 – 0.06 lb/MMbtu	NA	0.028 lb/MMbtu
\a Control Techniques Guidelines for the Oil and Natural Gas Industry (Draft, 2015) \b RACT/BACT/LAER Clearinghouse for Natural Gas Combustion \c The Costs and Benefits of Selective Catalytic Reduction on Cement Kilns for Multi-Pollutant Control (A. Armendariz, 2008)				
NOx				
Applicable Feasible Technologies		**Selected Technologies – SCR w/ Low NOx Burners**		
1.0 SCR w Low NOx Burners 2.0 Low NOx Burners 3.0 SCR's 4.0 SNCR's	1.0 70 – 90% \a 2.0 70 – 90% \a 3.0 70 – 90% \a 4.0 30 – 50% \a	1.0 0.012 – 0.03 lb/MMbtu \c 2.0 0.03 – 0.04 lb/MMbtu 3.0 0.02 – 0.03 lb/MMbtu 4.0 0.04 – 0.09 lb/MMbtu	79% \d	1.0 0.0063 lb/MMbtu 2.0 0.03 lb/MMBTU
\a Control Techniques Guidelines for the Oil and Natural Gas Industry (Draft, 2015) \b RACT/BACT/LAER Clearinghouse for Natural Gas Combustion, Heaters less than 250 MMBtu/hr \c RACT/BACT/LAER Clearinghouse & Permit for Northern Plains Grandforks Plant, Primary Reformer (2015) \d Control effectiveness and emissions levels specified by vendor/supplier guarantee				
VOCs				
Applicable Feasible Technologies		**Selected Technologies – Good Combustion Practices w/ SCR**		
Good Combustion Practices with SCR	50 – 75% \a, \c	0.005 – 0.014 lb/MMbtu \b	75%	0.0054 lb/MMbtu
\a Control Techniques Guidelines for the Oil and Natural Gas Industry (Draft, 2015) \b RACT/BACT/LAER Clearinghouse & Permit for Valero Refinery, New Orleans, LA, Hydrogen Plant, SMR Heaters (2009) \c The Costs and Benefits of SCR on Cement Kilns for Multi-Pollutant Control (A. Armendariz, 2008) (HAP destruction = VOC destruction)				

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Technically Feasible Control Options		Identified Control Efficiency Ranges	Identified Emissions Ranges	Control Efficiency Used	Controlled Emission Factor Used
PMs					
Applicable Feasible Technologies			**Selected Technologies – Good Combustion Practices w/ SCR**		
1.0	Good Combustion Practices	1.0 NA	1.0 0.004 lb/MMbtu \b	1.0 NA	1. 0.004 lb/MMbtu \b
2.0	Venturi Scrubbers	2.0 70 – 99% \a	2.0 0.0012 lb/MMbtu \a	2.0 70% \a	2. 0.0012 lb/MMbtu \a
3.0	Catalytic Sorbant (Tri-Mer or equivalent)	3.0 70 – 90%	3.0 0.0012 lb/MMbtu	3.0 70% \b	
\a	EPA Air Pollution Control Fact Sheet for Venturi Scrubber, EPA-452/F-03-017				
\b	Control effectiveness and emissions levels specified by vendor/supplier guarantee				

Best management practices for CO emissions for heaters and boilers are identified within the EPA RACT/BACT/LAER Clearinghouse as good combustion practices. Meridian has received supplier guarantee for CO emissions by implementation of good combustion practices with ultra-low NOx burners. This value is 0.028 lb/MMBTU.

For NOx emissions, Meridian will implement Ultra-Low NOx burners on all units as well as SCR controls on the larger units throughout the facility. Emissions values for both scenarios are based on vendor/supplier guarantees. Emissions for ultra-low NOx burners without SCR control are guaranteed at 0.03 lb/MMBTU. Emissions for low NOx burners with SCR control are guaranteed at 0.0012 lb/MMBTU.

VOC emissions levels and control effectiveness were identified through review of EPA RACT/BACT/LAER Clearinghouse as well as through review of similar permit for hydrogen plant in Louisiana.

For particulate emissions controls, Meridian has obtained a vendor/supplier guarantee for particulate emissions rate for good combustion practices of 0.004 lb/MMBTU. Meridian proposes to further implement venturi scrubber controls on the larger heater and boiler units to further reduce particulate emissions. EPA fact sheet guidance for venturi scrubbers shows a control effectiveness of 70-99% over non-controlled emissions. Meridian is conservatively assuming a 70% control effectiveness for this in stack add on control for the larger heater and boiler units resulting in an emission rate for these units of 0.0012 lb/MMBTU. For all other units, the vendor/supplier guarantee rate of 0.004 lb/MMBTU was utilized.

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Table 4d: Davis Refinery – Summary of Applicable Air Pollution Control Technologies by Source Category
Fluidized Catalytic Cracking (FCC) Regeneration Vent

Technically Feasible Control Options	Identified Control Efficiency Ranges	Identified Emissions Ranges	Control Efficiency Used	Controlled Emission Factor Used
CO – note: CO emissions controlled through Best Combustion Practices (full-burn operation) and 100% captured and recirculated through a regenerator resulting in no emissions				
NOx				
Applicable Feasible Technologies [a]		**Selected Technologies – COP-NP - Non-Platinum CO combustion promoter OR Tri-Mer Catalyst**		
1.0 SNCR, 2.0 SCR, 3.0 LoTOx, 4.0 Catalyst additives (Tri-Mer) 5.0 COP-NP - Non-Platinum CO combustion promoter	1.0 SNCR – 60 - 80% 2.0 SCR - > 90% 3.0 LoTox - >90% (with SCR) 4.0/5.0 Catalyst additives and low NOx combustion - 45-98% [b]	No significant data available	98% [b]	1.42 lb/MMbbl fresh feed
\a Utah Division of Air Quality Source Plan Review, Holly Refining Heavy Crude Processing Project, Davis County, UT (2013) \b Upper range of control is based on manufacturer commitments for both COP-NP system as well as for Tri-Mer catalyst usage				
SO_2				
Applicable Feasible Technologies		**Selected Technologies – Wet Scrubber OR Dri-Sorb**		
1.0 Control of sulfur in the FCCU feed 2.0 Wet Gas Scrubbers 3.0 Wellman-Lord Flue Gas Desulfurization Process 4.0 DeSOx Additives (Dri-Sorbant or equivalent)	1.0 90% [a] 2.0 95 – 99.9% [a, c] 3.0 No recent data [a] 4.0 97% [b]	25 ppmvd@ 0% O_2 1-yr avg 50 ppmvd@ 0% O_2 7-dy avg	99% [b]	1.52 lb/hr [b]
\a Utah Division of Air Quality Source Plan Review, Holly Refining Heavy Crude Processing Project, Davis County, UT (2013) \b Upper range of control is based on manufacturer commitments for wet scrubber \c EPA Air Pollution Control Technology Fact Sheet Spray-Chamber/ Spray Tower Wet Scrubber (control effectiveness for SOx 80-99+%				
PM – since wet scrubber is used for SO_2 control, PM emissions are controlled to de-minimis levels **VOC/HAPs – controlled to de-minimis levels through best combustion practices and flue gas capture to regenerator**				

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For CO emissions, Meridian is designing the FCCU with a hot burn regenerator which captures the exhaust and recirculates it through a regenerator system. This has been shown to be a best combustion practice that is essentially 100% effective in reduction of CO emissions from the exhaust.

For NOx emissions controls, Meridian has worked with the manufacturer to implement a COP-NP - Non-Platinum CO combustion promoter or Tri-Mer catalyst. Manufacturer control effectiveness of this approach is guaranteed as 1.42 lb/MMbbl. It should be noted that the FCCU will not be installed as part of the initial Phase I construction.

For SO2 emissions controls, a wet scrubber system will be installed to reduce SO2 emissions to minimal levels. Based on EPA Fact Sheet as well as review of permit support documents for Holly Refining in Utah, Meridian anticipates a removal efficiency of at least 99% for SO2. The FCCU licensor guarantee will result in a maximum emission rate of 1.52 lb/hr.

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Table 4e: Davis Refinery – Summary of Applicable Air Pollution Control Technologies by Source Category
Sulfur Recovery Plant

Technically Feasible Control Options	Identified Control Efficiency Ranges	Identified Emissions Ranges	Control Efficiency Used	Controlled Emission Factor Used
SO_2				
Applicable Feasible Technologies [a]		**Selected Technologies – LO-CAT with vent gases routed to thermal oxidizer**		
1.0 Claus 2 Stages 2.0 Claus 3 Stages 3.0 Claus 4 Stages 4.0 LO-CAT with/ Tail Gas Treatment	1. 93.5% for SO_2 2. 95.5% for SO_2 3. 96.5% for SO_2 4. >98.5% for H_2S in LO-CAT vent[a] which translates to >99.9% for SO_2 from thermal oxidizer[b]	1. 278 lb/ton of sulfur product 2. 188 lb/ton of sulfur product 3. 145 lb/ton of sulfur product 4. 4 lb/ton of sulfur product	99.9%[b]	1.15 ppm
\a Texas Commission on Environmental Quality, Federal Operating Permit, Wasson CO2 Recovery Plant, Yoakum County, TX (2015) \b RACT/BACT/LAER Clearinghouse & Permit for Venoco-Ellwood Onshore Facility, Thermal Oxidizer (LO-CAT oxidation air) (2011)				

Meridian will implement a LO-CAT system with vent gas from the LO-CAT system then routed to a thermal oxidizer. This effectively reduces SO2 emissions to minimal levels. This is identified as BACT by TCEQ and EPA RACT/BACT/LAER Clearinghouse for similar applications. Claus technology although effective at capacities starting at 25 LTPY, will not be effective for the sulfur content loading expected in the Bakken feed. Mass balance calculations for the full capacity refinery indicate an annual production of around 10 LTPY.

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Table 4f: Davis Refinery – Summary of Applicable Air Pollution Control Technologies by Source Category
Blowdown System

Technically Feasible Control Options	Identified Control Efficiency Ranges	Identified Emissions Ranges	Control Efficiency Used	Controlled Emission Factor Used
All Emissions				
Applicable Feasible Technologies [\a]		**Selected Technologies – Vapor Recovery to product capture w/ emergency flaring during upset only**		
1.0 Uncontrolled 2.0 Vapor Recovery to flare 3.0 Vapor Recovery to product capture w/ emergency flaring during upset only	1.0 Base case 2.0 99.8% 3.0 Up to 100%	1.0 0.586 lb/MMbtu (VOC) 2.0 0.0012 lb/MMbtu (VOC) 3.0 0.0 lb/MMbtu (VOC)	99.8% [\a]	0.0008 lb/MMbtu or 1.8 lb/hr [\a]
\a Emissions Estimation Protocol for Petroleum Refineries, Version 3. Table 5.12 (RTI International, April 2015) Note: Values in lb/MMbtu are shown for VOC only as example. Other default values for CO, NOx, SO2 are shown in Table 5.12, reference \a				

Meridian will implement an aggressive vapor recovery system for the blowdown system. The captured vapors will be rerouted back into processes/product feed during normal operations. Routing of gases to flare from this unit will only ocurr for upset conditions. This approach is considered state of industry. Analysis of effectiveness of this system is discussed in detail in the referenced document (Emissions Estimation Protocol for Petroleum Refineries) which was completed under EPA contract by RTI International (2015).

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Table 4g: Davis Refinery – Summary of Applicable Air Pollution Control Technologies by Source Category
Flares

Technically Feasible Control Options	Identified Control Efficiency Ranges	Identified Emissions Ranges	Control Efficiency Used	Controlled Emission Factor Used
All Emissions				
Applicable Feasible Technologies [\a]		**Selected Technologies – emergency flaring during upset only**		
Flare systems are designed with vapor recovery units to address only upset conditions under minimal hours per year operations. Flare emissions are therefore de-minimus for all pollutants.	98% + [\a]	>300 btu/scf net heating value	Per EPA & NDDoH stds	Per EPA & NDDoH stds
\a AP 42 Emission Factors, Fifth Edition, Section 13.5, Industrial Flares				

For flare systems, the primary control is to structure the facility to utilize the flares only during true upset conditions. All vapor recovery units will collect vapors and route collected materials back to processes/product feed. For this reason flare systems are anticipated to be utilized for maximum of 168 hours per year each. Flare pilots will run full time however and emissions for these pilot units have been taken into account. Flare operation and control are specified by EPA and NDDoH standards
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Table 4h: Davis Refinery – Summary of Applicable Air Pollution Control Technologies by Source Category
Wastewater Treatment System

Technically Feasible Control Options	Identified Control Efficiency Ranges	Identified Emissions Ranges	Control Efficiency Used	Controlled Emission Factor Used
VOC / HAP				
Applicable Feasible Technologies [\a]		**Selected Technologies – All technologies identified as feasible will be installed in multiple overlay to maximize controls**		
1.0 Enclosed tanks and oil/water separators with vapor recovery 2.0 VESP Unit (or equivalent) with API oil/water separators 3.0 Diffused air flotation (DAF) units	99% [\a] Combined Controls	0.400 TPY [\a]	95% for VOC 55% for HAPs	10.52 TPY VOC 0.52 TPY HAP
\a RACT/BACT/LAER Clearinghouse and Permit Review for Magellan Processing, LP, Corpus Christi, Terminal, TX (2015)				

For the wastewater treatment system, the primary emissions of concern are VOCs and related HAPs. Meridian will implement enclosed tank systems with vapor recovery from the tanks. In addition, waters will be run through a VESP and/or covered oil water separator and a DAF system with vapor recovery from these units to ensure a BWON compliant plant. The combination of these controls is anticipated to remove contaminants by at least 99%. However for calculation purposes, calculations were based on 95% control for VOCs and 55% control for HAPs.

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Table 4i: Davis Refinery – Summary of Applicable Air Pollution Control Technologies by Source Category
Cooling Towers

Technically Feasible Control Options	Identified Control Efficiency Ranges	Identified Emissions Ranges	Control Efficiency Used	Controlled Emission Factor Used
PM10 / VOC				
Applicable Feasible Technologies [\a, \b]		**Selected Technologies – PM10 – drift eliminators. VOC's periodic monitoring of water for hydrocarbons per regs.**		
1.0 PM10 – drift eliminators [\a, \b] 2.0 VOC – periodic monitoring of flows for VOC's hydrocarbons [\a, \b]	Controls are inherent in process design for cooling tower for PM10 and are part of hydrocarbon levels monitoring of waters for VOCs.	None specifically identified	Controls are inherent in design for cooling tower for PM10 and are part water level monitoring for VOCs.	Project and site specific.
\a Emissions Estimation Protocol for Petroleum Refineries, Version 3. Table 5.12 (RTI International, April 2015)				

Cooling tower emissions and related controls are considered standard in the industry and are widely recognized as BACT.

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Table 4j: Davis Refinery – Summary of Applicable Air Pollution Control Technologies by Source Category
Product Loading

Technically Feasible Control Options	Identified Control Efficiency Ranges	Identified Emissions Ranges	Control Efficiency Used	Controlled Emission Factor Used
VOC				
Applicable Feasible Technologies \a,		**Selected Technologies – vapor recovery to product recycle with upsets to emergency flares**		
1.0 Condensation vapor recovery systems 2.0 Thermal oxidizer VOC / HAP control with low NOx burners. 3.0 Testing of all tanker trucks for leaks 4.0 Pressurized system.	Generally 98% for new facilities \a per Loading Facilities MACT (40 CFR Part 63, Subpart BBBBBB)	limited to 80 milligrams \a of TOCs per liter of gasoline Control	98%	MACT per 40 CFR Part 63, Subpart BBBBBB
\a Emissions Estimation Protocol for Petroleum Refineries, Version 3. (RTI International, April 2015)				

Meridian will implement an aggressive vapor recovery system for the product loading systems. The captured vapors will be rerouted back into product feed. Routing of captured vapors to flaring will only ocurr for upset conditions. This approach is considered state of industry. Analysis of effectiveness of this system is discussed in detail in the referenced document (Emissions Estimation Protocol for Petroleum Refineries) which was completed under EPA contract by RTI International (2015). Maximum allowable emissions and well as controls approaches are specified by MACT standards.

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Table 4k: Davis Refinery – Summary of Applicable Air Pollution Control Technologies by Source Category
Fugitive Vehicular Emissions

Technically Feasible Control Options	Identified Control Efficiency Ranges	Identified Emissions Ranges	Control Efficiency Used	Controlled Emission Factor Used
PM				
Applicable Feasible Technologies [a]		**Selected Technologies – Paving of areas of routine vehicle traffic. Maintain vehicle speeds to less than 15 mph**		
1.0 Paving 2.0 Speed Controls	Primary control is paving vs no paving. Base condition is paving	NA	NA	$PM_{2.5}$ - 0.00054 lb/vmt PM_{10} - 0.0022 lb/vmt Silt load = 2.15E-02
\a 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				

Control of fugitive area emissions from roadways and parking areas will be through paving of these areas as well as control of vehicle speeds. All routinely traveled roadway areas as well as parking lot areas will be paved. All roadways will be posted to maintain on-site speed limits to below 15 mph. Paving and speed controls are considered BACT for control of emissions from these areas
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