Table D1-1. Assessable Potential Emissions Summary
Golden Valley Electric Association - North Pole Power Plant

Potential to Emit	Regulated Air Pollutant Emissions (tons per year) [1,2]								
	NO_X	CO	PM [3]	PM_{10} [3]	$PM_{2.5}$ [3]	VOC [4]	SO_2	HAP [5]	GHG [6,7]
Significant	3,969.8	48.9	102.2	102.2	102.2	3.9	2,346.9	10.9	778,978.1
Insignificant	0.1	0.0	0.0	0.0	0.0	0.1	0.5	0.0	159.1
Total Emissions	**3,970**	**49**	**102**	**102**	**102**	**0**	**2,347**	**11**	**779,137**
Assessable Emission Subtotals	**3,970**	**49**	**102**	**102**	**102**	**0**	**2,347**	**7**	**779,137**
Fees Apply to Pollutant? [8]	**Yes**	**Yes**	**Yes**	**No [9]**	**No [9]**	**No**	**Yes**	**No[10]**	**No [11]**
Total Assessable Emissions	**6,468**								

Notes:

[1] Emissions are based on maximum allowable operation and permit operating limits, where applicable.

[2] Regulated air pollutant calculations based on AP-42 emission factors and mass balances as shown in accompanying spreadsheets.

[3] $PM_{2.5}$ and PM_{10} emissions are assumed to be equal to total PM emissions.

[4] VOCs which are also HAPs are included in the HAPs column. VOC HAPs are not included in the VOC total.

[5] See individual emissions unit category HAP emissions calculations for details on methodology and assumptions.

[6] GHG emissions are defined as CO_2e emissions. CO_2e is determined by the summation of CO_2, CH_4, and N_2O with the global warming potential for each pollutant applied.

[7] Per 40 CFR 71.2, GHGs are subject to regulation, if as of July 1, 2011, GHG emissions are at a stationary source having the potential to emit 100,000 tpy CO_2e.

[8] Fees paid on each pollutant emitted in quantities greater than 10 tpy per 18 AAC 50.410.

[9] $PM_{2.5}$ emissions are a subset of PM_{10} emissions, and both are subsets of total PM. Per ADEC policy 04.02.103, total PM is used to determine assessable emissions.

[10] In accordance with Item 10 of ADEC guidance policy 04.02.103, PTE for individual HAPs are to be evaluated separately for billing purposes. As a result, the highest individu HAP PTE is provided in the assessable emission subtotal.

[11] Assessable emission fees for GHGs have not been established under 18 AAC 50.

Table D1-2a. Significant Emission Unit Summary
Golden Valley Electric Association - North Pole Power Plant

Emission Unit			Fuel Type	Maximum Capacity	Potential Operation	Install Date
ID	Description	Make/Model				
1	Simple Cycle Gas Turbine	GE Frame 7, Series 7001, Model BR	Jet A. No. 1 Diesel No. 2 Diesel	672 MMBtu/hr	5,411 hr/yr [2]	1976
2	Simple Cycle Gas Turbine	GE Frame 7, Series 7001, Model BR	Jet A. No. 1 Diesel No. 2 Diesel	672 MMBtu/hr	7,992 hr/yr [3]	1977
5	Combined Cycle Gas Turbine	GE LM6000PC	Jet A. No. 1 Diesel Naphtha	455 MMBtu/hr	8,760 hr/yr	2005 [5]
6	Combined Cycle Gas Turbine	GE LM6000PC	Jet A. No. 1 Diesel Naphtha	455 MMBtu/hr	8,760 hr/yr	TBD
7	Emergency Generator Engine	Mitsubishi 0A8829	No. 2 Diesel	564.6 hp[1]	52 hr/yr [4]	2005
11	Boiler	Bryan Steam RV500	Propane	5.0 MMBtu/hr	8,760 hr/yr	2005
12	Boiler	Bryan Steam RV500	Propane	5.0 MMBtu/hr	8,760 hr/yr	

Notes:

[1] The generator has an electrical output of 400 kW. Assuming a 95% efficiency (per Section 2.7.2.1 of ADEC Modeling Review Procedures Manual) and converting from Kw to hp, the input rating is 564.6 hp.

Input Rating, hp= (Output Rating, kW) / (Efficiency, 0.95) * (Conversion, 1.341 hp/kW)

[2] EU IDs 1, 5, and 6 are limited to 1,600 tpy NO_X on a 12-month rolling basis per Condition 13 of Permit No. AQ0110TVP03. As a result, EU ID 1 can operate no more than 5,411 hours per 12-month rolling period. The potential operation of 5,411 hr/yr was determined as follows:

Potential Operation, hr/yr= (NO_X emission limit, 1,600 tpy) x (Conversion, 2,000 lb/ton) / (NO_X emission rate, 0.88 lb/MMBtu) / (Capacity, 672 MMBtu/hr)

[3] EU ID 2 is limited to 7,992 hours of operation on a 12-month rolling basis per Condition 12 of Permit No. AQ0110TVP03.

[4] EU ID 7 is limited to 52 hours of operation on a 12-month rolling basis per Condition 10 of Permit No. AQ0110TVP03.

[5] EU ID 5 was purchased in 2004 (regulatory applicability date), installed in 2005, and first operated in 2006.

Table D1-2b. Insignificant Emission Unit Inventory
Golden Valley Electric Association - North Pole Power Plant

Emission Unit		Fuel Type/ Material	Rating/Size	Potential Operation	Install Date	Insignificant Basis
ID	Description					
N/A	Burnham 17 A-T Boiler [1]	Heating Oil	0.222 MMBtu/hr	8,760 hr/yr	1995	18 AAC 50.326(e)
3	Fuel Oil Storage Tank	Diesel	50,000 gallons	8,760 hr/yr	1995	18 AAC 50.326(e)(4)
4	Fuel Oil Storage Tank	Diesel	50,000 gallons	8,760 hr/yr	1995	18 AAC 50.326(e)(4)
N/A	Fuel Oil Storage Tank No. 1 Heater 1- Steel Vessel	Diesel	180 gallons	8,760 hr/yr	1978	18 AAC 50.326(g)(1)
N/A	Fuel Oil Storage Tank No. 1 Heater 2- Steel Vessel	Diesel	180 gallons	8,760 hr/yr	1978	18 AAC 50.326(g)(1)
N/A	Fuel Oil Storage Tank No. 2 Heater 1- Steel Vessel	Diesel	200 gallons	8,760 hr/yr	1978	18 AAC 50.326(g)(1)
N/A	Fuel Oil Storage Tank No. 2 Heater 2- Steel Vessel	Diesel	200 gallons	8,760 hr/yr	1978	18 AAC 50.326(g)(1)
N/A	Fuel Oil Storage Tank No. 1 Filter 1- Steel Vessel	Diesel	80 gallons	8,760 hr/yr	1995	18 AAC 50.326(g)(1)
N/A	Fuel Oil Storage Tank No. 1 Filter 2- Steel Vessel	Diesel	80 gallons	8,760 hr/yr	1995	18 AAC 50.326(g)(1)
N/A	Fuel Oil Storage Tank No. 2 Filter 1- Steel Vessel	Diesel	80 gallons	8,760 hr/yr	1995	18 AAC 50.326(g)(1)
N/A	Fuel Oil Storage Tank No. 2 Filter 2- Steel Vessel	Diesel	80 gallons	8,760 hr/yr	1995	18 AAC 50.326(g)(1)
N/A	Heating Oil Storage Tank	Heating Oil	1,000 gallons	8,760 hr/yr	Unknown	18 AAC 50.326(g)(3)
N/A	Fuel Oil Storage Tank Filter 1- Steel Vessel	Diesel	160 gallons	8,760 hr/yr	1995	18 AAC 50.326(g)(1)
N/A	Fuel Oil Storage Tank Filter 2-Steel Vessel	Diesel	160 gallons	8,760 hr/yr	1995	18 AAC 50.326(g)(1)
N/A	Emergency Generator Engine Tank	Diesel	2,500 gallons	8,760 hr/yr	2006	18 AAC 50.326(g)(3)
N/A	Emergency Generator Engine Day Tank	Diesel	275 gallons	8,760 hr/yr	2006	18 AAC 50.326(g)(3)

Notes:
[1] The Burnham 17 A-T Boiler is considered a hot water boiler as indicated in the definition of hot water heater provided in 40 CFR 63.11237, and is therefore exempt from 40 CFR 63 Subpart JJJJJ.

Table D1-3. Assessable Potential Oxides of Nitrogen (NO_X) Emissions
Golden Valley Electric Association - North Pole Power Plant

Emission Unit ID	Emission Unit Description	Maximum Capacity	Fuel Type	Factor Reference	NO_X Emission Factor	Potential Operation	Potential Emissions
Significant Emission Units							
2	Simple Cycle Gas Turbine	672 MMBtu/hr	Jet A. No. 1 Diesel No. 2 Diesel	AP-42 Table 3.1-1	0.88 lb/MMBtu	7,992 hr/yr	2,363.07 tpy
1	Simple Cycle Gas Turbine	672 MMBtu/hr	Jet A. No. 1 Diesel No. 2 Diesel	AP-42 Table 3.1-1	0.88 lb/MMBtu	5,411 hr/yr	1,600.00 tpy [1]
5	Combined Cycle Gas Turbine	455 MMBtu/hr	Jet A. No. 1 Diesel Naphtha	AP-42 Table 3.1-1	0.24 lb/MMBtu	8,760 hr/yr	
6	Combined Cycle Gas Turbine	455 MMBtu/hr	Jet A. No. 1 Diesel Naphtha	AP-42 Table 3.1-1	0.24 lb/MMBtu	8,760 hr/yr	
7	Emergency Generator Engine	564.6 hp	No. 2 Diesel	AP-42 Table 3.3-1	0.031 lb/hp-hr	52 hr/yr	0.46 tpy
11	Boiler	5.0 MMBtu/hr	Propane	AP-42 Table 1.5-1	13 lb/10^3gal	8,760 hr/yr	3.13 tpy
12	Boiler	5.0 MMBtu/hr	Propane	AP-42 Table 1.5-1	13 lb/10^3gal	8,760 hr/yr	3.13 tpy
Insignificant Emission Units							
N/A	Burnham 17 A-T Boiler 1	0.222 MMBtu/hr	Heating Oil	AP-42 Table 1.3-1	18 lb/10^3gal	8,760 hr/yr	0.13 tpy
3	Fuel Oil Storage Tank	50,000 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
4	Fuel Oil Storage Tank	50,000 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Heater 1- Steel Vessel	180 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Heater 2- Steel Vessel	180 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Heater 1- Steel Vessel	200 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Heater 2- Steel Vessel	200 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Filter 1- Steel Vessel	80 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Filter 2- Steel Vessel	80 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Filter 1- Steel Vessel	80 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Filter 2- Steel Vessel	80 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Heating Oil Storage Tank	1,000 gallons	Heating Oil	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank Filter 1- Steel Vessel	160 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank Filter 2-Steel Vessel	160 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Emergency Generator Engine Tank	2,500 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Emergency Generator Engine Day Tank	275 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
					Total Potential NO_X Emissions for Significant Emission Units		**3,969.8 tpy**
					Total Potential NO_X Emissions for Insignificant Emission Units		**0.1 tpy**
					Total Potential NO_X Emissions for All Emission Units		**3,969.9 tpy**

Sample Calculations:

Turbine Emissions, tpy= (Emission factor, lb/MMBtu) x (Capacity, MMBtu/hr) x (Operation, hr/yr) / (2,000 lb/ton)
Engine Emissions, tpy= (Emission factor, lb/hp-hr x (Capacity, hp) x (Operation, hr/yr) / (2,000 lb/ton)
Boiler Emissions, tpy= (Emission factor, lb/10^3gal) / (Conversion 1,000 gal/10^3gal) / (HHV, MMBtu/gal) x (Rating, MMBtu/hr) x (Operation, hr/yr) / (2,000 lb/ton)

Notes:
[1] EU IDs 1, 5, and 6 are limited to 1,600 tpy NO_X emissions on a 12-month rolling basis per Condition 13 of AQ0110TVP03.

Engineering Data:

HHV Propane= 0.091 MMBtu/gal (40 CFR 98 Table C-1)
HHV No. 2 Diesel= 0.138 MMBtu/gal (40 CFR 98 Table C-1)

Table D1-4. Assessable Potential Carbon Monoxide (CO) Emissions
Golden Valley Electric Association - North Pole Power Plant

Emission Unit ID	Emission Unit Description	Maximum Capacity	Fuel Type	Factor Reference	CO Emission Factor	Potential Operation	Potential Emissions
Significant Emission Units							
1	Simple Cycle Gas Turbine	672 MMBtu/hr	Jet A. No. 1 Diesel No. 2 Diesel	AP-42 Table 3.1-1	0.0033 lb/MMBtu	5,411 hr/yr	6.00 tpy
2	Simple Cycle Gas Turbine	672 MMBtu/hr	Jet A. No. 1 Diesel No. 2 Diesel	AP-42 Table 3.1-1	0.0033 lb/MMBtu	7,992 hr/yr	8.86 tpy
5	Combined Cycle Gas Turbine	455 MMBtu/hr	Jet A. No. 1 Diesel Naphtha	AP-42 Table 3.1-1 and 90% reduction efficiency	0.0076 lb/MMBtu	8,760 hr/yr	15.15 tpy
6	Combined Cycle Gas Turbine	455 MMBtu/hr	Jet A. No. 1 Diesel Naphtha	AP-42 Table 3.1-1 and 90% reduction efficiency	0.0076 lb/MMBtu	8,760 hr/yr	15.15 tpy
7	Emergency Generator Engine	564.6 hp	No. 2 Diesel	AP-42 Table 3.3-1	0.00668 lb/hp-hr	52 hr/yr	0.10 tpy
11	Boiler	5.0 MMBtu/hr	Propane	AP-42 Table 1.5-1	7.5 lb/10^3gal	8,760 hr/yr	1.80 tpy
12	Boiler	5.0 MMBtu/hr	Propane	AP-42 Table 1.5-1	7.5 lb/10^3gal	8,760 hr/yr	1.80 tpy
Insignificant Emission Units							
N/A	Burnham 17 A-T Boiler 1	0.222 MMBtu/hr	Heating Oil	AP-42 Table 1.3-1	5.0 lb/10^3gal	8,760 hr/yr	0.04 tpy
3	Fuel Oil Storage Tank	50,000 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
4	Fuel Oil Storage Tank	50,000 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Heater 1- Steel Vessel	180 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Heater 2- Steel Vessel	180 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Heater 1- Steel Vessel	200 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Heater 2- Steel Vessel	200 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Filter 1- Steel Vessel	80 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Filter 2- Steel Vessel	80 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Filter 1- Steel Vessel	80 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Filter 2- Steel Vessel	80 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Heating Oil Storage Tank	1,000 gallons	Heating Oil	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank Filter 1- Steel Vessel	160 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank Filter 2-Steel Vessel	160 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Emergency Generator Engine Tank	2,500 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Emergency Generator Engine Day Tank	275 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
Total Potential CO Emissions for Significant Emission Units							**48.9 tpy**
Total Potential CO Emissions for Insignificant Emission Units							**3.5E-02 tpy**
Total Potential CO Emissions for All Emission Units							**48.9 tpy**

Sample Calculations:

Turbine Emissions, tpy= (Emission factor, lb/MMBtu) x (Capacity, MMBtu/hr) x (Operation, hr/yr) / (2,000 lb/ton)
Engine Emissions, tpy= (Emission factor, lb/hp-hr x (Capacity, hp) x (Operation, hr/yr) / (2,000 lb/ton)
Boiler Emissions, tpy= (Emission factor, lb/10^3gal) / (Conversion 1,000 gal/10^3gal) / (HHV, MMBtu/gal) x (Rating, MMBtu/hr) x (Operation, hr/yr) / (2,000 lb/ton)

Notes:
[1] EU IDs 5 and 6 are limited to 98 tpy CO emissions on a 12-month rolling basis per Condition 18.2 of AQ0110TVP03.

Engineering Data:

HHV Propane= 0.091 MMBtu/gal (40 CFR 98 Table C-1)
HHV No. 2 Diesel= 0.138 MMBtu/gal (40 CFR 98 Table C-1)

Table D1-5. Assessable Potential Particulate Matter (PM) Emissions
Golden Valley Electric Association - North Pole Power Plant

Emission Unit ID	Emission Unit Description	Maximum Capacity	Fuel Type	Factor Reference	PM Emission Factor	Potential Operation	Potential PM Emissions
Significant Emission Units							
1	Simple Cycle Gas Turbine	672 MMBtu/hr	Jet A. No. 1 Diesel No. 2 Diesel	AP-42 Table 3.1-2a	0.012 lb/MMBtu	5,411 hr/yr	21.82 tpy
2	Simple Cycle Gas Turbine	672 MMBtu/hr	Jet A. No. 1 Diesel No. 2 Diesel	AP-42 Table 3.1-2a	0.012 lb/MMBtu	7,992 hr/yr	32.22 tpy
5	Combined Cycle Gas Turbine	455 MMBtu/hr	Jet A. No. 1 Diesel Naphtha	AP-42 Table 3.1-2a	0.012 lb/MMBtu	8,760 hr/yr	23.91 tpy
6	Combined Cycle Gas Turbine	455 MMBtu/hr	Jet A. No. 1 Diesel Naphtha	AP-42 Table 3.1-2a	0.012 lb/MMBtu	8,760 hr/yr	23.91 tpy
7	Emergency Generator Engine	564.6 hp	No. 2 Diesel	AP-42 Table 3.3-1	0.0022 lb/hp-hr [1]	52 hr/yr	0.03 tpy
11	Boiler	5.0 MMBtu/hr	Propane	AP-42 Table 1.5-1	0.7 lb/10^3gal	8,760 hr/yr	0.17 tpy
12	Boiler	5.0 MMBtu/hr	Propane	AP-42 Table 1.5-1	0.7 lb/10^3gal	8,760 hr/yr	0.17 tpy
Insignificant Emission Units							
N/A	Burnham 17 A-T Boiler 1	0.222 MMBtu/hr	Heating Oil	AP-42 Tables 1.3-1 and 1.3-2	1.7 lb/10^3gal	8,760 hr/yr	0.01 tpy
3	Fuel Oil Storage Tank	50,000 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
4	Fuel Oil Storage Tank	50,000 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Heater 1- Steel Vessel	180 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Heater 2- Steel Vessel	180 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Heater 1- Steel Vessel	200 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Heater 2- Steel Vessel	200 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Filter 1- Steel Vessel	80 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Filter 2- Steel Vessel	80 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Filter 1- Steel Vessel	80 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Filter 2- Steel Vessel	80 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Heating Oil Storage Tank	1,000 gallons	Heating Oil	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank Filter 1- Steel Vessel	160 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank Filter 2-Steel Vessel	160 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Emergency Generator Engine Tank	2,500 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Emergency Generator Engine Day Tank	275 gallons	Diesel	N/A	N/A	8,760 hr/yr	0 tpy
					Total Potential PM Emissions for Significant Emission Units		**102.2 tpy**
					Total Potential PM Emissions for Insignificant Emission Units		**1.2E-02 tpy**
					Total Potential PM Emissions for All Emission Units		**102.3 tpy**

Sample Calculations:

Turbine Emissions, tpy= (Emission factor, lb/MMBtu) x (Capacity, MMBtu/hr) x (Operation, hr/yr) / (2,000 lb/ton)
Engine Emissions, tpy= (Emission factor, lb/hp-hr x (Capacity, hp) x (Operation, hr/yr) / (2,000 lb/ton)
Boiler Emissions, tpy= (Emission factor, lb/10^3gal) / (Conversion 1,000 gal/10^3gal) / (HHV, MMBtu/gal) x (Rating, MMBtu/hr) x (Operation, hr/yr) / (2,000 lb/ton)

Notes:
[1] Assumes that PM_{10} emissions are representative of total PM emissions.

Engineering Data:

HHV Propane= 0.091 MMBtu/gal (40 CFR 98 Table C-1)
HHV No. 2 Diesel= 0.138 MMBtu/gal (40 CFR 98 Table C-1)

Table D1-6. Assessable Potential Sulfur Dioxide (SO_2) Emissions
Golden Valley Electric Association - North Pole Power Plant

Emission Unit ID	Emission Unit Description	Maximum Capacity	Fuel Type	Factor Reference	Maximum Fuel Sulfur Content	SO_2 Emission Factor	Potential Operation	Potential Emissions
Significant Emission Units								
1	Simple Cycle Gas Turbine	672 MMBtu/hr	Jet A. No. 1 Diesel No. 2 Diesel	AP-42 Table 3.1-2a	0.5 wt. pct. S [2]	0.505 lb/MMBtu	5,411 hr/yr	918.18 tpy
2	Simple Cycle Gas Turbine	672 MMBtu/hr	Jet A. No. 1 Diesel No. 2 Diesel	AP-42 Table 3.1-2a	0.5 wt. pct. S [2]	0.505 lb/MMBtu	7,992 hr/yr	1,356.08 tpy
5	Combined Cycle Gas Turbine	455 MMBtu/hr	Jet A. No. 1 Diesel Naphtha	Mass Balance (startup) AP-42 Table 3.1-2a (non-startup)	0.3 wt. pct. S [3] 0.003 wt. pct. S [4]	0.041 lb/gal 0.003 lb/MMBtu	1,500,000 gal/yr [7] 8,302 hr/yr [8]	30.60 tpy 5.72 tpy
6	Combined Cycle Gas Turbine	455 MMBtu/hr	Jet A. No. 1 Diesel Naphtha	Mass Balance (startup) AP-42 Table 3.1-2a (non-startup)	0.3 wt. pct. S [3] 0.003 wt. pct. S [4]	0.041 lb/gal 0.003 lb/MMBtu	1,500,000 gal/yr [7] 8,302 hr/yr [8]	30.60 tpy 5.72 tpy
7	Emergency Generator Engine	32.0 gal/hr [1]	No. 2 Diesel	Mass Balance	0.1 wt. pct. S [5]	0.015 lb/gal	52 hr/yr	0.01 tpy
11	Boiler	5.0 MMBtu/hr	Propane	Mass Balance	1.9E-07 wt. pct. S [6]	1.6E-08 lb/gal	8,760 hr/yr	3.8E-09 tpy
12	Boiler	5.0 MMBtu/hr	Propane	Mass Balance	1.9E-06 wt. pct. S [6]	1.6E-07 lb/gal	8,760 hr/yr	3.8E-08 tpy
Insignificant Emission Units								
N/A	Burnham 17 A-T Boiler 1	0.222 MMBtu/hr	Heating Oil	Mass Balance	0.5 wt. pct. S	0.073 lb/gal	8,760 hr/yr	0.51 tpy
3	Fuel Oil Storage Tank	50,000 gallons	Diesel	N/A	N/A	N/A	8,760 hr/yr	0 tpy
4	Fuel Oil Storage Tank	50,000 gallons	Diesel	N/A	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Heater 1- Steel Vessel	180 gallons	Diesel	N/A	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Heater 2- Steel Vessel	180 gallons	Diesel	N/A	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Heater 1- Steel Vessel	200 gallons	Diesel	N/A	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Heater 2- Steel Vessel	200 gallons	Diesel	N/A	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Filter 1- Steel Vessel	80 gallons	Diesel	N/A	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Filter 2- Steel Vessel	80 gallons	Diesel	N/A	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Filter 1- Steel Vessel	80 gallons	Diesel	N/A	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Filter 2- Steel Vessel	80 gallons	Diesel	N/A	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Heating Oil Storage Tank	1,000 gallons	Heating Oil	N/A	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank Filter 1- Steel Vessel	160 gallons	Diesel	N/A	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank Filter 2-Steel Vessel	160 gallons	Diesel	N/A	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Emergency Generator Engine Tank	2,500 gallons	Diesel	N/A	N/A	N/A	8,760 hr/yr	0 tpy
N/A	Emergency Generator Engine Day Tank	275 gallons	Diesel	N/A	N/A	N/A	8,760 hr/yr	0 tpy
						Total Potential SO_2 Emissions for Significant Emission Units		**2,346.9 tpy**
						Total Potential SO_2 Emissions for Insignificant Emission Units		**0.5 tpy**
						Total Potential SO_2 Emissions for All Emission Units		**2,347.4 tpy**

Notes:

Sample Calculations: [9]

Molar mass ratio is 32 lb S/mol : 64 lb SO_2/mol

Stoichiometry: 1 mol S = 1 mol SO_2

Mass Balance Emission Factor, lb/gal = (Molar mass ratio, 2 lb SO_2:1 lb S) x (weight % S in fuel) x (density of fuel, lb/gal) / 100%

Turbine Emissions, tpy= (Emission factor, lb/MMBtu) x (Rating, MMBtu/hr) x (Operation, hr/yr) / (2,000 lb/ton)

Engine Emissions, tpy= (Emission factor, lb/gal) x (Capacity, gal/hr) x (Operation, hr/yr) / (2,000 lb/ton)

Boiler Emissions, tpy= (Emission factor, lb/gal) / (HHV, MMBtu/gal) x (Rating, MMBtu/hr) x (Operation, hr/yr) / (2,000 lb/ton)

Boiler wt. pct. S= (Sulfur compound content, ppmv SO_2) x (Conversion, 1.66E-7 lb SO_2/scf / ppm SO_2) x (F-factor, 8,710 scf/MMBtu) x (Conversion, 0.0216 MMBtu/lb) x (Conversion, mole SO_2/64 lb SO_2) x (Conversion, mole S/mole SO_2) x (Conversion, 32 lb S/ mole S)

Notes:

[1] The engine specification datasheet indicates a maximum fuel throughput of 32 gal/hr.

[2] EU IDs 1 and 2 can emit no more that 24,500 pounds of SO_2 per day per Condition 14 of Permit AQ0110TVP03. However, the fuel oil sulfur specification limit of 0.5 percent by weight is more restrictive.

[3] A fuel sulfur limit of 0.30 percent by weight for EU IDs 5 and 6 is provided for startup fuel under Condition 15.2 of Permit AQ0110TVP03.

[4] A fuel sulfur limit of 0.05 percent by weight for EU IDs 5 and 6 is provided for naphtha under Condition 15.1 of Permit AQ0110TVP03. However, GVEA receives naphtha from PSI under a long-term contract that limits fuel sulfur to 30 ppmw (0.003 percent sulfur by weight) under the terms of the contract. Therefore, the fuel sulfur limit provided in the contract between GVEA and PSI is used to calculate emissions for naphtha.

[5] A fuel sulfur limit of 0.1 percent by weight for EU ID 7 is provided under Condition 15.1 of Permit AQ0110TVP03.

[6] A fuel sulfur limit of 0.012 percent by volume for EU IDs 11 and 12 is provided under Condition 11 of Permit AQ0110TVP03. The fuel sulfur limit is converted from percent sulfur by volume to percent sulfur by weight using the equation provided in the sample calculations section above.

[7] Startup fuel for EU IDs 5 and 6 is limited to 1.5 million gallons per year under Condition 16.1 of Permit AQ0110TVP03. The use of 1.5 million gallons per year is equivalent to 458 hours per year.

[8] Under a worst-case scenario using 1,500,000 gallons of No. 1 Diesel startup fuel during a 12-month rolling period, approximately 8,302 hours remain.

[9] Fuel density assumed equal to 6.8 lb/gal for Jet A and No. 1 Diesel, 7.3 lb/gal for No. 2 Diesel and Heating Oil, and 4.2 lb/gal for Propane.

Engineering Data:

HHV Propane=	0.091	MMBtu/gal	(40 CFR 98 Table C-1)
HHV No. 1 Diesel=	0.139	MMBtu/gal	(40 CFR 98 Table C-1)
HHV No. 2 Diesel=	0.138	MMBtu/gal	(40 CFR 98 Table C-1)
Heat Content of Propane=	0.0216	MMBtu/lb	(https://www.engineeringtoolbox.com/heating-values-fuel-gases-d_823.html)

Table D1-7. Assessable Potential Volatile Organic Compound (VOC) Emissions
Golden Valley Electric Association - North Pole Power Plant

Emission Unit		Maximum	Fuel	Factor	VOC Emission	Potential	Potential VOC
ID	Description	Capacity	Type	Reference	Factor	Operation	Emissions
Significant Emission Units							
1	Simple Cycle Gas Turbine	672 MMBtu/hr	Jet A. No. 1 Diesel No. 2 Diesel	AP-42 Table 3.1-2a	0.00041 lb/MMBtu	5,411 hr/yr	0.75 tpy
2	Simple Cycle Gas Turbine	672 MMBtu/hr	Jet A. No. 1 Diesel No. 2 Diesel	AP-42 Table 3.1-2a	0.00041 lb/MMBtu	7,992 hr/yr	1.10 tpy
5	Combined Cycle Gas Turbine	455 MMBtu/hr	Jet A. No. 1 Diesel Naphtha	AP-42 Table 3.1-2a	0.00041 lb/MMBtu	8,760 hr/yr	0.82 tpy
6	Combined Cycle Gas Turbine	455 MMBtu/hr	Jet A. No. 1 Diesel Naphtha	AP-42 Table 3.1-2a	0.00041 lb/MMBtu	8,760 hr/yr	0.82 tpy
7	Emergency Generator Engine	564.6 hp	No. 2 Diesel	AP-42 Table 3.3-1	0.003 lb/hp-hr	52 hr/yr	0.04 tpy
11	Boiler	5.0 MMBtu/hr	Propane	AP-42 Table 1.5-1	0.8 lb/10^3gal	8,760 hr/yr	0.19 tpy
12	Boiler	5.0 MMBtu/hr	Propane	AP-42 Table 1.5-1	0.8 lb/10^3gal	8,760 hr/yr	0.19 tpy
Insignificant Emission Units							
N/A	Burnham 17 A-T Boiler 1	0.222 MMBtu/hr	Heating Oil	AP-42 Table 1.3-3	0.713 lb/10^3gal	8,760 hr/yr	0.01 tpy
3	Fuel Oil Storage Tank	50,000 gallons	Diesel	AP-42 Chapter 7 [1]	N/A	8,760 hr/yr	3.1E-02 tpy
4	Fuel Oil Storage Tank	50,000 gallons	Diesel	AP-42 Chapter 7 [1]	N/A	8,760 hr/yr	3.1E-02 tpy
N/A	Fuel Oil Storage Tank No. 1 Heater 1- Steel Vessel	180 gallons	Diesel	N/A	N/A	8,760 hr/yr	<0.01 tpy
N/A	Fuel Oil Storage Tank No. 1 Heater 2- Steel Vessel	180 gallons	Diesel	N/A	N/A	8,760 hr/yr	<0.01 tpy
N/A	Fuel Oil Storage Tank No. 2 Heater 1- Steel Vessel	200 gallons	Diesel	N/A	N/A	8,760 hr/yr	<0.01 tpy
N/A	Fuel Oil Storage Tank No. 2 Heater 2- Steel Vessel	200 gallons	Diesel	N/A	N/A	8,760 hr/yr	<0.01 tpy
N/A	Fuel Oil Storage Tank No. 1 Filter 1- Steel Vessel	80 gallons	Diesel	N/A	N/A	8,760 hr/yr	<0.01 tpy
N/A	Fuel Oil Storage Tank No. 1 Filter 2- Steel Vessel	80 gallons	Diesel	N/A	N/A	8,760 hr/yr	<0.01 tpy
N/A	Fuel Oil Storage Tank No. 2 Filter 1- Steel Vessel	80 gallons	Diesel	N/A	N/A	8,760 hr/yr	<0.01 tpy
N/A	Fuel Oil Storage Tank No. 2 Filter 2- Steel Vessel	80 gallons	Diesel	N/A	N/A	8,760 hr/yr	<0.01 tpy
N/A	Heating Oil Storage Tank	1,000 gallons	Heating Oil	N/A	N/A	8,760 hr/yr	<0.01 tpy
N/A	Fuel Oil Storage Tank Filter 1- Steel Vessel	160 gallons	Diesel	N/A	N/A	8,760 hr/yr	<0.01 tpy
N/A	Fuel Oil Storage Tank Filter 2-Steel Vessel	160 gallons	Diesel	N/A	N/A	8,760 hr/yr	<0.01 tpy
N/A	Emergency Generator Engine Tank	2,500 gallons	Diesel	N/A	N/A	8,760 hr/yr	<0.01 tpy
N/A	Emergency Generator Engine Day Tank	275 gallons	Diesel	N/A	N/A	8,760 hr/yr	<0.01 tpy
Total Potential VOC Emissions for Significant Emission Units							**3.9 tpy**
Total Potential VOC Emissions for Insignificant Emission Units							**0.1 tpy**
Total Potential VOC Emissions for All Emission Units							**4.0 tpy**

Note:
[1] Calculations are provided in Table D1-8d.

Sample Calculations:

Turbine Emissions, tpy= (Emission factor, lb/MMBtu) x (Capacity, MMBtu/hr) x (Operation, hr/yr) / (2,000 lb/ton)
Engine Emissions, tpy= (Emission factor, lb/hp-hr x (Capacity, hp) x (Operation, hr/yr) / (2,000 lb/ton)
Boiler Emissions, tpy= (Emission factor, lb/10^3gal) / (Conversion 1,000 gal/10^3gal) / (HHV, MMBtu/gal) x (Rating, MMBtu/hr) x (Operation, hr/yr) / (2,000 lb/ton)

Engineering Data:

HHV Propane=	0.091	MMBtu/gal	(40 CFR 98 Table C-1)
HHV No. 2 Diesel=	0.138	MMBtu/gal	(40 CFR 98 Table C-1)

Table D1-8. Assessable Potential Hazardous Air Pollutant (HAP) Emissions
Golden Valley Electric Association - North Pole Power Plant

Hazardous Air Pollutant	Fuel Oil-Fired Turbines	Fuel Oil-Fired Engine <600 hp	Propane-Fired Boiler[1]	Fuel Oil-Fired Boiler (Insignificant EU)	Fuel Storage Tanks (Insignificant EUs)	Total HAP Emissions[2]		
						Significant Emission Units	Insignificant Emission Units	All Emission Units
Acetaldehyde	----	7.88E-05	----	----	----	**7.88E-05**	**----**	**7.88E-05**
Acrolein	----	9.51E-06	----	----	----	**9.51E-06**	**----**	**9.51E-06**
Benzene	4.67E-01	9.59E-05	----	1.51E-06	5.24E-04	**4.67E-01**	**5.25E-04**	**4.67E-01**
1,3-Butadiene	1.36E-01	4.02E-06	----	----	----	**1.36E-01**	**----**	**1.36E-01**
Ethyl benzene	----	----	----	4.48E-07	----	**0.00E+00**	**4.48E-07**	**4.48E-07**
Formaldehyde	2.38E+00	1.21E-04	----	2.33E-04	----	**2.38E+00**	**2.33E-04**	**2.38E+00**
Polycyclic Organic Matter (POM)	6.37E-01	1.73E-05	----	8.40E-06	----	**6.37E-01**	**8.40E-06**	**6.37E-01**
Polycyclic aromatic compounds (PAH)	*3.40E-01*	----	----	----	----	**3.40E-01**	**----**	**3.40E-01**
Acenaphthene	----	*1.46E-07*	----	*1.49E-07*	----	**1.46E-07**	**1.49E-07**	**2.95E-07**
Acenaphthylene	----	*5.20E-07*	----	*1.78E-09*	----	**5.20E-07**	**1.78E-09**	**5.22E-07**
Anthracene	----	*1.92E-07*	----	*8.60E-09*	----	**1.92E-07**	**8.60E-09**	**2.01E-07**
Benzo(a)anthracene	----	*1.73E-07*	----	*2.83E-08*	----	**1.73E-07**	**2.83E-08**	**2.01E-07**
Benzo(a)pyrene	----	*1.93E-08*	----	----	----	**1.93E-08**	**----**	**1.93E-08**
Benzo(e)pyrene	----	----	----	----	----	**0.00E+00**	**----**	
Benzo(b)fluoranthene	----	*1.02E-08*	----	*1.04E-08*	----	**1.02E-08**	**1.04E-08**	**2.06E-08**
Benzo(g,h,i)perylene	----	----	----	*1.59E-08*	----	**0.00E+00**	**1.59E-08**	**1.59E-08**
Benzo(g,h,l)perylene	----	*5.03E-08*	----	----	----	**5.03E-08**	**----**	**5.03E-08**
Benzo(k)fluoranthene	----	*1.59E-08*	----	*1.04E-08*	----	**1.59E-08**	**1.04E-08**	**2.64E-08**
Chrysene	----	*3.63E-08*	----	*1.68E-08*	----	**3.63E-08**	**1.68E-08**	**5.30E-08**
Dibenz(a,h)anthracene	----	*5.99E-08*	----	*1.18E-08*	----	**5.99E-08**	**1.18E-08**	**7.17E-08**
Fluorene	----	*3.00E-06*	----	*3.15E-08*	----	**3.00E-06**	**3.15E-08**	**3.03E-06**
Fluoranthene	----	*7.82E-07*	----	*3.41E-08*	----	**7.82E-07**	**3.41E-08**	**8.16E-07**
Indeno(1,2,3-cd)pyrene	----	*3.85E-08*	----	*1.51E-08*	----	**3.85E-08**	**1.51E-08**	**5.36E-08**
Naphthalene	*2.97E-01*	*8.71E-06*	----	*7.96E-06*	5.49E-05	**2.97E-01**	**6.29E-05**	**2.97E-01**
Phenanthrene	----	*3.02E-06*	----	*7.40E-08*	----	**3.02E-06**	**7.40E-08**	**3.10E-06**
Pyrene	----	*4.91E-07*	----	*2.99E-08*	----	**4.91E-07**	**2.99E-08**	**5.21E-07**
Toluene	----	4.20E-05	----	4.37E-05	1.54E-03	**4.20E-05**	**1.58E-03**	**8.57E-05**
1,1,1-Trichloroethane	----	----	----	1.66E-06	----	**0.00E+00**	**1.66E-06**	**1.66E-06**
Xylenes	----	2.93E-05	----	7.68E-07	1.09E-03	**2.93E-05**	**1.09E-03**	**3.01E-05**
Arsenic Compounds	9.34E-02	----	----	3.89E-06	----	**9.34E-02**	**3.89E-06**	**9.34E-02**
Beryllium Compounds	2.63E-03	----	----	2.92E-06	----	**2.63E-03**	**2.92E-06**	**2.63E-03**
Cadmium Compounds	4.07E-02	----	----	2.92E-06	----	**4.07E-02**	**2.92E-06**	**4.08E-02**
Chromium Compounds	9.34E-02	----	----	2.92E-06	----	**9.34E-02**	**2.92E-06**	**9.34E-02**
Lead Compounds	1.19E-01	----	----	8.75E-06	----	**1.19E-01**	**8.75E-06**	**1.19E-01**
Manganese Compounds	6.71E+00	----	----	5.83E-06	----	**6.71E+00**	**5.83E-06**	**6.71E+00**
Mercury Compounds	1.02E-02	----	----	2.92E-06	----	**1.02E-02**	**2.92E-06**	**1.02E-02**
Nickel Compounds	3.91E-02	----	----	2.92E-06	----	**3.91E-02**	**2.92E-06**	**3.91E-02**
Selenium Compounds	2.12E-01	----	----	1.46E-05	----	**2.12E-01**	**1.46E-05**	**2.12E-01**
Total HAPs - Maximum Individual HAP[2]	**6.71**	**1.21E-04**	**0.00E+00**	**2.33E-04**	**1.54E-03**	**6.71**	**2.33E-04**	**6.71**
Total VOC HAP Emissions	**4.25**	**3.37E-04**	**0.00E+00**	**2.97E-04**	**5.42E-03**	**4.25**	**2.97E-04**	**4.25**
Total HAP Emissions	**10.93**	**3.98E-04**	**0.00E+00**	**3.37E-04**	**5.36E-03**	**10.93**	**3.37E-04**	**10.93**

Notes:
[1] HAPs emission factors are not available.
[2] See individual emissions unit category emissions calculations for details on methodology and assumptions in the electronic copy.
[3] Cell shading indicates the highest individual HAP.

Table D1-8a. Assessable Potential Hazardous Air Pollutant (HAP) Emissions
Golden Valley Electric Association - North Pole Power Plant
Fuel Oil-Fired Turbines

Maximum Total Heat Input: 16,978,588 MMBtu/yr [1]

Section 112 Hazardous Air Pollutants		Source Category Emission Calculations	
CAS No.	**Chemical Name**	**Emission Factor [2]**	**Estimated Emissions**
106-99-0	1,3-Butadiene	1.6E-05 lb/MMBtu	1.4E-01 tpy [3]
71-43-2	Benzene	5.5E-05 lb/MMBtu	4.7E-01 tpy
5-00-0	Formaldehyde	2.8E-04 lb/MMBtu	2.4E+00 tpy
1330-20-7	Naphthalene	3.5E-05 lb/MMBtu	3.0E-01 tpy
N/A	Polycyclic aromatic compounds (PAH)	4.0E-05 lb/MMBtu	3.4E-01 tpy
N/A	Arsenic Compounds	1.1E-05 lb/MMBtu	9.3E-02 tpy [3]
N/A	Beryllium Compounds	3.1E-07 lb/MMBtu	2.6E-03 tpy [3]
N/A	Cadmium Compounds	4.8E-06 lb/MMBtu	4.1E-02 tpy
N/A	Chromium Compounds	1.1E-05 lb/MMBtu	9.3E-02 tpy
N/A	Lead Compounds	1.4E-05 lb/MMBtu	1.2E-01 tpy
N/A	Manganese Compounds	7.9E-04 lb/MMBtu	6.7E+00 tpy
N/A	Mercury Compounds	1.2E-06 lb/MMBtu	1.0E-02 tpy
N/A	Nickel Compounds	4.6E-06 lb/MMBtu	3.9E-02 tpy [3]
N/A	Selenium Compounds	2.5E-05 lb/MMBtu	2.1E-01 tpy [3]

Total Potential HAP Emissions: 10.93 tpy

Notes:
[1] Total fuel use based on operation as noted below.

EU ID	Description	Rating/Capacity	Potential Operation	Potential Heat Input
1	Simple Cycle Gas Turbine	672 MMBtu/hr	5,411 hr/yr	3,636,364 MMBtu/yr
2	Simple Cycle Gas Turbine	672 MMBtu/hr	7,992 hr/yr	5,370,624 MMBtu/yr
5	Combined Cycle Gas Turbine	455 MMBtu/hr	8,760 hr/yr	3,985,800 MMBtu/yr
6	Combined Cycle Gas Turbine	455 MMBtu/hr	8,760 hr/yr	3,985,800 MMBtu/yr
		Total Potential Heat Input for All Emissions Units:		**16,978,588 MMBtu/yr**

[2] AP-42 indicates that the compound was not detected and the presented emission value is based on one-half of the detection limit.
[3] Reference: AP-42, Tables 3.1-4 and 3.1-5.

Table D1-8b. Assessable Potential Hazardous Air Pollutant (HAP) Emissions
Golden Valley Electric Association - North Pole Power Plant
Fuel Oil-Fired Engine Less Than 600 Horsepower

Maximum Total Heat Input: 206 MMBtu/yr [1]

Section 112 Hazardous Air Pollutants		Source Category Emission Calculations		
CAS No.	**Chemical Name**	**Emission Factor [2]**		**Estimated Emissions**
75-07-0	Acetaldehyde	7.67E-04	lb/MMBtu	7.88E-05 tpy
107-02-8	Acrolein	9.25E-05	lb/MMBtu	9.51E-06 tpy
71-43-2	Benzene	9.33E-04	lb/MMBtu	9.59E-05 tpy
106990	1,3-Butadiene	3.91E-05	lb/MMBtu	4.02E-06 tpy
5-00-0	Formaldehyde	1.18E-03	lb/MMBtu	1.21E-04 tpy
108-88-3	Toluene	4.09E-04	lb/MMBtu	4.20E-05 tpy
1330-20-7	Xylenes	2.85E-04	lb/MMBtu	2.93E-05 tpy
N/A	Polycyclic Organic Matter (POM)			
N/A	Polycyclic aromatic compounds(PAH)			
	Acenaphthene	1.42E-06	lb/MMBtu	1.46E-07 tpy [2]
	Acenaphthylene	5.06E-06	lb/MMBtu	5.20E-07 tpy [2]
120-12-7	Anthracene	1.87E-06	lb/MMBtu	1.92E-07 tpy
	Benzo(a)anthracene	1.68E-06	lb/MMBtu	1.73E-07 tpy
	Benzo(b)fluoranthene	9.91E-08	lb/MMBtu	1.02E-08 tpy [2]
	Benzo(k)fluoranthene	1.55E-07	lb/MMBtu	1.59E-08 tpy [2]
	Benzo(a)pyrene	1.88E-07	lb/MMBtu	1.93E-08 tpy [2]
	Benzo(g,h,l)perylene	4.89E-07	lb/MMBtu	5.03E-08 tpy [2]
	Chrysene	3.53E-07	lb/MMBtu	3.63E-08 tpy
	Dibenz(a,h)anthracene	5.83E-07	lb/MMBtu	5.99E-08 tpy [2]
	Fluoranthene	7.61E-06	lb/MMBtu	7.82E-07 tpy
	Fluorene	2.92E-05	lb/MMBtu	3.00E-06 tpy
	Indeno(1,2,3-cd)pyrene	3.75E-07	lb/MMBtu	3.85E-08 tpy [2]
91-20-3	Naphthalene	8.48E-05	lb/MMBtu	8.71E-06 tpy
85-01-8	Phenanthrene	2.94E-05	lb/MMBtu	3.02E-06 tpy
	Pyrene	4.78E-06	lb/MMBtu	4.91E-07 tpy

Total Potential HAP Emissions: 3.98E-04 tpy

[1] Total fuel use based on operation as noted below.

EU ID	Description	Rating/Capacity	Potential Operation	Potential Heat Input
7	Emergency Generator Engine	565 hp	52 hr/yr	205.53 MMBtu/yr
			Total Potential Heat Input for All Emissions Units:	**206 MMBtu/yr**

Average brake-specific fuel consumption (BSFC) for EU ID 7 7,000 Btu/hp-hr AP-42, Table 3.3-1

[2] AP-42 indicates that the compound was not detected and the presented emission value is based on one-half of the detection limit.
[3] Reference: AP-42, Table 3.3-2.

Table D1-8c. Assessable Potential Hazardous Air Pollutant (HAP) Emissions
Golden Valley Electric Association - North Pole Power Plant
Fuel Oil-Fired Heater

Maximum Total Heat Input: 1,945 MMBtu/yr [1]

Section 112 Hazardous Air Pollutants		Source Category Emission Calculations	
CAS No.	**Chemical Name**	**Emission Factor [2]**	**Estimated Emissions**
N/A	Arsenic Compounds	4.00E-06 lb/MMBtu	3.89E-06 tpy
71-43-2	Benzene	1.55E-06 lb/MMBtu	1.51E-06 tpy
N/A	Beryllium Compounds	3.00E-06 lb/MMBtu	2.92E-06 tpy
N/A	Cadmium Compounds	3.00E-06 lb/MMBtu	2.92E-06 tpy
N/A	Chromium Compounds	3.00E-06 lb/MMBtu	2.92E-06 tpy
100-41-4	Ethyl benzene	4.61E-07 lb/MMBtu	4.48E-07 tpy
50-00-0	Formaldehyde	2.39E-04 lb/MMBtu	2.33E-04 tpy
N/A	Lead Compounds	9.00E-06 lb/MMBtu	8.75E-06 tpy
N/A	Manganese Compounds	6.00E-06 lb/MMBtu	5.83E-06 tpy
N/A	Mercury Compounds	3.00E-06 lb/MMBtu	2.92E-06 tpy
N/A	Nickel Compounds	3.00E-06 lb/MMBtu	2.92E-06 tpy
N/A	Selenium Compounds	1.50E-05 lb/MMBtu	1.46E-05 tpy
108-88-3	Toluene	4.49E-05 lb/MMBtu	4.37E-05 tpy
71-55-6	1,1,1-Trichloroethane	1.71E-06 lb/MMBtu	1.66E-06 tpy
1330-20-7	Xylenes	7.90E-07 lb/MMBtu	7.68E-07 tpy
N/A	Polycyclic Organic Matter (POM)		
N/A	Polycyclic aromatic compounds(PAH)		
208-96-8	Acenaphthene	1.53E-07 lb/MMBtu	1.49E-07 tpy
83-32-9	Acenaphthylene	1.83E-09 lb/MMBtu	1.78E-09 tpy
120-12-7	Anthracene	8.84E-09 lb/MMBtu	8.60E-09 tpy
56-55-3	Benzo(a)anthracene	2.91E-08 lb/MMBtu	2.83E-08 tpy
205-99-2	Benzo(b)fluoranthene	1.07E-08 lb/MMBtu	1.04E-08 tpy
207-08-9	Benzo(k)fluoranthene	1.07E-08 lb/MMBtu	1.04E-08 tpy
191-24-2	Benzo(g,h,i)perylene	1.64E-08 lb/MMBtu	1.59E-08 tpy
218-01-9	Chrysene	1.72E-08 lb/MMBtu	1.68E-08 tpy
53-70-3	Dibenz(a,h)anthracene	1.21E-08 lb/MMBtu	1.18E-08 tpy
206-44-0	Fluoranthene	3.51E-08 lb/MMBtu	3.41E-08 tpy
86-73-7	Fluorene	3.24E-08 lb/MMBtu	3.15E-08 tpy
193-39-5	Indeno(1,2,3-cd)pyrene	1.55E-08 lb/MMBtu	1.51E-08 tpy
91-20-3	Naphthalene	8.19E-06 lb/MMBtu	7.96E-06 tpy
85-01-8	Phenanthrene	7.61E-08 lb/MMBtu	7.40E-08 tpy
129-00-0	Pyrene	3.08E-08 lb/MMBtu	2.99E-08 tpy
	Total Potential HAP Emissions:		**3.37E-04 tpy**

Notes:
[1] Total fuel use based on operation as noted below.

EU ID	Description	Rating/Capacity	Potential Operation	Potential Heat Input
Insig.	Burnham 17 A-T Boiler 1	0.222 MMBtu/hr	8,760 hr/yr	1,944.72 MMBtu/yr
			Total Potential Heat Input for Insignificant Emissions Units:	**1,945 MMBtu/yr**

[2] Reference: AP-42, Tables 1.3-9, and 1.3-10.

HHV Fuel Oil= 0.138 MMBtu/gal (Engineering estimate)

Table D1-8d. Assessable Potential Hazardous Air Pollutant (HAP) Emissions
Golden Valley Electric Association - North Pole Power Plant
Fuel Storage Tanks

Potential Total Vapor Loss: 6.28E-02 **tpy**[1]

Section 112 Hazardous Air Pollutants		Source Category Emission Calculations		
CAS No.	**Chemical Name**	**Emission Factor** [2]		**Estimated Emissions**
	Benzene	8.34E-01	wt. pct.	5.24E-04 tpy
	Cyclohexane	1.03E+00	wt. pct.	6.44E-04 tpy
	Ethylbenzene	4.07E-01	wt. pct.	2.56E-04 tpy
	n-Hexane	2.37E+00	wt. pct.	1.49E-03 tpy
	Naphthalene	8.75E-02	wt. pct.	5.49E-05 tpy
	Toluene	2.45E+00	wt. pct.	1.54E-03 tpy
	1,2,4-Trimethylbenzene	4.39E-01	wt. pct.	2.76E-04 tpy
	2,2,4-Trimethylpentane	1.15E+00	wt. pct.	7.21E-04 tpy
	Xylenes	1.73E+00	wt. pct.	1.09E-03 tpy

Total Potential HAP Emissions: 6.59E-03 tpy

[1] Total vapor loss determined using AP-42, Section 7.1 as shown below.
[2] Reference: EPA SPECIATE Data Browser, Diesel Headspace Vapor - Citgo Diesel - adjusted for oxygenates.

Fuel Storage Tank Detail:

Orientation:	Horizontal		Effective Diameter (De):	30.3 ft	(AP-42, Section 7.1, Equation 1-13)
Capacity:	50,000 gallons		Effective Height (He):	9.4 ft	(AP-42, Section 7.1, Equation 1-14)
Diameter:	12 ft		Maximum Liquid Height (Hlx):	8.4 ft	
Length:	60 ft		Potential Diesel Throughput:	68,268,026 gal/yr	
Location:	North Pole, AK		Paint Condition:	Good	
Tank Color:	Tan				

Standing Loss

Standing Loss (Ls) = 365 x Ke x (pi / 4 x De^2) x Hvo x Ks x Wv (AP-42, Section 7.1, Equation 1-4)

Ke = 0.0018 x dTv = 0.0018 x [0.72 x (Tax - Tan) + 0.028 x a x i] (AP-42, Section 7.1, Equation 1-5)
where:

Tax =	43.6	°F	(AP-42, Section 7.1, Table 7.1-7 for Homer AK)
Tan =	29.5	°F	(AP-42, Section 7.1, Table 7.1-7 for Homer AK)
Tax =	503.6	°R	
Tan =	489.5	°R	
a =	0.43	(dimensionless)	(AP-42, Section 7.1, Table 7.1-6)
i =	838	Btu/ft^2-d	(AP-42, Section 7.1, Table 7.1-7 for Homer AK)
Ke =	**0.0364**	**(dimensionless**	

Hvo = 0.5 x He (AP-42, Section 7.1, text below Equation 1-14)
Hvo = 4.7 ft

Ks = 1 / (1 + 0.053 x Pva x Hvo) (AP-42, Section 7.1, Equation 1-20)
where:

Tla = 0.44 x Taa + 0.56 x Tb + 0.0079 x a x i (AP-42, Section 7.1, Equation 1-26)
where:

Taa = (Tax + Tan)/2 (AP-42, Section 7.1, Equation 1-27)
Taa = 496.55 °R

Tb = Taa + 6 x a - 1 (AP-42, Section 7.1, Equation 1-28)
Tb = 498.13 °R

Tla = 500.28 °R

Pva (Diesel) = 0.0031 psi (AP-42, Section 7.1, Table 7.1-2)

Ks (Diesel) = 0.99923 (dimensionless)

Wv = (Mv x Pva) / (10.731 x Tla) (AP-42, Section 7.1, Equation 1-21)
where:

Mv (Diesel) = 130 lb/lb-mole (AP-42, Section 7.1, Table 7.1-2)

Wv (Diesel) = 7.51E-05 lb/ft^3

Ls (Diesel) = 3.38 lb/yr

Working Loss

Working Loss (Lw) = 0.0010 / 5.614 x 10.731 x Tla x N x Hlx x pi / 4 x De2 x Kn x Kp x Wv (AP-42, Section 7.1, Equation 1-34)

Q (Diesel) = 1,625,429 bbl/yr (Throughput converted from gal/yr to bbl/yr)

Kn = 1 (dimensionless) for turnovers ≤36
Kn = (180 + N) / 6 x N for turnovers >36
where:

N = 5.614 x Q / Vlx (AP-42, Section 7.1, Equation 1-30)
where:

Vlx = pi / 4 x De^2 x Hlx (AP-42, Section 7.1, Equation 1-31)
Vlx = 6,048 ft^3

N (Diesel) = 1,508.8

Kn (Diesel) = 0.2 (dimensionless)

Kp = 1 (dimensionless) (AP-42, Section 7.1, Notes under Equation 1-35)

Lw (Diesel) = 122.20 lb/yr

Total Loss

Lt = Ls + Lw (AP-42, Section 7.1, Equation 1-1)
Lt (Diesel) = 125.58 lb/yr (both tanks combined)

Table D1-9. Assessable Potential Carbon Dioxide Equivalent (CO_2e) Emissions
Golden Valley Electric Association - North Pole Power Plant

Emission Unit			Fuel Type	Potential Operation	Potential Greenhouse Gas Emissions (tpy)			
ID	Description	Rating/Capacity			CO_2	CH_4	N_2O	GHG CO_2e
Significant Emission Units								
1	Simple Cycle Gas Turbine	672 MMBtu/hr	Jet A. No. 1 Diesel No. 2 Diesel	5,411 hr/yr	296,512	12.0	2.4	297,530
2	Simple Cycle Gas Turbine	672 MMBtu/hr	Jet A. No. 1 Diesel No. 2 Diesel	7,992 hr/yr	437,926	17.8	3.6	439,428
5	Combined Cycle Gas Turbine	455 MMBtu/hr	Jet A. No. 1 Diesel Naphtha	8,760 hr/yr	16,838	13.2	2.6	17,953
6	Combined Cycle Gas Turbine	455 MMBtu/hr	Jet A. No. 1 Diesel Naphtha	8,760 hr/yr	16,838	13.2	2.6	17,953
7	Emergency Generator Engine	564.6 hp	No. 2 Diesel	52 hr/yr	17	6.8E-04	1.4E-04	17
11	Boiler	5 MMBtu/hr	Propane	8760 hr/yr	3,036	1.4E-01	2.9E-02	3,048
12	Boiler	5 MMBtu/hr	Propane	8760 hr/yr	3,036	1.4E-01	2.9E-02	3,048
Insignificant Emission Units								
N/A	Burnham 17 A-T Boiler 1	0.222 MMBtu/hr	Heating Oil	8,760 hr/yr	159	0	0	159
3	Fuel Oil Storage Tank	50,000 gallons	Diesel	8,760 hr/yr	0	0	0	0
4	Fuel Oil Storage Tank	50,000 gallons	Diesel	8,760 hr/yr	0	0	0	0
N/A	Fuel Oil Storage Tank No. 1 Heater 1- Steel Vessel	180 gallons	Diesel	8,760 hr/yr	0	0	0	0
N/A	Fuel Oil Storage Tank No. 1 Heater 2- Steel Vessel	180 gallons	Diesel	8,760 hr/yr	0	0	0	0
N/A	Fuel Oil Storage Tank No. 2 Heater 1- Steel Vessel	200 gallons	Diesel	8,760 hr/yr	0	0	0	0
N/A	Fuel Oil Storage Tank No. 2 Heater 2- Steel Vessel	200 gallons	Diesel	8,760 hr/yr	0	0	0	0
N/A	Fuel Oil Storage Tank No. 1 Filter 1- Steel Vessel	80 gallons	Diesel	8,760 hr/yr	0	0	0	0
N/A	Fuel Oil Storage Tank No. 1 Filter 2- Steel Vessel	80 gallons	Diesel	8,760 hr/yr	0	0	0	0
N/A	Fuel Oil Storage Tank No. 2 Filter 1- Steel Vessel	80 gallons	Diesel	8,760 hr/yr	0	0	0	0
N/A	Fuel Oil Storage Tank No. 2 Filter 2- Steel Vessel	80 gallons	Diesel	8,760 hr/yr	0	0	0	0
N/A	Heating Oil Storage Tank	1,000 gallons	Heating Oil	8,760 hr/yr	0	0	0	0
N/A	Fuel Oil Storage Tank Filter 1- Steel Vessel	160 gallons	Diesel	8,760 hr/yr	0	0	0	0
N/A	Fuel Oil Storage Tank Filter 2-Steel Vessel	160 gallons	Diesel	8,760 hr/yr	0	0	0	0
N/A	Emergency Generator Engine Tank	2,500 gallons	Diesel	8,760 hr/yr	0	0	0	0
N/A	Emergency Generator Engine Day Tank	275 gallons	Diesel	8,760 hr/yr	0	0	0	0
Total Potential CO_2e Emissions for Significant Emission Units								**778,978**
Total Potential CO_2e Emissions for Insignificant Emission Units								**159**
Total Potential CO_2e Emissions for All Emission Units								**779,137**

Sample Calculation:

GHG (CO_2e) emissions = CO_2 emissions + (25 * CH_4 emissions) + (298 * N_2O emissions) [40 CFR 98 Subpart A, Table A-1]

Table D1-9a. Assessable Potential Carbon Dioxide (CO_2) Emissions
Golden Valley Electric Association - North Pole Power Plant

Emission Unit			Fuel Type	Factor Reference	CO_2 Emission Factor	Potential Operation	Potential CO_2 Emissions
ID	Description	Rating/Capacity					
Significant Emission Units							
1	Simple Cycle Gas Turbine	672 MMBtu/hr	Jet A.	Table C-1, 40 CFR 98	72.22 kg/MMBtu	5,411 hr/yr	296,512 tpy [1]
			No. 1 Diesel		73.25 kg/MMBtu		
			No. 2 Diesel		73.96 kg/MMBtu		
2	Simple Cycle Gas Turbine	672 MMBtu/hr	Jet A.	Table C-1, 40 CFR 98	72.22 kg/MMBtu	7,992 hr/yr	437,926 tpy [1]
			No. 1 Diesel		73.25 kg/MMBtu		
			No. 2 Diesel		73.96 kg/MMBtu		
5	Combined Cycle Gas Turbine	455 MMBtu/hr	Jet A.	Table C-1, 40 CFR 98	72.22 kg/MMBtu	458 hr/yr [2]	16,838 tpy [3]
			No. 1 Diesel		73.25 kg/MMBtu		
			Naphtha		68.02 kg/MMBtu	8,302 hr/yr	283,267 tpy
6	Combined Cycle Gas Turbine	455 MMBtu/hr	Jet A.	Table C-1, 40 CFR 98	72.22 kg/MMBtu	458 hr/yr [2]	16,838 tpy [3]
			No. 1 Diesel		73.25 kg/MMBtu		
			Naphtha		68.02 kg/MMBtu	8,302 hr/yr	283,267 tpy
7	Emergency Generator Engine	564.6 hp	No. 2 Diesel	Table C-1, 40 CFR 98	73.96 kg/MMBtu	52 hr/yr	17 tpy
11	Boiler	5 MMBtu/hr	Propane	Table C-1, 40 CFR 98	62.87 kg/MMBtu	8,760 hr/yr	3,036 tpy
12	Boiler	5 MMBtu/hr	Propane	Table C-1, 40 CFR 98	62.87 kg/MMBtu	8,760 hr/yr	3,036 tpy
Insignificant Emission Units							
N/A	Burnham 17 A-T Boiler 1	0.222 MMBtu/hr	Heating Oil	Table C-1, 40 CFR 98	73.96 kg/MMBtu	8,760 hr/yr	159 tpy
3	Fuel Oil Storage Tank	50,000 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
4	Fuel Oil Storage Tank	50,000 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Heater 1- Steel Vessel	180 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Heater 2- Steel Vessel	180 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Heater 1- Steel Vessel	200 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Heater 2- Steel Vessel	200 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Filter 1- Steel Vessel	80 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Filter 2- Steel Vessel	80 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Filter 1- Steel Vessel	80 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Filter 2- Steel Vessel	80 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Heating Oil Storage Tank	1,000 gallons	Heating Oil	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank Filter 1- Steel Vessel	160 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank Filter 2-Steel Vessel	160 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Emergency Generator Engine Tank	2,500 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Emergency Generator Engine Day Tank	275 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
Total Potential CO_2 Emissions for Significant Emissions Units							**1,340,738 tpy**
Total Potential CO_2 Emissions for Insignificant Emissions Units							**159 tpy**
Total Potential CO_2 Emissions for All Emissions Units							**1,340,896 tpy**

Notes:
[1] Non-startup fuel (No. 2 diesel) is used for the calculation.
[2] Startup fuel for EU IDs 5 and 6 is limited to 1.5 million gallons per year under Condition 16.1 of Permit AQ0110TVP03. The use of 1.5 million gallons per year is equivalent to 458 hours per year.
[3] Under a worst-case scenario using 1,500,000 gallons of No. 1 Diesel startup fuel during a 12-month rolling period, approximately 8,302 hours remain.

Sample Calculation:

Emissions, tpy = (Emission factor, kg/MMBtu) x (Rating, MMBtu/hr) x (Operation, hr/yr) x (Conversion, 2.205 lb/kg) / (Conversion, 2,000 lb/ton)
Emissions, tpy = (Emission factor, kg/MMBtu) x (Rating, hp) x (BSFC, 7,000 Btu/hp-hr) / (Conversion, 1,000,0000 Btu/MMBtu) x (Operation, hr/yr) x (Conversion, 2.205 lb/kg) / (Conversion, 2,000 lb/ton)

Data and Conversion Factors:

1 kilogram = 2.205 lb
Brake-specific fuel consumption = 7,000 Btu/hp-hr

Table D1-9b. Assessable Potential Methane (CH_4) Emissions
Golden Valley Electric Association - North Pole Power Plant

Emission Unit			Fuel Type	Factor Reference	CH_4 Emission Factor	Potential Operation	Potential CH_4 Emissions
ID	Description	Rating/Capacity					
Significant Emission Units							
1	Simple Cycle Gas Turbine	672 MMBtu/hr	Jet A. No. 1 Diesel No. 2 Diesel	Table C-2, 40 CFR 98	3.0E-03 kg/MMBtu	5,411 hr/yr	12.0 tpy
2	Simple Cycle Gas Turbine	672 MMBtu/hr	Jet A. No. 1 Diesel No. 2 Diesel	Table C-2, 40 CFR 98	3.0E-03 kg/MMBtu	7,992 hr/yr	17.8 tpy
5	Combined Cycle Gas Turbine	455 MMBtu/hr	Jet A. No. 1 Diesel Naphtha	Table C-2, 40 CFR 98	3.0E-03 kg/MMBtu	8,760 hr/yr	13.2 tpy
6	Combined Cycle Gas Turbine	455 MMBtu/hr	Jet A. No. 1 Diesel Naphtha	Table C-2, 40 CFR 98	3.0E-03 kg/MMBtu	8,760 hr/yr	13.2 tpy
7	Emergency Generator Engine	564.6 hp	No. 2 Diesel	Table C-2, 40 CFR 98	3.0E-03 kg/MMBtu	52 hr/yr	6.8E-04 tpy
11	Boiler	5 MMBtu/hr	Propane	Table C-2, 40 CFR 98	3.0E-03 kg/MMBtu	8,760 hr/yr	1.4E-01 tpy
12	Boiler	5 MMBtu/hr	Propane	Table C-2, 40 CFR 98	3.0E-03 kg/MMBtu	8,760 hr/yr	1.4E-01 tpy
Insignificant Emission Units							
N/A	Burnham 17 A-T Boiler 1	0.222 MMBtu/hr	Heating Oil	Table C-2, 40 CFR 98	3.0E-03 kg/MMBtu	8,760 hr/yr	6.4E-03 tpy
3	Fuel Oil Storage Tank	50,000 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
4	Fuel Oil Storage Tank	50,000 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Heater 1- Steel Vessel	180 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Heater 2- Steel Vessel	180 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Heater 1- Steel Vessel	200 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Heater 2- Steel Vessel	200 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Filter 1- Steel Vessel	80 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Filter 2- Steel Vessel	80 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Filter 1- Steel Vessel	80 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Filter 2- Steel Vessel	80 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Heating Oil Storage Tank	1,000 gallons	Heating Oil	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank Filter 1- Steel Vessel	160 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank Filter 2-Steel Vessel	160 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Emergency Generator Engine Tank	2,500 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Emergency Generator Engine Day Tank	275 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
					Total Potential CH_4 Emissions for Significant Emissions Units		**56.4 tpy**
					Total Potential CH_4 Emissions for Insignificant Emissions Units		**6.4E-03 tpy**
					Total Potential CH_4 Emissions for All Emissions Units		**56.5 tpy**

Sample Calculation:

Emissions, tpy = (Emission factor, kg/MMBtu) x (Rating, MMBtu/hr) x (Operation, hr/yr) x (Conversion, 2.205 lb/kg) / (Conversion, 2,000 lb/ton)
Emissions, tpy = (Emission factor, kg/MMBtu) x (Rating, hp) x (BSFC, 7,000 Btu/hp-hr) / (Conversion, 1,000,0000 Btu/MMBtu) x (Operation, hr/yr) x (Conversion, 2.205 lb/kg) / (Conversion, 2,000 lb/ton)

Data and Conversion Factors:

1 kilogram = 2.205 lb
Brake-specific fuel consumption = 7,000 Btu/hp-hr

Table D1-9c. Assessable Potential Nitrous Oxide (N_2O) Emissions
Golden Valley Electric Association - North Pole Power Plant

Emission Unit			Fuel Type	Factor Reference	N_2O Emission Factor	Potential Operation	Potential N_2O Emissions
ID	Description	Rating/Capacity					
Significant Emission Units							
1	Simple Cycle Gas Turbine	672 MMBtu/hr	Jet A. No. 1 Diesel No. 2 Diesel	Table C-1, 40 CFR 98	6.0E-04 kg/MMBtu	5,411 hr/yr	2.4 tpy
2	Simple Cycle Gas Turbine	672 MMBtu/hr	Jet A. No. 1 Diesel No. 2 Diesel	Table C-1, 40 CFR 98	6.0E-04 kg/MMBtu	7,992 hr/yr	3.6 tpy
5	Combined Cycle Gas Turbine	455 MMBtu/hr	Jet A. No. 1 Diesel Naphtha	Table C-1, 40 CFR 98	6.0E-04 kg/MMBtu	8,760 hr/yr	2.6 tpy
6	Combined Cycle Gas Turbine	455 MMBtu/hr	Jet A. No. 1 Diesel Naphtha	Table C-1, 40 CFR 98	6.0E-04 kg/MMBtu	8,760 hr/yr	2.6 tpy
7	Emergency Generator Engine	564.6 hp	No. 2 Diesel	Table C-1, 40 CFR 98	6.0E-04 kg/MMBtu	52 hr/yr	1.4E-04 tpy
11	Boiler	5 MMBtu/hr	Propane	Table C-1, 40 CFR 98	6.0E-04 kg/MMBtu	8,760 hr/yr	2.9E-02 tpy
12	Boiler	5 MMBtu/hr	Propane	Table C-1, 40 CFR 98	6.0E-04 kg/MMBtu	8,760 hr/yr	2.9E-02 tpy
Insignificant Emission Units							
N/A	Burnham 17 A-T Boiler 1	0.222 MMBtu/hr	Heating Oil	Table C-1, 40 CFR 98	6.0E-04 kg/MMBtu	8,760 hr/yr	1.3E-03 tpy
3	Fuel Oil Storage Tank	50,000 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
4	Fuel Oil Storage Tank	50,000 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Heater 1- Steel Vessel	180 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Heater 2- Steel Vessel	180 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Heater 1- Steel Vessel	200 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Heater 2- Steel Vessel	200 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Filter 1- Steel Vessel	80 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 1 Filter 2- Steel Vessel	80 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Filter 1- Steel Vessel	80 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank No. 2 Filter 2- Steel Vessel	80 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Heating Oil Storage Tank	1,000 gallons	Heating Oil	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank Filter 1- Steel Vessel	160 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Fuel Oil Storage Tank Filter 2-Steel Vessel	160 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Emergency Generator Engine Tank	2,500 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
N/A	Emergency Generator Engine Day Tank	275 gallons	Diesel	NA	NA	8,760 hr/yr	0 tpy
					Total Potential N_2O Emissions for Significant Emissions Units		**11.3 tpy**
					Total Potential N_2O Emissions for Insignificant Emissions Units		**1.3E-03 tpy**
					Total Potential N_2O Emissions for All Emissions Units		**11.3 tpy**

Sample Calculation:

Emissions, tpy = (Emission factor, kg/MMBtu) x (Rating, MMBtu/hr) x (Operation, hr/yr) x (Conversion, 2.205 lb/kg) / (Conversion, 2,000 lb/ton)
Emissions, tpy = (Emission factor, kg/MMBtu) x (Rating, hp) x (BSFC, 7,000 Btu/hp-hr) / (Conversion, 1,000,0000 Btu/MMBtu) x (Operation, hr/yr) x (Conversion, 2.205 lb/kg) / (Conversion, 2,000 lb/ton)

Data and Conversion Factors:

1 kilogram = 2.205 lb
Brake-specific fuel consumption = 7,000 Btu/hp-hr