Appendix N

Greenhouse Gas Analysis

Appendix X: GHG Emission Detailed Calculations

Potential Construction Emissions (tons)							
Equipment Type	**No. of Equipment**	**Days**	**Duration (hours/day)**	**Fuel Consumption (gal/hour)**	**Fuel Type**	**Est. Total Gallons (per year)**	**Notes/Assumptions**
Bulldozer	1	20	8	7.3	Diesel	1,168	Caterpillar D8T Medium Load
Grader/scraper	1	20	8	4.01	Diesel	642	Caterpillar 140-13 (AWD) Medium Load
Backhoe	1	20	8	3.1	Diesel	496	Caterpillar 422F2 Low Load
Vibratory compactor	6	12	8	2.91	Diesel	1,676	Caterpillar CS56/CP56 Medium Load
Dump Truck	2	20	8	10	Diesel	3,200	Tandem Axle 10-14 CY
Excavator	3	12	8	8.1	Diesel	2,333	Caterpillar 336D Medium Load
Concrete truck and boom	1	5	8	12	Diesel	480	Primarily Substation
Semi truck/trailer	1	20	8	10	Diesel	1,600	Standard size and weight semitruck for equipment deliveries (non-peak)
Skid steer	4	20	8	3.3	Diesel	2,112	Caterpillar 299D Medium Load
Fork lift (all terrain)	2	20	8	2.9	Diesel	928	JLG 1255 Medium Load or telehandler
Pile driver	3	10	8	7.1	Diesel	1,704	Vermeer PD10 Medium/High Load
Truck-mounted auger/drill	1	5	8	4.8	Diesel	192	Altec D3060 digging truck
Medium duty crane	1	10	8	18.8	Diesel	1,504	120T RT Telescopic Crane (This may end up being a 90 ton RTC or work split the a 120 & 90 ton)
Watering truck	2	30	8	11	Diesel	5,280	
Light-duty pickup truck (on-site)	4	30	8	3.6	Gasoline	3,456	
ATVs	4	30	8	0.4	Gasoline	384	Club Car 4 Seater ATV
Construction contractor vehicles (commute to/from site)	15	45	2	2.5	Gasoline	3,375	Assume 10.6% carpool (MN EQB climate tool default value).
					TOTAL GALLONS DIESEL (per year)	**23,315**	
					TOTAL GALLONS GAS (per year)	**7,215**	

Potential Operations Emissions (tons)							
Equipment Type	**No. of Equipment**	**Days/Year**	**Duration (hours/day)**	**Fuel Consumption (gal/hour)**	**Fuel Type**	**Est. Total Gallons (per year)**	**Notes/Assumptions**
Light-duty pickup truck (commute to/from site) - 1 part time staff	1	260	2	2.5	Gasoline	1,300.0	1 part time technician.
O&M contractor vehicles (commute to/from site)	1	260	2	2.5	Gasoline	1,300.0	1 part time technician.
					TOTAL GALLONS DIESEL (per year)	**0.0**	
					TOTAL GALLONS GAS (per year)	**2,600.0**	

Phase	**Annual Fuel Usage (gal)**	**CO2 Emission Factor (kg/gal)**	**CO2 (kg)**	**CO2 (US short tons)**	**CH4 Emission Factor (g/gal)**	**CH4 (g)**	**CH4 (kg)**	**CH4 (US short tons)**	**CH4 to CO2e (GWP=28) (short tons)**	**N2O Emission Factor (g/gal)**	**N2O (g)**	**N20 (kg)**	**N2O (US short tons)**	**N2O to CO2e (GWP=265) (short**	**Total CO2e (short tons)**
Construction															
Total Motor Gasoline	7,215.00	8.78	63,347.70	69.83	2.86	20,634.90	20.63	0.02	0.64	1.48	10,678.20	10.68	0.01	3.12	73.58
Total Diesel Fuel	23,314.56	10.21	238,041.66	262.40	1.01	23,547.71	23.55	0.03	0.73	0.94	21,915.69	21.92	0.02	6.40	269.52
Total	30,529.56		301,389.36	332.22											
Operation															
Total Motor Gasoline	2,600.00	8.78	22,828.00	25.16	2.86	7,436.00	7.44	0.01	0.23	1.48	3,848.00	3.85	0.00	1.12	26.52
Total Diesel Fuel	-	10.21	-	-	1.01	-	-	-		0.94	-	-	-		
Total	2,600.00		22,828.00	25.16											
Total Motor Gasoline	9,815.00	-	86,175.70	94.99	-	28,070.90	28.07	0.03	0.87	-	14,526.20	14.53	0.02	4.24	100.10
Total Diesel Fuel	23,314.56		238,041.66	262.40		23,547.71	23.55	0.03	0.73		21,915.69	21.92	0.02	6.40	269.52
Total	33,129.56	-	324,217.36	357.39	-	51,618.61	51.62	0.06	1.59	-	36,441.89	36.44	0.04	10.65	369.63