APPENDIX A
CONSTRUCTION EMISSIONS

SUMMARY

	Construction Emissions (tpy) [Maximum per Year]								
Source	**NO_x**	**CO**	**VOC**	**SO_2**	**TSP**	**PM_{10}**	**$PM_{2.5}$**	**HAPS**	**CO2e**
COMBUSTION SOURCES									
Equipment Onsite	24.9	8.15	2.09	0.99	2.23	1.83	1.83	0.04	5,263
Barges	20.4	5.41	0.52	0.01	0.44	0.37	0.37	0.03	1,053
Total Combustion Sources	45.3	13.6	2.61	1.00	2.67	2.20	2.20	0.07	6,316
FUGITIVE SOURCES									
Controlled Fugitive Earthwork	-	-	-	-	1.00	0.49	0.10	-	-
Total Fugitive Sources	-	-	-	-	1.00	0.49	0.10	-	-
Total - All Construction Sources	45.3	13.6	2.61	1.00	3.67	2.68	2.30	0.07	6,316

INPUT DATA:

Major Construction Activities and Typical Equipment Fleets

Construction Equipment Type	Rail Infrastructure and Rotary Car Dump Station		Conveyors, Transfer Stations and Surge Bins		Shiploader, Dock, and Trestles	
	Max Qty per Month	Duration (months)	Max Qty per Month	Duration (months)	Max Qty per Month	Duration (months)
Mobile Cranes (25-50t)[1]	2	18	2	18	2	18
Mobile Cranes (50-150t)[1]	2	18	2	18	2	18
Mobile Cranes (150-300t)[1]	1	18	1	18	1	18
Water Trucks[2]	1	12	1	12	0	0
Dump Trucks	3	12	1	12	0	0
Dozers	1	5	0	0	0	0
Excavators[3]	1	9	2	12	1	3
Rollers	2	9	2	12	1	3
Graders	2	9	0	0	1	3
Compactors	2	9	2	12	1	3
Track Laying Machine	1	2	0	0	0	0
Drill Rigs	1	2	2	6	0	0
Impact Piling Rigs	2	6	2	6	2	6
Loaders[4]	1	12	1	12	1	9
River Barge	0	0	0	0	2	18
Generator	2	18	2	18	2	18
Air Compressor	2	18	2	18	2	18

Source: MBTL, *Noise Resource Report* , Appendix D-1 (URS, June 2014)

NOTES:

[1] Mobile cranes to be shared between the 3 areas.

[2] Water truck to be shared between the 2 land areas.

[3] Excavators to be shared between the 3 areas.

[4] Loaders to be shared between the 3 areas.

Typical construction fleet may be modified with equivalent items as construction activities demand

Assume entire construction period for all 3 areas is: 18 months total, 5 days/week

ONSITE EQUIPMENT (NON-BARGE) EMISSIONS

Equipment Type	Engine Size (hp)	Fuel	Maximum Units Onsite (per year)	EPA NONROAD SCC Number	EPA NONROAD model combustion emission factor (tons/yr per unit)					
					THC-Exhaust	CO-Exhaust	NOx-Exhaust	CO2-Exhaust	SO2-Exhaust	PM-Exhaust
Crane, 50 ton	165	Diesel	2	2270002045	5.15E-02	1.65E-01	6.50E-01	120.43	2.38E-02	5.04E-02
Crane, 150 ton	280	Diesel	2	2270002045	7.69E-02	2.12E-01	9.99E-01	201.70	3.88E-02	6.33E-02
Crane, 300 ton	450	Diesel	1	2270002045	8.22E-02	3.69E-01	1.44E+00	215.37	4.28E-02	7.47E-02
Water Trucks	350	Diesel	1	2270002051	3.06E-02	9.01E-02	3.12E-01	108.922	1.86E-02	3.49E-02
Dump Trucks	350	Diesel	4	*See Notes*	*3.06E-02*	*9.01E-02*	*3.12E-01*	*108.922*	*1.86E-02*	*3.49E-02*
Dozers	185	Diesel	0.4	2270002069	1.66E-01	8.15E-01	1.96E+00	437.06	8.46E-02	2.35E-01
Excavators	230	Diesel	2	2270002036	3.15E-01	1.24E+00	3.65E+00	977.30	1.79E-01	3.62E-01
Rollers	350	Diesel	3.8	2270002015	4.20E-02	1.70E-01	5.19E-01	110.57	2.12E-02	4.42E-02
Graders	185	Diesel	1.8	2270002048	5.49E-02	2.71E-01	6.48E-01	146.26	2.83E-02	7.85E-02
Compactors	25	Diesel	3.8	2270002009	2.47E-04	1.15E-03	2.15E-03	0.26	5.65E-05	1.78E-04
Track Laying Machine	*See Notes*	Diesel	0.2	*See Notes*	*3.17E-01*	*1.25E+00*	*4.51E+00*	*460.07*	*9.19E-02*	*3.49E-01*
Drill Rigs	*NONROAD Default*	Diesel	1.2	2270002033	4.12E-02	1.48E-01	5.47E-01	62.90	1.27E-02	3.29E-02
Impact Piling Rigs	*NONROAD Default*	Diesel	3	2270002033	*4.12E-02*	*1.48E-01*	*5.47E-01*	*62.90*	*1.27E-02*	*3.29E-02*
Loaders	140	Diesel	1	2270002060	1.96E-01	9.29E-01	2.35E+00	459.49	9.05E-02	2.51E-01
Generator	30	Diesel	2	2270006005	1.10E-01	4.39E-01	1.00E+00	119.95	2.48E-02	8.80E-02
Air Compressor	25	Diesel	6	2270006015	2.27E-04	1.17E-03	2.23E-03	0.29	6.30E-05	1.77E-04

NOTES:
Assume Dump Truck size/emissions same as Water Truck.
Assume Track Laying Machine uses 1 diesel locomotive and 1 front end loader engine (Harsco Rail, New Track Construction). Assume full-time locomotive used 4 hrs/day, 5 days/wk.
Horsepower and weight estimates based on capacity ratings and industry specifications, or average ratings per equipment type. Where hp could not be assumed, an average hp rate in NONROAD for the equipment type was used.

Emission Rates for Onsite Equipment (tpy)

	NO_x	**CO**	**VOC**	**SO_2**	**TSP**	**PM_{10}**	**$PM_{2.5}$**	**HAPS**	**CO2**	**CH4**	**N2O**	**CO2e**
Crane, 50 ton	1.30	0.33	0.10	0.05	0.10	0.08	0.08	0.002	241	0.0118	0.0006	241
Crane, 150 ton	2.00	0.42	0.15	0.08	0.13	0.10	0.10	0.002	403	0.0198	0.0010	404
Crane, 300 ton	1.44	0.37	0.08	0.04	0.07	0.06	0.06	0.002	215	0.0106	0.0005	216
Water Trucks	0.31	0.09	0.03	0.02	0.03	0.03	0.03	0.000	109	0.0053	0.0003	109
Dump Trucks	1.25	0.36	0.12	0.07	0.14	0.11	0.11	0.002	436	0.0214	0.0011	437
Dozers	0.82	0.34	0.07	0.04	0.10	0.08	0.08	0.002	182	0.0089	0.0004	182
Excavators	7.30	2.48	0.63	0.36	0.72	0.60	0.60	0.012	1955	0.0960	0.0047	1958
Rollers	1.95	0.64	0.16	0.08	0.17	0.14	0.14	0.003	415	0.0204	0.0010	415
Graders	1.13	0.47	0.10	0.05	0.14	0.11	0.11	0.002	256	0.0126	0.0006	256
Compactors	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.000	1	0.0000	0.0000	1
Track Laying Machine	0.75	0.21	0.05	0.02	0.06	0.05	0.05	0.001	77	0.0038	0.0002	77
Drill Rigs	0.64	0.17	0.05	0.01	0.04	0.03	0.03	0.001	73	0.0036	0.0002	74
Impact Piling Rigs	1.64	0.44	0.12	0.04	0.10	0.08	0.08	0.002	189	0.0093	0.0005	189
Loaders	2.35	0.93	0.20	0.09	0.25	0.21	0.21	0.005	459	0.0226	0.0011	460
Generator	2.01	0.88	0.22	0.05	0.18	0.14	0.14	0.004	240	0.0118	0.0006	240
Air Compressor	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.000	2	0.0001	0.0000	2
Total Onsite Construction Equipment (tpy)	24.9	8.1	2.09	0.99	2.23	1.83	1.83	0.04	5252	0.26	0.01	5263

Note:
For PM_{10}, $PM_{2.5}$, HAPs, and GHGs (CH_4 and N_2O), use same emission ratio as emission factor ratios for Large Diesel Engines (below): P_{10} and $PM_{2.5}$ ratio to TSP; HAPs ratio to CO, and; GHGs ratio to C_2.

BARGE EMISSIONS

Barges for Construction: 2 (Maximum # Units per year))
Engine Size (propulsion): 3500 hp
Total Barge Engines: 7000 hp
Barge Positioning Time: 1 hrs/ship (in-out) (Conservative estimate)
Total Power per "Trip": 7,000 hp-hrs

Construction Trips: 1 per day
260 per year
Annual Power: 1,820,000 hp-hrs/yr
Annual Diesel Fuel Use: 12,740 MMBtu/yr
93,248 gallons/yr

Emission Factors for Barges

lb/MMBtu, fuel input

	NO_x	**CO**	**VOC**	**SO_2**	**TSP**	**PM_{10}**	**$PM_{2.5}$**	**HAPS**	**CO2**	**CH4**	**N2O**	**CO2e**
Large Diesel Engines	3.20	0.85	0.08	0.002	0.07	0.06	0.06	0.004	165	0.0081	0.0004	165

Source:

Emission factors from: *EPA AP-42, Section 3.4 Large Stationary Diesel and All Stationary Duel-fuel Engines* (10/96). Assume Sulfur content of 0.0015% by weight (15 ppm). Assume TSP to PM10 ratio from Table 3.4-2, and PM2.5=PM10. Sum of HAPs factors from Table 3.4-3 and 3.4-4.

Global Warming Potentials (GWPs): CO_2 - 1
CH_4 - 25
N_2O - 298

Emission Rates for Barges (tpy)

	NO_x	**CO**	**VOC**	**SO_2**	**TSP**	**PM_{10}**	**$PM_{2.5}$**	**HAPS**	**CO2**	**CH4**	**N2O**	**CO2e**
Construction - Barges	20.4	5.41	0.52	0.01	0.44	0.37	0.37	0.03	1051	0.05	0.003	1053

FUGITIVE DUST EMISSIONS

Methodology based on EPA AP-42 Chapter 13.2.3 Heavy Construction Operations

Assumed acreage for groundwork: 100 acres
Assumed schedule for groundwork: 1 year
12 months

Annual Groundwork Operations: 8.33 acres/month

AP-42 Emission Factor: 1.2 tons PM/acre/month

Uncontrolled PM Emissions: 10.0 tons

Controlled Emissions (assume watering only; no factor included for natural control from precipitation):
Control %: 90 *WRAP Fugitive Dust Handbook, Table 9-4, Watering.*

PM_{10} and $PM_{2.5}$ Fractions of Total PM
(CARB Appendix A CEIDARS $PM_{2.5}$ and PM_{10} fractions of TSP; Fugitive Dust - Construction and Demolition
(http://www.aqmd.gov/docs/default-source/ceqa/handbook/localized-significance-thresholds/particulate-matter-(pm)-2.5-significance-thresholds-and-calculation-methodology/appendix-a-updated-ceidars-table-with-pm2-5-fractions.doc?sfvrsn=2)

PM_{10} Fraction of Total PM: 0.489
$PM_{2.5}$ Fraction of Total PM: 0.102

Emission Rates for Fugitive Dust (tpy)

	NO_x	**CO**	**VOC**	**SO_2**	**TSP**	**PM_{10}**	**$PM_{2.5}$**	**HAPS**	**CO2**	**CH4**	**N2O**	**CO2e**
Construction - Fugitive Dust	-	-	-	-	1.00	0.49	0.10	-	-	-	-	-

APPENDIX B
CONSTRUCTION - 'NONROAD' MODEL EMISSIONS

EPA`s NONROAD Emissions Model
Core Model ver 2008a, 07/06/09
Jul 25 11:58:30: 2014
MBTL
2014
Options file used: C:\NONROAD\Projects\MBTL.OPT
Total for year: 2014
Tons/Year

Cnty	Sub	SCC	HP	Population	THC-Exhaust	CO-Exhaust	NOx-Exhaust
####		#########	40	1.70E-03	1.53E-05	5.51E-04	4.18E-05
####		#########	75	6.63E-02	1.04E-03	3.81E-02	2.83E-03
####		#########	100	3.06E-02	8.13E-04	2.98E-02	2.22E-03
####		#########	175	1.19E-01	3.66E-03	1.34E-01	9.98E-03
####		#########	300	1.70E-03	1.14E-04	4.20E-03	3.12E-04
####		#########	40	3.32E-02	5.20E-05	1.84E-03	2.95E-04
####		#########	50	0.00E+00	0.00E+00	0.00E+00	0.00E+00
####		#########	75	2.23E-01	3.06E-03	8.60E-02	1.35E-02
####		#########	100	1.33E-03	2.21E-05	6.22E-04	9.74E-05
####		#########	175	2.65E-02	6.26E-04	1.76E-02	2.76E-03
####		#########	6	3.82E+00	2.92E-03	1.94E-02	2.14E-02
####		#########	11	1.71E+00	2.26E-03	1.50E-02	1.66E-02
####		#########	16	1.04E+00	1.87E-03	8.73E-03	1.63E-02
####		#########	25	9.57E-02	2.47E-04	1.15E-03	2.15E-03
####		#########	6	4.11E-01	6.24E-04	5.13E-03	4.78E-03
####		#########	11	7.72E-01	1.87E-03	1.54E-02	1.43E-02
####		#########	16	9.24E-01	2.79E-03	1.51E-02	2.76E-02
####		#########	25	1.66E+00	7.28E-03	3.95E-02	7.19E-02
####		#########	40	2.37E+00	8.94E-03	4.83E-02	1.58E-01
####		#########	50	2.19E+00	1.17E-02	6.31E-02	2.06E-01
####		#########	75	2.22E+00	1.88E-02	1.78E-01	2.48E-01
####		#########	100	6.07E+00	7.16E-02	7.40E-01	8.22E-01
####		#########	175	5.63E+00	8.40E-02	3.99E-01	1.01E+00
####		#########	300	1.92E+00	4.20E-02	1.70E-01	5.19E-01
####		#########	600	5.70E-01	2.34E-02	1.59E-01	3.93E-01
####		#########	11	1.78E-02	2.15E-05	1.41E-04	1.57E-04
####		#########	16	2.73E-02	4.94E-05	2.28E-04	4.24E-04
####		#########	25	6.15E-02	1.80E-04	8.32E-04	1.54E-03
####		#########	40	1.05E+00	2.69E-03	1.22E-02	3.37E-02
####		#########	50	1.07E+00	3.91E-03	1.78E-02	4.89E-02
####		#########	75	1.73E+00	1.23E-02	6.46E-02	1.23E-01
####		#########	100	1.76E+00	1.71E-02	8.67E-02	1.63E-01
####		#########	175	2.58E+00	2.85E-02	1.07E-01	3.64E-01
####		#########	300	2.25E+00	4.12E-02	1.48E-01	5.47E-01
####		#########	600	1.29E+00	4.05E-02	1.88E-01	6.15E-01
####		#########	750	3.03E-01	1.42E-02	7.74E-02	2.22E-01
####		#########	1000	1.65E-01	1.39E-02	5.50E-02	1.93E-01

####	#########	1200	2.73E-03	2.78E-04	1.10E-03	3.85E-03
####	#########	2000	5.47E-03	7.93E-04	3.14E-03	1.10E-02
####	#########	6	2.05E-02	4.89E-05	3.97E-04	3.77E-04
####	#########	11	1.13E-01	3.59E-04	2.91E-03	2.77E-03
####	#########	16	2.34E-01	9.77E-04	5.20E-03	9.73E-03
####	#########	25	1.04E+00	7.14E-03	3.80E-02	7.11E-02
####	#########	40	2.16E+00	1.08E-02	5.30E-02	2.00E-01
####	#########	50	1.15E+00	8.01E-03	3.92E-02	1.47E-01
####	#########	75	8.92E-01	8.53E-03	8.81E-02	1.30E-01
####	#########	100	4.03E+00	5.70E-02	6.74E-01	7.03E-01
####	#########	175	1.50E+01	2.76E-01	1.39E+00	3.22E+00
####	#########	300	1.10E+01	3.15E-01	1.24E+00	3.65E+00
####	#########	600	2.91E+00	1.39E-01	8.58E-01	2.18E+00
####	#########	750	9.29E-02	7.56E-03	7.04E-02	1.22E-01
####	#########	1000	1.08E-01	1.83E-02	9.27E-02	2.72E-01
####	#########	1200	4.10E-03	9.42E-04	4.78E-03	1.40E-02
####	#########	2000	4.10E-02	1.39E-02	7.04E-02	2.07E-01
####	#########	3000	1.37E-03	6.15E-04	3.12E-03	9.16E-03
####	#########	25	0.00E+00	0.00E+00	0.00E+00	0.00E+00
####	#########	40	1.72E-01	7.55E-04	3.82E-03	1.33E-02
####	#########	50	2.73E-03	1.27E-05	6.42E-05	2.24E-04
####	#########	75	9.16E-02	7.91E-04	5.87E-03	1.07E-02
####	#########	100	8.85E-01	1.04E-02	7.08E-02	1.24E-01
####	#########	175	3.33E+00	5.15E-02	1.65E-01	6.50E-01
####	#########	300	3.41E+00	7.69E-02	2.12E-01	9.99E-01
####	#########	600	2.10E+00	8.22E-02	3.69E-01	1.44E+00
####	#########	750	9.02E-02	5.44E-03	3.35E-02	1.01E-01
####	#########	1000	2.60E-02	3.56E-03	1.27E-02	5.47E-02
####	#########	1200	1.37E-03	2.27E-04	8.08E-04	3.49E-03
####	#########	40	0.00E+00	0.00E+00	0.00E+00	0.00E+00
####	#########	50	5.47E-03	3.69E-05	1.88E-04	6.67E-04
####	#########	75	3.96E-02	3.54E-04	3.56E-03	5.14E-03
####	#########	100	3.03E-01	3.80E-03	4.30E-02	4.59E-02
####	#########	175	3.10E+00	5.49E-02	2.71E-01	6.48E-01
####	#########	300	5.19E+00	1.36E-01	5.51E-01	1.62E+00
####	#########	600	5.93E-01	2.19E-02	1.40E-01	3.57E-01
####	#########	750	3.55E-02	2.78E-03	2.63E-02	4.68E-02
####	#########	175	8.20E-03	2.28E-04	1.04E-03	2.45E-03
####	#########	300	7.79E-01	3.06E-02	9.01E-02	3.12E-01
####	#########	600	1.65E+00	1.13E-01	5.80E-01	1.45E+00
####	#########	750	9.35E-01	1.04E-01	8.34E-01	1.35E+00
####	#########	1000	4.54E-01	1.03E-01	5.26E-01	1.41E+00
####	#########	1200	1.43E-01	4.34E-02	2.21E-01	5.93E-01
####	#########	2000	7.27E-01	3.41E-01	1.73E+00	4.66E+00
####	#########	3000	1.78E-01	1.13E-01	5.75E-01	1.54E+00
####	#########	16	5.47E-03	1.44E-05	7.92E-05	1.42E-04
####	#########	25	6.15E-02	2.70E-04	1.48E-03	2.65E-03
####	#########	40	1.42E+00	4.98E-03	2.78E-02	8.61E-02
####	#########	50	1.58E+00	7.50E-03	4.18E-02	1.29E-01

####	#########	75	3.14E+00	2.62E-02	2.34E-01	3.24E-01
####	#########	100	1.80E+01	2.08E-01	2.01E+00	2.28E+00
####	#########	175	9.23E+00	1.23E-01	5.82E-01	1.49E+00
####	#########	300	4.78E-01	1.04E-02	4.25E-02	1.30E-01
####	#########	600	6.30E-01	2.12E-02	1.47E-01	3.40E-01
####	#########	11	0.00E+00	0.00E+00	0.00E+00	0.00E+00
####	#########	16	0.00E+00	0.00E+00	0.00E+00	0.00E+00
####	#########	25	1.37E-02	6.97E-05	3.78E-04	6.88E-04
####	#########	40	7.20E-01	2.88E-03	1.56E-02	5.08E-02
####	#########	50	8.27E-01	4.37E-03	2.36E-02	7.72E-02
####	#########	75	1.17E+00	1.01E-02	9.51E-02	1.33E-01
####	#########	100	5.02E+00	5.98E-02	6.18E-01	6.86E-01
####	#########	175	1.27E+01	1.96E-01	9.29E-01	2.35E+00
####	#########	300	1.21E+01	2.81E-01	1.14E+00	3.47E+00
####	#########	600	8.90E+00	3.63E-01	2.47E+00	6.14E+00
####	#########	750	6.72E-01	4.28E-02	4.07E-01	7.67E-01
####	#########	1000	3.28E-01	4.54E-02	2.40E-01	6.64E-01
####	#########	1200	6.83E-02	1.18E-02	6.25E-02	1.73E-01
####	#########	2000	4.02E-01	1.20E-01	6.34E-01	1.75E+00
####	#########	3000	1.50E-02	5.38E-03	2.85E-02	7.88E-02
####	#########	40	0.00E+00	0.00E+00	0.00E+00	0.00E+00
####	#########	50	0.00E+00	0.00E+00	0.00E+00	0.00E+00
####	#########	75	1.52E-01	1.30E-03	1.30E-02	1.87E-02
####	#########	100	4.35E+00	5.62E-02	6.31E-01	6.77E-01
####	#########	175	9.84E+00	1.66E-01	8.15E-01	1.96E+00
####	#########	300	8.52E+00	2.23E-01	9.06E-01	2.67E+00
####	#########	600	4.31E+00	1.96E-01	1.26E+00	3.19E+00
####	#########	750	1.70E+00	1.23E-01	1.17E+00	2.09E+00
####	#########	1000	3.53E-01	5.68E-02	2.90E-01	8.52E-01
####	#########	1200	6.12E-01	1.14E-01	5.81E-01	1.71E+00
####	#########	2000	2.73E-03	7.03E-04	3.58E-03	1.05E-02
####	#########	6	1.90E+01	1.32E-02	7.54E-02	9.35E-02
####	#########	11	1.89E+01	2.07E-02	1.18E-01	1.47E-01
####	#########	16	1.46E+01	2.30E-02	9.59E-02	1.70E-01
####	#########	25	2.30E+01	5.70E-02	2.37E-01	4.20E-01
####	#########	40	3.80E+01	1.10E-01	4.39E-01	1.00E+00
####	#########	50	5.20E+00	2.03E-02	8.10E-02	1.85E-01
####	#########	75	1.92E+01	9.86E-02	5.03E-01	9.35E-01
####	#########	100	2.33E+01	1.72E-01	8.48E-01	1.55E+00
####	#########	175	7.96E+00	6.81E-02	2.53E-01	8.19E-01
####	#########	300	4.43E+00	6.13E-02	2.17E-01	7.61E-01
####	#########	600	2.30E+00	4.83E-02	2.15E-01	6.95E-01
####	#########	750	0.00E+00	0.00E+00	0.00E+00	0.00E+00
####	#########	1000	0.00E+00	0.00E+00	0.00E+00	0.00E+00
####	#########	1200	0.00E+00	0.00E+00	0.00E+00	0.00E+00
####	#########	2000	0.00E+00	0.00E+00	0.00E+00	0.00E+00
####	#########	3000	0.00E+00	0.00E+00	0.00E+00	0.00E+00
####	#########	6	1.11E-01	1.36E-04	1.06E-03	1.05E-03
####	#########	11	2.71E-01	5.68E-04	4.42E-03	4.35E-03

####	#########	16	3.69E-02	8.67E-05	4.49E-04	8.54E-04
####	#########	25	5.68E-02	2.27E-04	1.17E-03	2.23E-03
####	#########	40	2.09E+00	6.72E-03	3.45E-02	1.16E-01
####	#########	50	1.44E+00	6.14E-03	3.15E-02	1.06E-01
####	#########	75	9.25E+00	7.19E-02	4.81E-01	9.03E-01
####	#########	100	1.20E+01	1.28E-01	7.97E-01	1.45E+00
####	#########	175	1.38E+00	1.73E-02	5.52E-02	2.25E-01
####	#########	300	1.24E+00	2.61E-02	7.35E-02	3.54E-01
####	#########	600	3.55E-01	1.43E-02	6.63E-02	2.31E-01
####	#########	750	0.00E+00	0.00E+00	0.00E+00	0.00E+00

CO2-Exhaust	SO2-Exhaust	PM-Exhaust	Crankcase	Hot-Soaks	Diurnal	Displacement
2.96E-02	6.10E-06	3.06E-06	0.00E+00	1.67E-07	7.96E-07	1.12E-05
1.92E+00	3.95E-04	1.96E-04	0.00E+00	6.50E-06	8.20E-05	7.25E-04
1.50E+00	3.09E-04	1.53E-04	0.00E+00	3.00E-06	3.79E-05	5.67E-04
6.76E+00	1.39E-03	6.90E-04	0.00E+00	1.17E-05	2.43E-04	2.55E-03
2.11E-01	4.36E-05	2.16E-05	0.00E+00	1.67E-07	7.61E-06	7.99E-05
1.52E-01	2.95E-06	1.60E-05	6.96E-07	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2.40E+00	4.67E-05	2.42E-04	5.99E-04	0.00E+00	0.00E+00	0.00E+00
1.74E-02	3.38E-07	1.75E-06	4.33E-06	0.00E+00	0.00E+00	0.00E+00
4.92E-01	9.56E-06	4.94E-05	1.23E-04	0.00E+00	0.00E+00	0.00E+00
2.54E+00	5.47E-04	2.21E-03	3.10E-05	0.00E+00	0.00E+00	0.00E+00
1.97E+00	4.24E-04	1.71E-03	2.40E-05	0.00E+00	0.00E+00	0.00E+00
1.99E+00	4.28E-04	1.35E-03	2.03E-05	0.00E+00	0.00E+00	0.00E+00
2.63E-01	5.65E-05	1.78E-04	2.68E-06	0.00E+00	0.00E+00	0.00E+00
6.57E-01	1.41E-04	4.31E-04	9.20E-07	0.00E+00	0.00E+00	0.00E+00
1.97E+00	4.24E-04	1.29E-03	2.76E-06	0.00E+00	0.00E+00	0.00E+00
3.68E+00	7.91E-04	2.26E-03	4.08E-06	0.00E+00	0.00E+00	0.00E+00
9.60E+00	2.06E-03	5.88E-03	1.06E-05	0.00E+00	0.00E+00	0.00E+00
2.26E+01	4.40E-03	9.69E-03	1.54E-05	0.00E+00	0.00E+00	0.00E+00
2.95E+01	5.74E-03	1.26E-02	2.01E-05	0.00E+00	0.00E+00	0.00E+00
3.97E+01	8.05E-03	2.30E-02	2.40E-04	0.00E+00	0.00E+00	0.00E+00
1.51E+02	2.98E-02	1.10E-01	1.24E-03	0.00E+00	0.00E+00	0.00E+00
1.97E+02	3.89E-02	1.08E-01	1.40E-03	0.00E+00	0.00E+00	0.00E+00
1.11E+02	2.12E-02	4.42E-02	6.31E-04	0.00E+00	0.00E+00	0.00E+00
6.35E+01	1.26E-02	2.72E-02	3.82E-04	0.00E+00	0.00E+00	0.00E+00
1.85E-02	3.97E-06	1.63E-05	2.37E-07	0.00E+00	0.00E+00	0.00E+00
5.15E-02	1.11E-05	3.53E-05	5.57E-07	0.00E+00	0.00E+00	0.00E+00
1.88E-01	4.04E-05	1.29E-04	2.03E-06	0.00E+00	0.00E+00	0.00E+00
4.29E+00	8.78E-04	2.61E-03	3.47E-05	0.00E+00	0.00E+00	0.00E+00
6.24E+00	1.28E-03	3.79E-03	5.05E-05	0.00E+00	0.00E+00	0.00E+00
1.39E+01	2.90E-03	1.19E-02	2.19E-04	0.00E+00	0.00E+00	0.00E+00
1.95E+01	4.00E-03	1.71E-02	3.29E-04	0.00E+00	0.00E+00	0.00E+00
3.99E+01	8.19E-03	2.41E-02	5.39E-04	0.00E+00	0.00E+00	0.00E+00
6.29E+01	1.27E-02	3.29E-02	7.60E-04	0.00E+00	0.00E+00	0.00E+00
6.77E+01	1.38E-02	3.33E-02	7.45E-04	0.00E+00	0.00E+00	0.00E+00
2.45E+01	4.98E-03	1.23E-02	2.60E-04	0.00E+00	0.00E+00	0.00E+00
1.68E+01	3.42E-03	9.71E-03	2.43E-04	0.00E+00	0.00E+00	0.00E+00

3.36E-01	6.82E-05	1.94E-04	4.86E-06	0.00E+00	0.00E+00	0.00E+00
9.59E-01	1.95E-04	5.54E-04	1.39E-05	0.00E+00	0.00E+00	0.00E+00
5.19E-02	1.12E-05	3.22E-05	8.72E-09	0.00E+00	0.00E+00	0.00E+00
3.81E-01	8.20E-05	2.37E-04	6.41E-08	0.00E+00	0.00E+00	0.00E+00
1.30E+00	2.79E-04	7.97E-04	1.73E-07	0.00E+00	0.00E+00	0.00E+00
9.47E+00	2.04E-03	5.83E-03	1.26E-06	0.00E+00	0.00E+00	0.00E+00
3.01E+01	5.62E-03	1.15E-02	2.53E-06	0.00E+00	0.00E+00	0.00E+00
2.23E+01	4.15E-03	8.47E-03	1.87E-06	0.00E+00	0.00E+00	0.00E+00
2.31E+01	4.59E-03	1.10E-02	6.66E-05	0.00E+00	0.00E+00	0.00E+00
1.56E+02	2.98E-02	1.06E-01	8.68E-04	0.00E+00	0.00E+00	0.00E+00
7.88E+02	1.50E-01	4.20E-01	3.99E-03	0.00E+00	0.00E+00	0.00E+00
9.77E+02	1.79E-01	3.62E-01	3.84E-03	0.00E+00	0.00E+00	0.00E+00
4.56E+02	8.75E-02	1.73E-01	1.95E-03	0.00E+00	0.00E+00	0.00E+00
2.55E+01	4.89E-03	9.85E-03	1.05E-04	0.00E+00	0.00E+00	0.00E+00
3.63E+01	6.98E-03	1.58E-02	2.22E-04	0.00E+00	0.00E+00	0.00E+00
1.87E+00	3.60E-04	8.15E-04	1.14E-05	0.00E+00	0.00E+00	0.00E+00
2.76E+01	5.30E-03	1.20E-02	1.69E-04	0.00E+00	0.00E+00	0.00E+00
1.22E+00	2.35E-04	5.32E-04	7.47E-06	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1.88E+00	3.66E-04	7.96E-04	1.53E-06	0.00E+00	0.00E+00	0.00E+00
3.15E-02	6.15E-06	1.34E-05	2.57E-08	0.00E+00	0.00E+00	0.00E+00
1.62E+00	3.30E-04	8.59E-04	1.04E-05	0.00E+00	0.00E+00	0.00E+00
2.16E+01	4.27E-03	1.25E-02	1.80E-04	0.00E+00	0.00E+00	0.00E+00
1.20E+02	2.38E-02	5.04E-02	8.61E-04	0.00E+00	0.00E+00	0.00E+00
2.02E+02	3.88E-02	6.33E-02	1.17E-03	0.00E+00	0.00E+00	0.00E+00
2.15E+02	4.28E-02	7.47E-02	1.36E-03	0.00E+00	0.00E+00	0.00E+00
1.50E+01	2.98E-03	5.42E-03	8.90E-05	0.00E+00	0.00E+00	0.00E+00
5.70E+00	1.13E-03	2.53E-03	5.50E-05	0.00E+00	0.00E+00	0.00E+00
3.64E-01	7.23E-05	1.62E-04	3.51E-06	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
9.84E-02	1.87E-05	3.90E-05	2.15E-08	0.00E+00	0.00E+00	0.00E+00
8.79E-01	1.76E-04	4.47E-04	3.46E-06	0.00E+00	0.00E+00	0.00E+00
9.52E+00	1.84E-03	6.55E-03	6.11E-05	0.00E+00	0.00E+00	0.00E+00
1.46E+02	2.83E-02	7.85E-02	8.43E-04	0.00E+00	0.00E+00	0.00E+00
4.02E+02	7.51E-02	1.54E-01	1.80E-03	0.00E+00	0.00E+00	0.00E+00
6.80E+01	1.32E-02	2.66E-02	3.27E-04	0.00E+00	0.00E+00	0.00E+00
8.94E+00	1.74E-03	3.57E-03	4.09E-05	0.00E+00	0.00E+00	0.00E+00
7.53E-01	1.36E-04	3.56E-04	2.48E-06	0.00E+00	0.00E+00	0.00E+00
1.09E+02	1.86E-02	3.49E-02	2.22E-04	0.00E+00	0.00E+00	0.00E+00
3.97E+02	7.29E-02	1.44E-01	1.25E-03	0.00E+00	0.00E+00	0.00E+00
3.68E+02	6.76E-02	1.34E-01	1.15E-03	0.00E+00	0.00E+00	0.00E+00
2.25E+02	4.13E-02	9.12E-02	8.40E-04	0.00E+00	0.00E+00	0.00E+00
9.46E+01	1.74E-02	3.83E-02	3.53E-04	0.00E+00	0.00E+00	0.00E+00
7.43E+02	1.36E-01	3.01E-01	2.77E-03	0.00E+00	0.00E+00	0.00E+00
2.46E+02	4.52E-02	9.97E-02	9.19E-04	0.00E+00	0.00E+00	0.00E+00
1.89E-02	4.06E-06	1.16E-05	3.31E-08	0.00E+00	0.00E+00	0.00E+00
3.53E-01	7.60E-05	2.18E-04	6.20E-07	0.00E+00	0.00E+00	0.00E+00
1.22E+01	2.39E-03	5.50E-03	1.35E-05	0.00E+00	0.00E+00	0.00E+00
1.83E+01	3.60E-03	8.27E-03	2.03E-05	0.00E+00	0.00E+00	0.00E+00

4.94E+01	1.01E-02	3.18E-02	3.70E-04	0.00E+00	0.00E+00	0.00E+00
3.94E+02	7.84E-02	3.05E-01	3.70E-03	0.00E+00	0.00E+00	0.00E+00
2.68E+02	5.34E-02	1.49E-01	2.11E-03	0.00E+00	0.00E+00	0.00E+00
2.53E+01	4.90E-03	1.05E-02	1.64E-04	0.00E+00	0.00E+00	0.00E+00
5.03E+01	1.01E-02	2.41E-02	3.62E-04	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
9.18E-02	1.98E-05	5.63E-05	1.00E-07	0.00E+00	0.00E+00	0.00E+00
7.30E+00	1.42E-03	3.12E-03	4.92E-06	0.00E+00	0.00E+00	0.00E+00
1.11E+01	2.15E-03	4.73E-03	7.46E-06	0.00E+00	0.00E+00	0.00E+00
2.12E+01	4.31E-03	1.23E-02	1.28E-04	0.00E+00	0.00E+00	0.00E+00
1.27E+02	2.49E-02	9.20E-02	1.03E-03	0.00E+00	0.00E+00	0.00E+00
4.59E+02	9.05E-02	2.51E-01	3.25E-03	0.00E+00	0.00E+00	0.00E+00
7.40E+02	1.42E-01	2.96E-01	4.22E-03	0.00E+00	0.00E+00	0.00E+00
9.91E+02	1.96E-01	4.24E-01	5.92E-03	0.00E+00	0.00E+00	0.00E+00
1.24E+02	2.45E-02	5.47E-02	6.88E-04	0.00E+00	0.00E+00	0.00E+00
7.53E+01	1.49E-02	3.85E-02	6.86E-04	0.00E+00	0.00E+00	0.00E+00
1.96E+01	3.88E-03	1.00E-02	1.79E-04	0.00E+00	0.00E+00	0.00E+00
1.99E+02	3.94E-02	1.02E-01	1.81E-03	0.00E+00	0.00E+00	0.00E+00
8.94E+00	1.77E-03	4.57E-03	8.14E-05	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3.19E+00	6.39E-04	1.64E-03	1.31E-05	0.00E+00	0.00E+00	0.00E+00
1.39E+02	2.68E-02	9.57E-02	9.10E-04	0.00E+00	0.00E+00	0.00E+00
4.37E+02	8.46E-02	2.35E-01	2.57E-03	0.00E+00	0.00E+00	0.00E+00
6.55E+02	1.23E-01	2.51E-01	2.99E-03	0.00E+00	0.00E+00	0.00E+00
5.99E+02	1.17E-01	2.35E-01	2.95E-03	0.00E+00	0.00E+00	0.00E+00
3.93E+02	7.65E-02	1.58E-01	1.83E-03	0.00E+00	0.00E+00	0.00E+00
1.06E+02	2.07E-02	4.84E-02	7.67E-04	0.00E+00	0.00E+00	0.00E+00
2.13E+02	4.14E-02	9.70E-02	1.54E-03	0.00E+00	0.00E+00	0.00E+00
1.31E+00	2.56E-04	5.99E-04	9.49E-06	0.00E+00	0.00E+00	0.00E+00
9.55E+00	2.05E-03	1.01E-02	1.84E-04	0.00E+00	0.00E+00	0.00E+00
1.50E+01	3.23E-03	1.58E-02	2.89E-04	0.00E+00	0.00E+00	0.00E+00
1.86E+01	4.01E-03	1.58E-02	3.36E-04	0.00E+00	0.00E+00	0.00E+00
4.61E+01	9.91E-03	3.90E-02	8.31E-04	0.00E+00	0.00E+00	0.00E+00
1.20E+02	2.48E-02	8.80E-02	1.77E-03	0.00E+00	0.00E+00	0.00E+00
2.21E+01	4.58E-03	1.62E-02	3.27E-04	0.00E+00	0.00E+00	0.00E+00
1.08E+02	2.26E-02	8.99E-02	1.77E-03	0.00E+00	0.00E+00	0.00E+00
1.90E+02	3.91E-02	1.62E-01	3.31E-03	0.00E+00	0.00E+00	0.00E+00
9.17E+01	1.89E-02	5.46E-02	1.29E-03	0.00E+00	0.00E+00	0.00E+00
8.95E+01	1.81E-02	4.66E-02	1.14E-03	0.00E+00	0.00E+00	0.00E+00
8.19E+01	1.66E-02	3.70E-02	8.83E-04	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1.40E-01	3.01E-05	9.69E-05	4.97E-07	0.00E+00	0.00E+00	0.00E+00
5.84E-01	1.26E-04	4.03E-04	2.07E-06	0.00E+00	0.00E+00	0.00E+00

1.12E-01	2.41E-05	6.77E-05	3.09E-07	0.00E+00	0.00E+00	0.00E+00
2.93E-01	6.30E-05	1.77E-04	8.09E-07	0.00E+00	0.00E+00	0.00E+00
1.59E+01	3.15E-03	7.31E-03	2.83E-05	0.00E+00	0.00E+00	0.00E+00
1.46E+01	2.88E-03	6.69E-03	2.59E-05	0.00E+00	0.00E+00	0.00E+00
1.28E+02	2.62E-02	7.58E-02	1.06E-03	0.00E+00	0.00E+00	0.00E+00
2.30E+02	4.60E-02	1.46E-01	2.30E-03	0.00E+00	0.00E+00	0.00E+00
3.66E+01	7.31E-03	1.60E-02	3.01E-04	0.00E+00	0.00E+00	0.00E+00
6.18E+01	1.21E-02	2.09E-02	4.24E-04	0.00E+00	0.00E+00	0.00E+00
3.11E+01	6.23E-03	1.26E-02	2.49E-04	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Spillage	RunLoss	TankPerm	HosePerm	FuelCons.	Activity	LF
6.70E-07	3.74E-07	0.00E+00	0.00E+00	3.01E+00	1.41E+00	7.80E-01
2.20E-05	1.78E-05	0.00E+00	0.00E+00	1.95E+02	5.49E+01	7.80E-01
1.72E-05	8.23E-06	0.00E+00	0.00E+00	1.53E+02	2.53E+01	7.80E-01
4.69E-05	3.20E-05	0.00E+00	0.00E+00	6.88E+02	9.85E+01	7.80E-01
6.70E-07	4.57E-07	0.00E+00	0.00E+00	2.15E+01	1.41E+00	7.80E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.26E+01	1.37E+01	6.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.58E+02	9.20E+01	6.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.58E+00	5.48E-01	6.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.32E+01	1.10E+01	6.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.25E+02	1.85E+03	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E+02	8.26E+02	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.76E+02	5.02E+02	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.33E+01	4.63E+01	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.82E+01	3.13E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.75E+02	5.87E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.26E+02	7.02E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.49E+02	1.26E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E+03	1.80E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.61E+03	1.67E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.51E+03	1.69E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E+04	4.62E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.74E+04	4.28E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.78E+03	1.46E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.61E+03	4.33E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.64E+00	8.28E+00	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.56E+00	1.27E+01	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.66E+01	2.87E+01	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.80E+02	4.88E+02	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.52E+02	4.97E+02	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E+03	8.06E+02	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.72E+03	8.19E+02	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.53E+03	1.20E+03	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.57E+03	1.05E+03	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.99E+03	6.03E+02	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.17E+03	1.41E+02	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.49E+03	7.71E+01	4.30E-01

0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.97E+01	1.27E+00	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.49E+01	2.55E+00	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.60E+00	2.24E+01	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.38E+01	1.24E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E+02	2.55E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.39E+02	1.14E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.66E+03	2.35E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.97E+03	1.26E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.04E+03	9.74E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.38E+04	4.40E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.97E+04	1.64E+04	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.64E+04	1.20E+04	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.03E+04	3.18E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.25E+03	1.01E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.21E+03	1.18E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.66E+02	4.48E+00	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.44E+03	4.48E+01	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.08E+02	1.49E+00	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.66E+02	1.70E+02	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.79E+00	2.71E+00	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.43E+02	9.06E+01	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.91E+03	8.77E+02	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E+04	3.30E+03	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.78E+04	3.38E+03	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.90E+04	2.08E+03	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.33E+03	8.93E+01	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.04E+02	2.57E+01	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.22E+01	1.35E+00	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.70E+00	5.26E+00	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.77E+01	3.81E+01	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.41E+02	2.92E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.29E+04	2.98E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.56E+04	4.99E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.01E+03	5.71E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.90E+02	3.42E+01	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.66E+01	1.35E+01	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.63E+03	1.28E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.51E+04	2.71E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.25E+04	1.53E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.99E+04	7.44E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.37E+03	2.35E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.57E+04	1.19E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.18E+04	2.92E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.67E+00	3.62E+00	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.13E+01	4.07E+01	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.08E+03	9.42E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.62E+03	1.05E+03	5.90E-01

0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.37E+03	2.08E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.49E+04	1.19E+04	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.37E+04	6.11E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E+03	3.17E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.45E+03	4.17E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.13E+00	1.04E+01	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.45E+02	5.48E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.79E+02	6.29E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.88E+03	8.89E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.12E+04	3.82E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.06E+04	9.67E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.55E+04	9.23E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.76E+04	6.77E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.09E+04	5.12E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.67E+03	2.50E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.73E+03	5.20E+01	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.76E+04	3.06E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.91E+02	1.14E+01	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.82E+02	1.42E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E+04	4.07E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.86E+04	9.21E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.79E+04	7.97E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.29E+04	4.04E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.47E+04	1.59E+03	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.39E+03	3.30E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.88E+04	5.73E+02	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.16E+02	2.56E+00	5.90E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.47E+02	6.41E+03	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.33E+03	6.40E+03	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.65E+03	4.93E+03	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.09E+03	7.77E+03	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E+04	1.29E+04	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.96E+03	1.76E+03	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.60E+03	6.48E+03	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.68E+04	7.88E+03	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.12E+03	2.69E+03	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.92E+03	1.50E+03	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.24E+03	7.77E+02	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.24E+01	9.02E+01	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.17E+01	2.21E+02	4.30E-01

0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.91E+00	3.01E+01	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.59E+01	4.63E+01	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.41E+03	1.70E+03	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.29E+03	1.18E+03	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.13E+04	7.54E+03	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.03E+04	9.82E+03	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.23E+03	1.13E+03	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.47E+03	1.01E+03	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.75E+03	2.89E+02	4.30E-01
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

HPAvg
3.50E+01
5.82E+01
9.86E+01
1.14E+02
2.50E+02
2.90E+01
0.00E+00
6.59E+01
8.00E+01
1.13E+02
4.94E+00
8.55E+00
1.42E+01
2.04E+01
5.44E+00
8.69E+00
1.36E+01
1.97E+01
3.25E+01
4.58E+01
6.07E+01
8.48E+01
1.32E+02
2.17E+02
4.21E+02
8.00E+00
1.45E+01
2.35E+01
3.15E+01
4.49E+01
6.18E+01
8.51E+01
1.32E+02
2.39E+02
4.47E+02
6.91E+02
8.69E+02

1.05E+03
1.50E+03
6.00E+00
7.97E+00
1.31E+01
2.15E+01
3.30E+01
4.58E+01
6.13E+01
9.17E+01
1.38E+02
2.33E+02
4.11E+02
7.19E+02
8.84E+02
1.20E+03
1.77E+03
2.35E+03
0.00E+00
3.94E+01
4.17E+01
6.40E+01
8.81E+01
1.45E+02
2.38E+02
4.12E+02
6.69E+02
8.83E+02
1.07E+03
0.00E+00
4.83E+01
5.95E+01
8.42E+01
1.41E+02
2.31E+02
3.42E+02
7.50E+02
1.61E+02
2.44E+02
4.20E+02
6.88E+02
8.68E+02
1.15E+03
1.79E+03
2.42E+03
1.35E+01
2.25E+01
3.34E+01
4.51E+01

6.14E+01
8.56E+01
1.26E+02
2.29E+02
3.46E+02
0.00E+00
0.00E+00
2.28E+01
3.44E+01
4.54E+01
6.17E+01
8.55E+01
1.36E+02
2.30E+02
4.19E+02
6.92E+02
8.66E+02
1.08E+03
1.87E+03
2.24E+03
0.00E+00
0.00E+00
5.80E+01
8.79E+01
1.36E+02
2.36E+02
4.25E+02
7.07E+02
9.23E+02
1.07E+03
1.47E+03
5.35E+00
8.42E+00
1.36E+01
2.13E+01
3.34E+01
4.52E+01
6.00E+01
8.64E+01
1.36E+02
2.38E+02
4.19E+02
0.00E+00
0.00E+00
0.00E+00
0.00E+00
0.00E+00
5.57E+00
9.47E+00

1.33E+01
2.27E+01
3.35E+01
4.43E+01
6.08E+01
8.39E+01
1.29E+02
2.43E+02
4.27E+02
0.00E+00

APPENDIX C
SUMMARY OF EMISSIONS

Based on:

1 metric tonne = 1.1023 ton (short ton)

Facility Material Handling System Rating

Materials Handling System/Train Unload:	7500	metric tonnes/hr	8267	tons/hr
Reclaim and Vessel Loading:	6500	metric tonnes/hr	7165	tons/hr

Projected Operation

Operating hours 355 days/yr (Facility closed 10 days/yr)

	Stage 1	Stage 2	
Coal Throughput	25	44	MM metric tons per year
	28	49	MM tpy
Unit Trains	5	8	trains/day
Cars per Unit Train	125	125	cars/train
Coal per Car	100	100	tons/car
Onsite Tracks	5	8	number of tracks
Ships	328	614	ships/yr

	STAGE 1 Pollutant Emissions (tpy)								
Source	**NO_x**	**CO**	**VOC**	**SO_2**	**TSP**	**PM_{10}**	**$PM_{2.5}$**	**HAPS**	**CO2e**
FUGITIVE SOURCES									
Coal Transfer (except piles):									
Material Handling	-	-	-	-	0.52	0.18	0.03	-	-
Coal Piles:									
Wind Erosion	-	-	-	-	0.54	0.46	0.07	-	-
Material Handling	-	-	-	-	1.49	0.52	0.08	-	-
MOBILE SOURCES									
Maintenance/Operations Equipment:									
Combustion	3.92	1.29	0.32	0.16	0.34	0.28	0.28	0.01	869
Trains:									
Combustion (Off-site)	6.94	1.03	0.39	0.004	0.31	0.26	0.25	0.01	397
Fugitive (Off-site)	-	-	-	-	0.40	0.34	0.05	-	-
Combustion (On-site)	2.41	0.36	0.13	0.002	0.11	0.09	0.09	0.004	138
Fugitive (On-site)	-	-	-	-	0.48	0.41	0.06	-	-
Ships:									
Combustion (Off-site)	204	54	5.22	0.10	4.45	3.66	3.66	0.27	10,526
Combustion (On-site)	26	7.01	0.68	0.01	0.58	0.47	0.47	0.04	1,364
Total - All Sources, Onsite and Offsite	244	64	6.74	0.28	9.22	6.67	5.04	0.33	13,294
Total - Onsite Sources	33	8.66	1.13	0.18	4.06	2.42	1.08	0.05	2,371
Fugitives Only	-	-	-	-	3.04	1.58	0.24	-	-
Facility Equipment Only	3.92	1.29	0.32	0.16	2.89	1.44	0.46	0.01	869
Non-Mobile Sources Only	-	-	-	-	2.55	1.16	0.18	-	-

	STAGE 2 Pollutant Emissions (tpy)								
Source	**NO_x**	**CO**	**VOC**	**SO_2**	**TSP**	**PM_{10}**	**$PM_{2.5}$**	**HAPS**	**CO2e**
FUGITIVE SOURCES									
Coal Transfer (except piles):									
Material Handling	-	-	-	-	1.05	0.37	0.06	-	-
Coal Piles:									
Wind Erosion	-	-	-	-	1.08	0.92	0.14	-	-
Material Handling	-	-	-	-	2.62	0.92	0.14	-	-
MOBILE SOURCES									
Maintenance/Operations Equipment:									
Combustion	4.36	1.42	0.36	0.19	0.38	0.31	0.31	0.01	996
Trains:									
Combustion (Off-site)	12.2	1.82	0.68	0.01	0.55	0.45	0.44	0.02	699
Fugitive (Off-site)	-	-	-	-	0.70	0.59	0.09	-	-
Combustion (On-site)	4.68	0.70	0.26	0.003	0.21	0.17	0.17	0.01	268
Fugitive (On-site)	-	-	-	-	0.91	0.78	0.12	-	-
Ships:									
Combustion (Off-site)	366	97	9.37	0.17	7.98	6.56	6.56	0.49	18,881
Combustion (On-site)	49	13	1.27	0.02	1.08	0.89	0.89	0.07	2,554
Total - All Sources, Onsite and Offsite	437	114	12	0.39	17	12	8.91	0.59	23,397
Total - Onsite Sources	58	15	1.88	0.21	7.34	4.36	1.82	0.08	3,817
Fugitives Only	-	-	-	-	5.67	2.98	0.45	-	-
Facility Equipment Only	4.36	1.42	0.36	0.19	5.14	2.52	0.65	0.01	996
Non-Mobile Sources Only	-	-	-	-	4.76	2.21	0.34	-	-

Washington State Emissions in tons per year
2011 Emissions Inventory for Cowlitz County

Select Sources (full summary in separate worksheet)	**NO_x**	**CO**	**VOC**	**SO_2**	**TSP**	**PM_{10}**	**$PM_{2.5}$**	**HAPS**	**CO2e**	**DPM**
Point Sources	3,616	2,507	671	791	-	182	172	-	-	-
Non-Road Mobile (Land-based, non-locomotive)	389	3,718	592	1	-	48	46	-	-	24
Railroad	789	137	43	6	-	23	23	-	-	23
Ships (commercial marine vessels)	1,109	150	46	199	-	37	34	-	-	34
Total All Source Categories	10,382	36,142	16,919	1,020	-	1,872	971	-	-	164

APPENDIX D
PILE INFORMATION

Bulk Density of Coal:	817	kg/m3	min	(PRB coal; source Description of Facilites, September 2011)
	929	kg/m3	max	

Pile Dimensions:

	average L (ft)	Sfc W (ft)	Sfc Acres	Peak H (ft)	Mean H (ft)
Pile 1	2350	233	12.57	85	25
Pile 2	2350	233	12.57	85	25
Pile 3	2350	233	12.57	85	25
Pile 4	2350	233	12.57	85	25

From Millennium Coal Export Terminal, Applicant's Purpose and Need Description, Dec 2013

Coal pads vary between 2200 to 2500 ft in length

85 approximate coal stack height

	metric tonne	ton	
Pile 1	367,000	404,548	*(Stage 1 and 2)*
Pile 2	394,000	434,311	*(Stage 1 and 2)*
Pile 3	375,000	413,367	*(Stage 2 Only)*
Pile 4	368,000	405,651	*(Stage 2 Only)*

1,504,000 metric tonnes, total storage capacity

	Stage 1	Stage 2	
Annual Coal Throughput:	27,557,783	48,501,697	tpy
Average Pile Turnovers/yr	33	29	

Pile Throughput:

Pile 1	13,290,021	11,835,188	tpy
Pile 2	14,267,761	12,705,897	tpy
Pile 3	--	12,093,176	tpy
Pile 4	--	11,867,437	tpy

APPENDIX E
PILE - WIND EROSION

(Methodology from AP-24, Section 13.2.5 and WRAP Fugitive Dust Handbook, Section 9.3)
Industrial Wind Erosion

Wind Erosion (emissions from pile activity are covered in Materials Handling (MH) section)
(Equation based on Western Regional Air Partnership [WRAP] Fugitive Dust Handbook, Section 9.3)

$$E(lbTSP/acre/yr) = 1.7 * \frac{s}{1.5} * \frac{365*(365-p)}{235} * \frac{f}{15} * r$$

Where:

s=	2.2	Silt Content, weight %. *(Mean value from EPA AP-42, Section 13.2.4, Table 13.2.4-1, Coal-fired Power Plants (as received).)*
p=	175	Number of Days with >= 0.01 inches of precipitation per year. (NCDC Climate Summary for Longview, 1931-2006.)
f=	8.78	Percentage of Time that the unobstructed wind speed exceeds 12 mph at mean pile height. *(Calculated from Weyerhaeuser Mint Farm Met Station Data, 2001-2003 (wind speed monitor at 10 meter height; mean pile height (by exposed area) ~ 25 ft (7.6 m).)*
r=		Particulate Matter Size Ratios (WRAP Fugitive Dust Handbook, Section 9.3).
	1	TSP
	0.85	PM10
	0.13	PM2.5

Uncontrolled Emission Rates:

TSP	431	lb/acre/yr
PM10	366	lb/acre/yr
PM2.5	56	lb/acre/yr

Controlled Emissions:

Control %: 90 *WRAP Fugitive Dust Handbook, Table 9-4, Watering.*

Exposed Pile Area	Acres
Pile 1	12.57
Pile 2	12.57
Pile 3	12.57
Pile 4	12.57

	Stage 1	Stage 2	
Total Area	25.14	50.28	acres

Total Controlled Emissions:

Pollutant	Stage 1	Stage 2	
TSP	0.54	1.08	tpy
PM10	0.46	0.92	tpy
PM2.5	0.07	0.14	tpy

APPENDIX F
MATERIAL HANDLING

Transfer Operations (Pile Construction, Pile Removal)

(Methodology from AP-24, Section 13.2.4)
Aggregate Handling and Storage Piles

$$E\,(lb\ /\ ton\ ) = k * 0.0032 * \left\{ \frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \right\}$$

Where:

k=		Aerodynamic Particle Size Multiplier. *(EPA AP-42 Section 13.2.4.)*
	1	TSP
	0.35	PM10
	0.053	PM2.5
U=	5.04	Mean Wind Speed, mph. *(Calculated from Weyerhaeuser Mint Farm Met Station Data, 2001-2003 (wind speed monitor at 10 me*
M=	4.5	Material Moisture Content, percent. (Mean value from EPA AP-42, Section 13.2.4, Table 13.2.4-1, Coal-fired Power Plants (as received). This value fits range given in Description of Facilities, September 2011 (1-6% surface; 13-18% total).)

Uncontrolled Emission Rates:

TSP	1.04E-03	lb/ton
PM10	3.64E-04	lb/ton
PM2.5	5.51E-05	lb/ton

Controlled Emissions:

Control %:	90	*WRAP Fugitive Dust Handbook, Table 9-4, Watering.*
Natural Precipitation Mitigation Factor:	(365-P)/365	*EPA AP-42, Section 13.2.2*
P=	175	Number of Days with >= 0.01 inches of precipitation per year. *(NCDC Climate Summary for Longview, 1931-2006.*

	Stage 1	Stage 2	
Annual Coal Throughput:	27557783	48501697	tpy
Annual Coal Throughput x2 (pile construct and reclaim):	55115565	97003394	tpy

Total Controlled Emissions:			
Pollutant	Stage 1	Stage 2	
TSP	1.49	2.62	tpy
PM10	0.52	0.92	tpy
PM2.5	0.08	0.14	tpy

All Other Coal Handling Operations (Transfers, Conveyors)

All enclosed operations with dry fogging. Equipment is cleaned using a wet scraping technique; assumed cleaning particulate emissions are zero.

Uncontrolled Emission Rates (same methodology as above):

TSP	1.04E-03	lb/ton
PM10	3.64E-04	lb/ton
PM2.5	5.51E-05	lb/ton

Controlled Emissions:

Control %:	99	*Assumed control from full enclosure and any additional spray/fogging*
Natural Precipitation Mitigation Factor:	(365-P)/365	*EPA AP-42, Section 13.2.2*
P=	175	Number of Days with >= 0.01 inches of precipitation per year. (NCDC Climate Summary for Longview, 1931-2006.

	Stage 1	Stage 2	
Annual Coal Throughput:	27557783	48501697	tpy

Emission/Transfer Points:

Rail Dump	1	1
Transfer Tower 1	1	1
Transfer Towers 2-4	1	1
Transfer Towers 5-7	1	1
Surge Bin (WP9)	1	1
Surge Bin (WP10)	0	1
Transfer Tower 8	1	1
Conveyor to Ship	1	1

Total Controlled Emissions:			
Pollutant	Stage 1	Stage 2	
TSP	0.52	1.05	tpy
PM10	0.18	0.37	tpy
PM2.5	0.03	0.06	tpy

APPENDIX G
COAL CAR FUGITIVE EMISSIONS

(Methodology from AP-24, Section 13.2.5 and WRAP Fugitive Dust Handbook, Section 9.3)
Industrial Wind Erosion

Wind-related losses from Train Transport of Open Coal Cars
(Equation based on WRAP Fugitive Dust Handbook, Section 9.3))

$$E(lbTSP/acre/yr) = 1.7 * \frac{s}{1.5} * \frac{365*(365-p)}{235} * \frac{f}{15} * r$$

Where:

s=	2.2	Silt Content, weight %. *(Mean value from EPA AP-42, Section 13.2.4, Table 13.2.4-1, Coal-fired Power Plants (as received).)*
p=	175	Number of Days with >= 0.01 inches of precipitation per year. *(Calculated from Weyerhaeuser Mint Farm Met Station Data, 2001-2003. (Note: AP-42 Figure 13.2.2-1 shows 180 days, and NCDC Climate data indicates ~ 177*
f (moving train)=	100	Percentage of Time that the unobstructed wind speed exceeds 12 mph at mean pile height. *(Assumed 100% of time for moving train.)*
f (sitting train)=	8.78	Percentage of Time that the unobstructed wind speed exceeds 12 mph at mean 'pile' height. *(Calculated from Weyerhaeuser Mint Farm Met Station Data, 2001-2003 (wind speed monitor at 10 meter height; train car height with coal load = ~15 ft (4.6 m).)*
r=		Particulate Matter Size Ratios (WRAP Fugitive Dust Handbook, Section 9.3).
	1	TSP
	0.85	PM10
	0.13	PM2.5

Uncontrolled Emission Rates for Moving Trains:

TSP	4905	lb/acre/yr
PM10	4170	lb/acre/yr
PM2.5	638	lb/acre/yr

Uncontrolled Emission Rates for Sitting Trains:

TSP	431	lb/acre/yr
PM10	366	lb/acre/yr
PM2.5	56	lb/acre/yr

Train car exposed surface area:	518	ft2
Area/coal amount (by 1 car):	5.18	ft2/ton coal

	Stage 1	Stage 2	
Annual Coal Throughput:	27557783	48501697	tpy
Coal/car:	100	100	tons
Cars/train:	125	125	cars
Total Exposed Area:	3274	5763	acres

Off-site	Stage 1	Stage 2	
Distance from main rail line to site:	8.09	8.09	miles
Time Moving Car Exposed:	0.43	0.43	hrs

Offsite Emissions:

Pollutant	Stage 1	Stage 2	
TSP	0.40	0.70	tpy
PM10	0.34	0.59	tpy
PM2.5	0.05	0.09	tpy

On-site	Stage 1	Stage 2		
Onsite loop distance:	1.50	1.65	miles	
Dumper facility loop:	13236	13236	ft	(HDR Engineering track figures, 10/28/11)
	2.51	2.51	miles	
Total onsite distance for transport:	4.01	4.16	miles	Includes only loaded travel; assumes full cars for complete staging loop
Train Speed:	10	10	mph	
Time Moving Car Exposed:	0.40	0.42	hrs	and dump loop distances.
Waiting Time:	0.40	0.42	hrs	Conservative estimate for time waiting to unload.
Unloading Time:	2.10	2.60	hrs	*Millennium Bulk Terminals DRAFT Rail Plan* , HDR, November 15, 2011.
Time Sitting Car Exposed:	1.45	1.72	hrs	Assume time of exposure during unloading is only 1/2 of total unloading time.

Onsite Emissions:

Pollutant	Stage 1	Stage 2	
TSP	0.48	0.91	tpy
PM10	0.41	0.78	tpy
PM2.5	0.06	0.12	tpy

APPENDIX H
LOCOMOTIVE EMISSIONS

	Stage 1	Stage 2		
Coal Throughput	27557783	48501697	tons/yr	
Coal/car	100	100	tons	
Unit Trains (cars/train)	125	125	cars	
Unit Trains Required	2205	3880	Trains/yr	
	4	4	Locomotives/Train (full)	*Millennium Bulk Terminals DRAFT Rail Plan*, HDR, November 15, 2011.
	3	3	Locomotives/Train (empty)	*Millennium Bulk Terminals DRAFT Rail Plan*, HDR, November 15, 2011.
	7200	8500	ft train length	*from Longview Switching Company Line Capacity Analysis to Accommodate MBTL trains, HDR, Tech Memo Jan 2012*
Engine Size:		4400	hp/locomotive	*Millennium Bulk Terminals DRAFT Rail Plan*, HDR, November 15, 2011: GE AC4400CW (4400hp) or ElectroMotive Diesel SD70Ace (4300hp)
Locomotive Fuel Use:		20.8	bhp-hr/gal	(conversion for large line-haul locomotive *Emission Factors for Locomotives, EPA, Office of Transportation and Air Quality, EPA-420-F-09-025, April 2009*.)

Fuel Use per Train	Stage 1	Stage 2		
ON SITE				
Full Loaded Train:	5%	5%	Percent Load	(Notch percentage presented in Port of Long Beach Air Emissions Inventory - 2011 (POLB, July 2012); derived from EPA data
	880	880	hp	
	42	42	gallons/hr	
Empty Train:	5%	5%	Percent Load	
	660	660	hp	
	32	32	gallons/hr	
OFF SITE				
Full Loaded Train:	28%	28%	Percent Load	(Notch percentage presented in Port of Long Beach Air Emissions Inventory - 2011 (POLB, July 2012); derived from EPA data
	4928	4928	hp	
	237	237	gallons/hr	
Empty Train:	28%	28%	Percent Load	
	3696	3696	hp	
	178	178	gallons/hr	

Longview Short Line (Longview Switching Company (LSC) Track				
Distance from Main Rail Line to Site	8.09	8.09	miles	*Longview Switching Company Line Capacity Analysis to Accommodate MBTL trains, HDR, Tech Memo Jan 2012*
Travel Time to Site:	0.43	0.43	hrs	*Longview Switching Company Line Capacity Analysis to Accommodate MBTL trains, HDR, Tech Memo Jan 2012*
Total Power:	732214	1288697	hp-hr/yr	
Total Fuel Use:	35203	61957	gallons/yr	
Onsite				
Onsite loop distance:	7921	8727	ft	Per train average loop distance (HDR Engineering track figures, 10/28/11
Travel Distance:	1.50	1.65	miles	(one loop onsite; does not include dump track time which is operated by electric indexing system
Estimated Speed:	10	10	mph	From MBTL *Traffic Report*, URS 5/23/2014 (Draft)
Time per Train:	0.15	0.17	hours	
Total Power:	254660	493827	hp-hr/yr	
Total Fuel Use:	12243	23742	gallons/yr	
Total Fuel Use (On and Offsite)	47446	85698	gallons/yr	

Emission Factors

		NOx	CO	VOC	SO2	TSP	PM10	PM2.5	HAPS	CO2	CH4	N2O	CO2e
Tier 0 (most pre-2001 engines)[1-4]	(g/bhp-hr)	8.60	1.28	0.48	0.006	0.39	0.32	0.31	0.01				
GHG Factors[5,6]	(g/gal)									10150	0.80	0.26	10247

Sources:
[1]NOx, CO, VOC, PM10, PM2.5 emission factors from: *Emission Factors for Locomotives*, EPA, Office of Transportation and Air Quality, EPA-420-F-09-025, April 2009. Table 1, Line-Haul Emission Factors. From text: $P_{2.5} = 0.97 * PM_{10}$.
[2]SO2 emission factor from: *EPA AP-42, Section 3.4 Large Stationary Diesel and All Stationary Duel-fuel Engines* (10/96). Factor from Table 3.4-1 using S content of 15 ppm (Year 2014 sulfur content requirement (40 CFR 80)).
[3]TSP emission factor from: *EPA AP-42, Section 3.4 Large Stationary Diesel and All Stationary Duel-fuel Engines* (10/96). Based on ratio of total particulate to PM10 in diesel engines, as given in Table 3.4-2 (note: this ratio method matches PM2.5 factor as well).
[4]HAP emission factor from: *EPA AP-42, Section 3.4 Large Stationary Diesel and All Stationary Duel-fuel Engines* (10/96). Total HAPs from Tables 3.4-3 and 3.4-4, sum of HAPs as indicated by footnote b. For diesel fuel: 7000 Btu/hp-hr.
[5]*Direct Emissions from Mobile Combustion Sources*, EPA, Office of Air and Radiation, EPA-430-K-08-004, May 2008. CO_2 from Table B-1; N_2O and CH_4 from Table A-6.
[6]Global Warming Potentials (GWPs): CO_2 - 1
CH_4 - 25
N_2O - 298

Emission Rates (tpy)

		NO_x	CO	VOC	SO_2	TSP	PM_{10}	$PM_{2.5}$	HAPS	CO2	CH4	N2O	CO2e
Stage 1													
	Offsite	6.9	1.0	0.39	0.004	0.31	0.26	0.25	0.01	394	0.03	0.01	397
	Onsite	2.4	0.36	0.13	0.002	0.11	0.09	0.09	0.00	137	0.01	0.004	138
	Total	9	1.4	0.52	0.01	0.42	0.35	0.34	0.01	530	0.04	0.01	535
Stage 2													
	Offsite	12	1.8	0.68	0.01	0.55	0.45	0.44	0.02	693	0.05	0.02	699
	Onsite	4.7	0.70	0.26	0.003	0.21	0.17	0.17	0.01	265	0.02	0.01	268
	Total	17	2.5	0.94	0.01	0.76	0.63	0.61	0.03	958	0.08	0.02	967

APPENDIX I
CARGO VESSEL EMISSIONS

Tugs/Ship	3		(Conservative estimate)
Tug Engine Size (propulsion)	2000	hp	
Total Tug Engines/Ship	6000	hp	
Tug Positioning Time	3	hrs/ship (in-out)	(Conservative estimate)
Tug Load Factor	31%	Percent Load	(Engine load factor for Assist Tugs, from Port of Long Beach Air Emissions Inventory - 2011 (POLB, July 2012).)

Ship Auxilliary Engine Size	500	hp	(Conservative estimate)
Ship Berth Time	14	hrs	

	Stage 1	Stage 2	
Coal Throughput	27,557,783	48,501,697	tons/yr
Ships/yr	328	614	
Annual Power	2,357,573	4,413,261	hp-hrs/yr
Annual Diesel Fuel Use	16,503	30,892.83	MMBtu/yr
	120,791	226,114	gallons/yr
Tugs/yr	984	1,842	
Annual Power	5,490,720	10,278,360	hp-hrs/yr
Annual Diesel Fuel Use	38,435	71,949	MMBtu/yr
	281,318	526,614	gallons/yr

Emission Factors

lb/MMBtu, fuel input

	NO_x	CO	VOC	SO_2	TSP	PM_{10}	$PM_{2.5}$	HAPS	CO2	CH4	N2O	CO2e
Large Diesel Engines	3.2	0.85	0.0819	0.0015	0.0697	0.0573	0.0573	0.00428	165	0.0081	0.0004	165

Source:
Emission factors from: *EPA AP-42, Section 3.4 Large Stationary Diesel and All Stationary Duel-fuel Engines* (10/96). Assume Sulfur content of 0.0015% by weight (15 ppm). Assume TSP to PM10 ratio from Table 3.4-2, and PM2.5=PM10.
Sum of HAPs factors from Table 3.4-3 and 3.4-4.
Global Warming Potentials (GWPs): CO_2 - 1
CH_4 - 25
N_2O - 298

For Offsite (off dock) Ship Travel (within 5 mile distance from site), use :

Emission Factors from EPA's Greenhouse Gas Inventory Protocol Core Module Guidance, Optional Emissions from Commuting, Business Travel and Product Transport. EPA430-R-08-006, May 2008.

	Emission Factor for Product Transport			
	CO_2 (kg/ton-mile)	CH_4 (g/ton-mile)	N_2O (g/ton-mile)	CO_2e (kg/ton-mile)
Ship Transport	0.048	0.0041	0.0014	0.0485

Travel Distance:

Ship Miles	5	miles	Estimated from berth site in Longview, west along Columbia River to Pacific Ocean, plus 3 nautical miles out to sea.

CO_2e Emissions:	Stage 1	Stage 2	
Ship	7369	12970	tpy

Assume emissions of other pollutants for this activity are prorated from CO2e emissions.

Emission Rates (tpy)

	NO_x	CO	VOC	SO_2	TSP	PM_{10}	$PM_{2.5}$	HAPS	CO2	CH4	N2O	CO2e
Stage 1												
Ships (Cargo Vessel) - Docked (Onsite)	26	7.01	0.68	0.01	0.58	0.47	0.47	0.04	1361	0.07	0.003	1364
Ships (Cargo Vessel) - (Offsite)	143	38	3.65	0.07	3.11	2.55	2.55	0.19	7355	0.36	0.02	7369
Tugs (Offsite)	61	16	1.57	0.03	1.34	1.10	1.10	0.08	3171	0.16	0.01	3177
Total	231	61	5.90	0.11	5.02	4.13	4.13	0.31	11887	0.58	0.03	11911
Stage 2												
Ships (Cargo Vessel) - Docked (Onsite)	49	13	1.27	0.02	1.08	0.89	0.89	0.07	2549	0.13	0.01	2554
Ships (Cargo Vessel) - (Offsite)	251	67	6.43	0.12	5.47	4.50	4.50	0.34	12945	0.64	0.03	12970
Tugs (Offsite)	115	31	2.95	0.05	2.51	2.06	2.06	0.15	5936	0.29	0.01	5947
Total	416	110	10.64	0.19	9.05	7.44	7.44	0.56	21429	1.05	0.05	21471

APPENDIX J
OPERATIONS AND MAINTENANCE EQUIPMENT

Equipment Information

Equipment Type	Estimated Engine Size (hp)	Fuel	Number of Units Stage 1	Number of Units Stage 2	EPA SCC Number	EPA NONROAD model combustion emission factor (tons/yr per unit) THC-Exhaust	CO-Exhaust	NOx-Exhaust	CO2-Exhaust	SO2-Exhaust	PM-Exhaust
Loader (miscellaneous use)	300	Diesel	1	1	2270002060	2.81E-01	1.14E+00	3.47E+00	7.40E+02	1.42E-01	2.96E-01
Bobcat (sump cleaning)	50	Diesel	1	2	2270002057	7.50E-03	4.18E-02	1.29E-01	1.83E+01	3.60E-03	8.27E-03
10-Ton Truck (sump cleaning)	300	Diesel	1	2	2270002051	3.06E-02	9.01E-02	3.12E-01	1.09E+02	1.86E-02	3.49E-02
Crane (miscellaneous use)	50	Diesel	1	1	2270002045	1.27E-05	6.42E-05	2.24E-04	3.15E-02	6.15E-06	1.34E-05
Forklift (miscellaneous use)	40	Propane	1	1	2267002057	5.20E-05	1.84E-03	2.95E-04	1.52E-01	2.95E-06	1.60E-05
Maintenance Trucks (eg. Ford F150)	300	Gasoline	4	4	2265003070	1.14E-04	4.20E-03	3.12E-04	2.11E-01	4.36E-05	2.16E-05

Note:
For PM_{10}, $PM_{2.5}$, and HAPs, use same emission ratio as emission factor ratios for Large Diesel Engines (see Construction worksheet): PM_{10} and $PM_{2.5}$ ratio to TSP, and; HAPs ratio to CO.

Annual Emissions (tpy)

STAGE 1 (tpy)	NO_x	CO	VOC	SO_2	TSP	PM10	PM2.5	HAPS	CO2e
Loader (miscellaneous use)	3.47	1.14	0.28	0.14	0.30	0.24	0.24	0.01	740
Bobcat (sump cleaning)	0.13	0.04	0.01	0.00	0.01	0.01	0.01	0.0002	18
10-Ton Truck (sump cleaning)	0.31	0.09	0.03	0.02	0.03	0.03	0.03	0.0005	109
Crane (miscellaneous use)	0.0002	0.0001	0.00001	0.000006	0.00001	0.00001	0.00001	0.0000003	0.03
Forklift (miscellaneous use)	0.0003	0.002	0.00005	0.000003	0.00002	0.00001	0.00001	0.00001	0.2
Maintenance Trucks (eg. Ford F150)	0.001	0.02	0.0005	0.0002	0.0001	0.0001	0.0001	0.0001	1
Stage 1 Total (tpy)	3.92	1.29	0.32	0.16	0.34	0.28	0.28	0.01	869

STAGE 2 (tpy)	NO_x	CO	VOC	SO_2	TSP	PM10	PM2.5	HAPS	CO2e
Loader (miscellaneous use)	3.47	1.14	0.28	0.14	0.30	0.24	0.24	0.01	740
Bobcat (sump cleaning)	0.26	0.08	0.01	0.01	0.02	0.01	0.01	0.00	37
10-Ton Truck (sump cleaning)	0.62	0.18	0.06	0.04	0.07	0.06	0.06	0.00	218
Crane (miscellaneous use)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Forklift (miscellaneous use)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Maintenance Trucks (eg. Ford F150)	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	1
Stage 2 Total (tpy)	4.36	1.42	0.36	0.19	0.38	0.31	0.31	0.01	996

APPENDIX K

Washington State Emissions in tons per year

2011 Emissions Inventory

APPENDIX M
STATEWIDE GHG EMISSIONS FROM TRANSPORT

Emission Factors from EPA's Greenhouse Gas Inventory Protocol Core Module Guidance, Optional Emissions from Commuting, Business Travel and Product Transport. EPA430-R-08-006, May 2008

	Emission Factor for Product Transport			
	CO_2 (kg/ton-mile)	CH_4 (g/ton-mile)	N_2O (g/ton-mile)	CO_2e (kg/ton-mile)
Rail Transport	0.0252	0.002	0.0006	0.0254
Ship Transport	0.048	0.0041	0.0014	0.0485

Travel Distance:

Rail Miles	450	miles	Estimated distance from main rail connector in Longview, south to Portland, east to Tri-Cities area, and northeast to Spokane.
Ship Miles	64	miles	Estimated from berth site in Longview, west along Columbia River to Pacific Ocean, plus 3 nautical miles out to sea

	Stage 1	Stage 2	
Coal Throughput	27557783	48501697	tons/yr

CO_2e Emissions:

	Stage 1	Stage 2	
Train	347602	611780	tpy
	0.32	0.55	$MMtCO_2e/yr$
Ship	94328	166018	tpy
	0.09	0.15	$MMtCO_2e/yr$
Total CO_2e	0.4	0.7	$MMtCO_2e/yr$

Washington State 2010 GHG Inventory in million metric tons per year ($MMtCO_2e/yr$))
(from Department of Ecology, *Washington State Greenhouse Gas Emissions Inventory 2009-2010*, Publication No. 12-02-034, December 2012, Revised September 2013)

	$MMtCO_2e$	Percent of Statewide CO_2e Stage 1	Stage 2
Total Transportation	42.2	1.0%	1.7%
Total Gross Emissions	96.1	0.4%	0.7%