TABLE 9A-29: EMISSIONS CALCLUATIONS - CONSTRUCTION PHASE
Mid-Atlantic Express Pipeline
Pipeline Construction Schedule

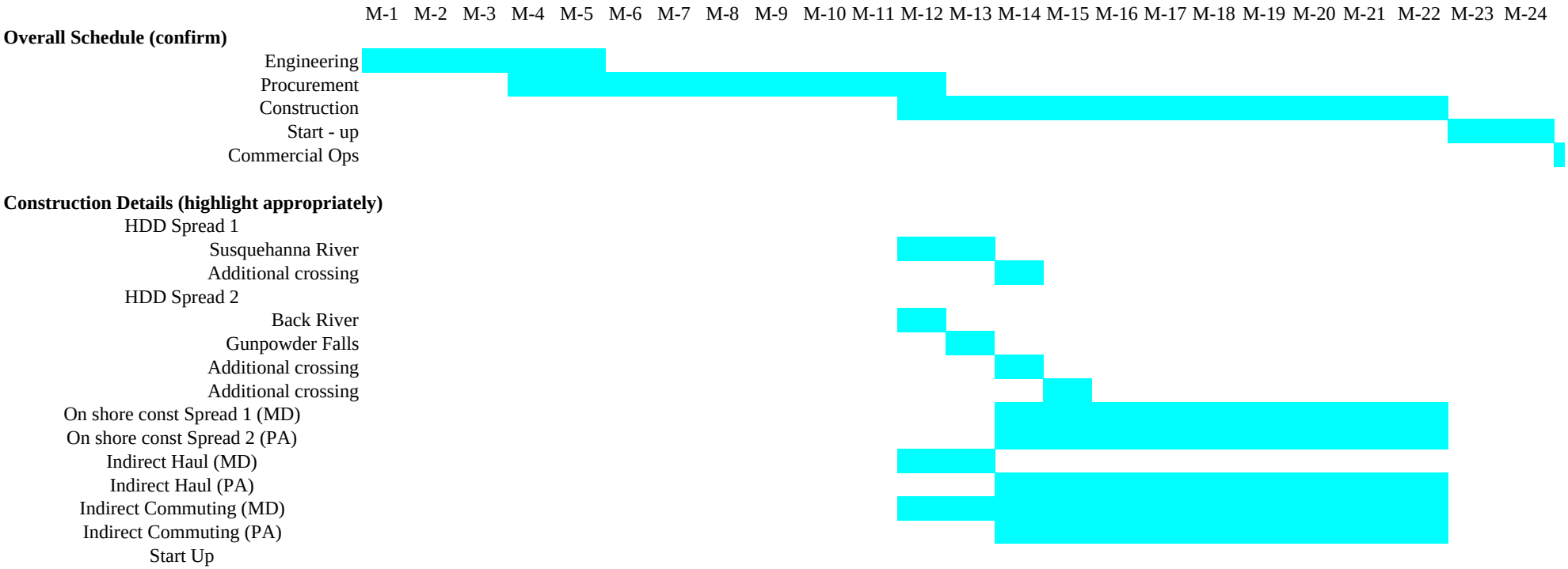

TABLE 9A-30: EMISSIONS CALCLUATIONS - CONSTRUCTION PHASE---- 2009 year, AQCR 115 and 114
Mid-Atlantic Express Pipeline
Horizontal Directional Drilling (HDD) Activities - Spread 1 (MD)

Split in half between AQCR 115 and 114, Construction Year 2009

Description	**HDD Spread 1 (MD)**
No. of Units	1 drill engine; 1 aux. generator; 1 cranes; 2 pumps;
	1 Cranes, 3 welding rigs, 5-pickups, 3 dozers
Generator kW / Bhp	300 kW 503 BHp
HDD Engine Bhp	450
BSFC, lb/hp-hr	0.367
% Sulfur Fuel	0.05
Crane Bhp, ea.	200
Pump Bhp, ea	200
Welding Rig	10
Crawler Sidebooms, Bhp	500
3/4 ton pickups	250
Engine Type	Diesel compression ignition
Load Factor	0.8 gen. 0.5 HDD + crane
Operating hrs/day	24

HDD Spread 1 Equipment

5 – ¾ ton pickup truck w/tools
3 - Crawler / Dozers (Diesel)
3 – Welding Rigs (Gasoline)
1 - Dragline Cranes (Diesel)

1 – Drilling rig (500 hp)
1 – Auxiliary Generators (Diesel)
1 – Water Pumps
1 – Slurry pumps

	HDD Engine			**Aux. Generator**			**Crane, each**			**Pump, each**			**Welding Rig, each**			**Crawlers, each**			**3/4 ton pickups, each**		
Pollutant	**Emission Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**g/sec**	**Emission Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**g/sec**	**Emission Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**g/sec**	**Emission Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**g/sec**	**Emission Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**g/sec**	**Emission Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**g/sec**	**Emission Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**g/sec**
PM	0.33	2.07	0.043	0.33	2.07	0.076	0.33	1	0.009	0.33	2.07	0.019	0.33	2.07	0.002	0.33	2.07	0.047	0.33	2.04	0.023
NO_X	8.38	1.05	0.550	8.38	1.05	0.983	8.38	1	0.233	8.38	1.05	0.244	8.38	1.05	0.020	8.38	1.05	0.611	8.38	1.03	0.300
SO_2	0.16	1.16	0.012	0.16	1.16	0.021	0.16	1	0.005	0.16	1.16	0.005	0.16	1.16	0.000	0.16	1.16	0.013	0.16	1.18	0.007
CO	2.7	2.66	0.449	2.7	2.66	0.803	2.7	1	0.075	2.7	2.66	0.200	2.7	2.66	0.016	2.7	2.66	0.499	2.7	2.31	0.217
HC	0.68	2.23	0.095	0.68	2.23	0.169	0.68	1	0.019	0.68	2.23	0.042	0.68	2.23	0.003	0.68	2.23	0.105	0.68	2.19	0.052

	HDD Engine	**Aux. Generator #12**	**HDD Spread Cranes**	**HDD Pumps**	**HDD Welding Rigs**	**HDD Crawler**	**HDD Pickup Trucks**	**Total HDD Spread**
No. of Units	1	1	1	2	3	3	5	
PM, g/sec	0.043	0.076	0.009	0.038	0.005	0.142	0.117	0.430
NO_X, g/sec	0.550	0.983	0.233	0.489	0.059	1.833	1.499	5.645
SO_2, g/sec	0.012	0.021	0.005	0.010	0.001	0.039	0.033	0.121
CO, g/sec	0.449	0.803	0.075	0.399	0.048	1.496	1.083	4.352
HC, g/sec	0.095	0.169	0.019	0.084	0.010	0.316	0.259	0.952

	Total tons/day @ 20 hr/day	**TPY @ 180 day constr sched**	**TPY @180 day for AQCR 115**	**TPY @180 day for AQCR 114**
PM	0.03	6.1	3.07	3.07
NO_X	0.45	80.6	40.32	40.32
SO_2	0.01	1.7	0.87	0.87
CO	0.35	62.2	31.09	31.09
HC	0.08	13.6	6.80	6.80

Notes:
[1] Emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised June 15, 1998, US EPA Office of Mobile Sources. Steady-state emission factors for CI engines obtained from Table 1, assuming 1988-99 model year engines, not subject to Tier 1 or Tier 2 controls. SO2 emission factor based on brake-specific fuel consumption (BSFC) given in Table 1 and assuming default sulfur content (0.05%) required for the construction year in nonroad diesel fuel.
2 In-use adjustment factors obtained from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised April 2004, US EPA Office of Mobile Sources.
3 Period of Construction Activites Used for Calculation: HDD Activities occur within the calendar 2009 year.

TABLE 9A-31: EMISSIONS CALCLUATIONS - CONSTRUCTION PHASE--- 2009 year, AQCR 115
Mid-Atlantic Express Pipeline
Horizontal Directional Drilling (HDD) Activities - Spread 2 (MD)

Description	**HDD Spread 2 (MD)**
No. of Units	1 drill engine; 1 aux. generator; 1 cranes; 2 pumps;
	1 Cranes, 3 welding rigs, 5-pickups, 3 dozers
Generator kW / Bhp	300 kW 503 BHp
HDD Engine Bhp	450
BSFC, lb/hp-hr	0.367
% Sulfur Fuel	0.05
Crane Bhp, ea.	200
Pump Bhp, ea	200
Welding Rig	10
Crawler Sidebooms, Bhp	500
3/4 ton pickups	250
Engine Type	Diesel compression ignition
Load Factor	0.8 gen. 0.5 HDD + crane
Operating hrs/day	24

HDD Spread 2 Equipment

5 – ¾ ton pickup truck w/tools
3 - Crawler / Dozers (Diesel)
3 – Welding Rigs (Gasoline)
1 - Dragline Cranes (Diesel)

1 – Drilling rig (500 hp)
1 – Auxiliary Generators (Diesel)
1 – Water Pumps
1 – Slurry pumps

	HDD Engine			**Aux. Generator**			**Crane, each**			**Pump, each**			**Welding Rig, each**			**Crawlers, each**			**3/4 ton pickups, each**		
Pollutant	**Emission Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**g/sec**	**Emission Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**g/sec**	**Emission Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**g/sec**	**Emission Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**g/sec**	**Emission Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**g/sec**	**Emission Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**g/sec**	**Emission Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**g/sec**
PM	0.33	2.07	0.043	0.33	2.07	0.076	0.33	1	0.009	0.33	2.07	0.019	0.33	2.07	0.002	0.33	2.07	0.047	0.33	2.04	0.023
NO_X	8.38	1.05	0.550	8.38	1.05	0.983	8.38	1	0.233	8.38	1.05	0.244	8.38	1.05	0.020	8.38	1.05	0.611	8.38	1.03	0.300
SO_2	0.16	1.16	0.012	0.16	1.16	0.021	0.16	1	0.005	0.16	1.16	0.005	0.16	1.16	0.000	0.16	1.16	0.013	0.16	1.18	0.007
CO	2.7	2.66	0.449	2.7	2.66	0.803	2.7	1	0.075	2.7	2.66	0.200	2.7	2.66	0.016	2.7	2.66	0.499	2.7	2.31	0.217
HC	0.68	2.23	0.095	0.68	2.23	0.169	0.68	1	0.019	0.68	2.23	0.042	0.68	2.23	0.003	0.68	2.23	0.105	0.68	2.19	0.052

	HDD Engine	**Aux. Generator #12**	**HDD Spread Cranes**	**HDD Pumps**	**HDD Welding Rigs**	**HDD Crawler**	**HDD Pickup Trucks**	**Total HDD Spread**
No. of Units	1	1	1	2	3	3	5	
PM, g/sec	0.043	0.076	0.009	0.038	0.005	0.142	0.117	0.430
NO_X, g/sec	0.550	0.983	0.233	0.489	0.059	1.833	1.499	5.645
SO_2, g/sec	0.012	0.021	0.005	0.010	0.001	0.039	0.033	0.121
CO, g/sec	0.449	0.803	0.075	0.399	0.048	1.496	1.083	4.352
HC, g/sec	0.095	0.169	0.019	0.084	0.010	0.316	0.259	0.952

	Total tons/day @ 20 hr/day	**TPY @ 180 day constr sched**
PM	0.03	6.1
NO_X	0.45	80.6
SO_2	0.01	1.7
CO	0.35	62.2
HC	0.08	13.6

Notes:
1 Emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised June 15, 1998, US EPA Office of Mobile Sources. Steady-state emission factors for CI engines obtained from Table 1, assuming 1988-99 model year engines, not subject to Tier 1 or Tier 2 controls. SO2 emission factor based on brake-specific fuel consumption (BSFC) given in Table 1 and assuming default sulfur content (0.05%) required for the construction year in nonroad diesel fuel.
2 In-use adjustment factors obtained from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised April 2004, US EPA Office of Mobile Sources.
3 Period of Construction Activites Used for Calculation: HDD Activities occur within the calendar 2009 year.

TABLE 9A-32: EMISSIONS CALCLUATIONS - CONSTRUCTION PHASE---- Calculated for the construction period, years 2009-2010, AQCR 115 and 114
Mid-Atlantic Express Pipeline
Pipeline Construction Activities - Spread 1 (MD)

Description	**Pipeline Construction Equipment (MD)**
No. of Units	2 cranes, 13 trackhoes, 19 dozers, 2 trencher, 19 crawlers/dozers, 53 trucks, 4 graders, 2 pump units
BSFC, lb/hp-hr (>100 hp)	0.367
BSFC, lb/hp-hr (<100hp)	0.408
% Sulfur Fuel	0.05
Engine Type	Diesel compression ignition
Avg. Load Factor	0.5
Operating hrs/day	10

Const Spread 1 Equipment (MD)

53 – ¾ ton pickup truck w/tools
13 – Track hoes
31 – Welding Rigs
4 – Fuel Trucks
2 - Dragline Cranes
4 – Road Bore Machines
4 - Motor Graders
2 – Wheel type Trenching Machines
2 – Generators
16 – Tractor trailer transports (Diesel)
2 – Water Fill Pumps

	2 Cranes				**13 Trackhoes**				**2 Fuel Trucks**				**2 Trenching Machines**				**53 3/4 ton Pickup trucks**				**31 Welding Rigs**			
	200 Bhp, each unit				**140 Bhp, each unit**				**400 Bhp, each unit**				**200 Bhp, each unit**				**250 Bhp, each unit**				**10 Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**
PM	0.33	1	0.018	0.037	0.33	2.07	0.027	0.345	0.33	2.07	0.076	0.152	0.33	2.07	0.038	0.076	0.33	2.07	0.047	2.514	0.33	2.07	0.002	0.059
NO_X	8.38	1	0.466	0.931	8.38	1.05	0.342	4.448	8.38	1.05	0.978	1.955	8.38	1.05	0.489	0.978	8.38	1.05	0.611	32.385	8.38	1.05	0.024	0.758
SO_2	0.16	1	0.009	0.018	0.16	1.16	0.007	0.095	0.16	1.16	0.021	0.042	16.21	1.16	1.045	2.090	0.16	1.16	0.013	0.692	0.18	1.16	0.001	0.018
CO	2.7	1	0.150	0.300	2.7	2.66	0.279	3.631	2.7	2.66	0.798	1.596	2.7	2.66	0.399	0.798	2.7	2.66	0.499	26.434	2.7	2.66	0.020	0.618
HC	0.68	1	0.038	0.076	0.68	2.23	0.059	0.767	0.68	2.23	0.168	0.337	0.68	2.23	0.084	0.168	0.68	2.23	0.105	5.581	0.68	2.23	0.004	0.131

	19 Crawlers / Dozers				**2 Dump Trucks**				**4 Motor Graders**				**2 Pumps**				**4 Road Bore Machine**				**16 Pipe Haul Trucks**			
	500 Bhp, each unit				**400 Bhp, each unit**				**200 Bhp, each unit**				**150 Bhp, each unit**				**125 Bhp, each unit**				**500 Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**
PM	0.33	1.29	0.059	1.123	0.33	2.04	0.075	0.150	0.33	2.07	0.038	0.152	0.33	2.07	0.028	0.057	0.33	2.07	0.024	0.095	0.33	2.07	0.095	1.518
NO_X	8.38	0.98	1.141	21.672	8.38	1.03	0.959	1.918	8.38	1.05	0.489	1.955	8.38	1.05	0.367	0.733	8.38	1.05	0.306	1.222	8.38	1.05	1.222	19.553
SO_2	0.16	1	0.023	0.428	0.16	1.18	0.021	0.043	0.16	1.16	0.010	0.042	0.16	1.16	0.008	0.016	0.16	1.16	0.007	0.026	0.16	1.16	0.026	0.418
CO	2.7	1.5	0.563	10.688	2.7	2.31	0.693	1.386	2.7	2.66	0.399	1.596	2.7	2.66	0.299	0.599	2.7	2.66	0.249	0.998	2.7	2.66	0.998	15.960
HC	0.68	0.88	0.083	1.579	0.68	2.19	0.165	0.331	0.68	2.23	0.084	0.337	0.68	2.23	0.063	0.126	0.68	2.23	0.053	0.211	0.68	2.23	0.211	3.370

	Total g/sec	**Daily Avg. Load Fact.**	**Total Tons per day @ 10 hr/day**	**Total TPY @ 190 day constr sched**
Pollutant				
PM	6.277	0.5	0.12	23.7
NO_X	88.509	0.5	1.76	333.7
SO_2	3.927	0.5	0.08	14.8
CO	64.603	0.5	1.28	243.5
HC	13.013	0.5	0.26	49.1

Notes:
1 Emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised April 2004, US EPA Office of Mobile Sources. Steady-state emission factors for CI engines obtained from Table 1, assuming 1988-99 model year engines, not subject to Tier 1 or Tier 2 controls. SO2 emission factor based on brake-specific fuel consumption (BSFC) given in Table 1 and assuming default sulfur content (0.05%) in nonroad diesel fuel.
2 In-use adjustment factor obtained from Table F-3 in above-referenced report.
3 Sizes of construction equipment diesel engines provided by Englobal.
4 Period of Construction Activites Used for Calculation: Pipeline Activities occur May 2009- Jan 2010 (9 months total).

TABLE 9A-33: EMISSIONS CALCLUATIONS - CONSTRUCTION PHASE---- Calculated for the construction period, years 2009-2010, AQCR 196 and 045
Mid-Atlantic Express Pipeline
Pipeline Construction Activities - Spread 2 (PA)

Description	**Pipeline Construction Equipment (PA)**
No. of Units	4 cranes, 26 trackhoes, 38 dozers, 4 trencher, 38 crawlers/dozers, 106 trucks, 8 graders, 4 pump units
BSFC, lb/hp-hr (>100 hp)	0.367
BSFC, lb/hp-hr (<100hp)	0.408
% Sulfur Fuel	0.05
Engine Type	Diesel compression ignition
Avg. Load Factor	0.5
Operating hrs/day	10

Const Spread 2 Equipment (PA)

53 – ¾ ton pickup truck w/tools
13 – Track hoes
31 – Welding Rigs
4 – Fuel Trucks
2 - Dragline Cranes
4 – Road Bore Machines
4 - Motor Graders
2 – Wheel type Trenching Machines
2 – Generators
16 – Tractor trailer transports (Diesel)
2 – Water Fill Pumps

	2 Cranes				**13 Trackhoes**				**2 Fuel Trucks**				**2 Trenching Machines**				**53 3/4 ton Pickup trucks**				**31 Welding Rigs**			
	200 Bhp, each unit				**140 Bhp, each unit**				**400 Bhp, each unit**				**200 Bhp, each unit**				**250 Bhp, each unit**				**10 Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**
PM	0.33	1	0.018	0.037	0.33	2.07	0.027	0.345	0.33	2.07	0.076	0.152	0.33	2.07	0.038	0.076	0.33	2.07	0.047	2.514	0.33	2.07	0.002	0.059
NO_X	8.38	1	0.466	0.931	8.38	1.05	0.342	4.448	8.38	1.05	0.978	1.955	8.38	1.05	0.489	0.978	8.38	1.05	0.611	32.385	8.38	1.05	0.024	0.758
SO_2	0.16	1	0.009	0.018	0.16	1.16	0.007	0.095	0.16	1.16	0.021	0.042	16.21	1.16	1.045	2.090	0.16	1.16	0.013	0.692	0.18	1.16	0.001	0.018
CO	2.7	1	0.150	0.300	2.7	2.66	0.279	3.631	2.7	2.66	0.798	1.596	2.7	2.66	0.399	0.798	2.7	2.66	0.499	26.434	2.7	2.66	0.020	0.618
HC	0.68	1	0.038	0.076	0.68	2.23	0.059	0.767	0.68	2.23	0.168	0.337	0.68	2.23	0.084	0.168	0.68	2.23	0.105	5.581	0.68	2.23	0.004	0.131

	19 Crawlers / Dozers				**2 Dump Trucks**				**4 Motor Graders**				**2 Pumps**				**4 Road Bore Machine**				**16 Pipe Haul Trucks**			
	500 Bhp, each unit				**400 Bhp, each unit**				**200 Bhp, each unit**				**150 Bhp, each unit**				**125 Bhp, each unit**				**500 Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**
PM	0.33	1.29	0.059	1.123	0.33	2.04	0.075	0.150	0.33	2.07	0.038	0.152	0.33	2.07	0.028	0.057	0.33	2.07	0.024	0.095	0.33	2.07	0.095	1.518
NO_X	8.38	0.98	1.141	21.672	8.38	1.03	0.959	1.918	8.38	1.05	0.489	1.955	8.38	1.05	0.367	0.733	8.38	1.05	0.306	1.222	8.38	1.05	1.222	19.553
SO_2	0.16	1	0.023	0.428	0.16	1.18	0.021	0.043	0.16	1.16	0.010	0.042	0.16	1.16	0.008	0.016	0.16	1.16	0.007	0.026	0.16	1.16	0.026	0.418
CO	2.7	1.5	0.563	10.688	2.7	2.31	0.693	1.386	2.7	2.66	0.399	1.596	2.7	2.66	0.299	0.599	2.7	2.66	0.249	0.998	2.7	2.66	0.998	15.960
HC	0.68	0.88	0.083	1.579	0.68	2.19	0.165	0.331	0.68	2.23	0.084	0.337	0.68	2.23	0.063	0.126	0.68	2.23	0.053	0.211	0.68	2.23	0.211	3.370

	Total g/sec	**Daily Avg. Load Fact.**	**Total Tons per day @ 10 hr/day**	**Total TPY @ 190 day constr sched**
Pollutant				
PM	6.277	0.5	0.12	23.7
NO_X	88.509	0.5	1.76	333.7
SO_2	3.927	0.5	0.08	14.8
CO	64.603	0.5	1.28	243.5
HC	13.013	0.5	0.26	49.1

Notes:
1 Emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised April 2004, US EPA Office of Mobile Sources. Steady-state emission factors for CI engines obtained from Table 1, assuming 1988-99 model year engines, not subject to Tier 1 or Tier 2 controls. SO2 emission factor based on brake-specific fuel consumption (BSFC) given in Table 1 and assuming default sulfur content (0.05%) in nonroad diesel fuel.
2 In-use adjustment factor obtained from Table F-3 in above-referenced report.
3 Sizes of construction equipment diesel engines provided by Englobal.
4 Period of Construction Activites Used for Calculation: Pipeline Activities occur May 2009- Jan 2010 (9 months total).

TABLE 9A-34: EMISSIONS CALCLUATIONS - CONSTRUCTION PHASE
---- Divided by years 2009 and 2010, divided by AQCR
Mid-Atlantic Express Pipeline

SPREAD 1 (MD)

Pollutant	Total TPCP @ 190day constr sched	Total TPCP @ 190 day AQCR 115	Total TPY 2009 (170 days) AQCR 115	Total TPY 2010 (20 days) AQCR 115	Total TPCP @ 190 day AQCR 114	Total TPY 2009 (170 days) AQCR 114	Total TPY 2010 (20 days) AQCR 114
PM	23.664	21.672	19.390	2.281	1.993	1.783	0.210
NO_X	333.665	305.566	273.401	32.165	28.100	25.142	2.958
SO_2	14.803	13.556	12.129	1.427	1.247	1.115	0.131
CO	243.542	223.032	199.555	23.477	20.510	18.351	2.159
HC	49.058	44.926	40.197	4.729	4.131	3.697	0.435

SPREAD 2 (PA)

Pollutant	Total TPCP @ 190day constr sched	Total TPCP @ 190 day AQCR 196	Total TPY 2009 (170 days) AQCR 196	Total TPY 2010 (20 days) AQCR 196	Total TPCP @ 190 day AQCR 045	Total TPY 2009 (170 days) AQCR 045	Total TPY 2010 (20 days) AQCR 045
PM	23.664	4.806	4.300	0.506	18.859	16.873	1.985
NO_X	333.665	67.761	60.629	7.133	265.904	237.914	27.990
SO_2	14.803	3.006	2.690	0.316	11.797	10.555	1.242
CO	243.542	49.459	44.253	5.206	194.083	173.653	20.430
HC	49.058	9.963	8.914	1.049	39.095	34.980	4.115

Notes:
1 Period of Construction Activites Used for Calculation: Pipeline Activities occur May 2009- Jan 2010 (9 months total); 21 days/month.
2 Pipeline Mileage of Spread 1 and 2 was proportioned between AQCRs according to following lengths: Pipeline Spread 1 (AQCR 115 and 114): 48.21 total miles; AQCR 115: 44.15 miles; AQCR 114: 4.06 miles. Pipeline Spread 2 (AQCR 196 and 045): 39.59 total miles; AQCR 196: 8.04 miles; AQCR 045: 31.55 miles.

TABLE 9A-35: EMISSIONS CALCLUATIONS - CONSTRUCTION PHASE
Mid-Atlantic Express Pipeline
Indirect Emissions from Haul Trucks and Workers Commuting

				PM			NH3			NO_X			VOC (HC)			CO		
Vehicle Type	Vehicle Trips per Day	Days per Year	Round Trip Miles	Emissions Factor (g/mile)	Tons/day	Tons/Year	Emissions Factor (g/mile)	Tons/day	Tons/Year	Emissions Factor (g/mile)	Tons/day	Tons/Year	Emissions Factor (g/mile)	Tons/day	Tons/Year	Emissions Factor (g/mile)	Tons/day	Tons/Year
Spoils Haul Trucks (HDDV)	16	40	20	0.3	0.0001	0.004	0.02704	0.0000	0.000	12.69	0.0045	0.18	1.56	0.0006	0.02	6.87	0.0024	0.10
Supplies Trucks (HDDV)	6	40	40	0.3	0.0001	0.003	0.02704	0.0000	0.000	12.69	0.0034	0.13	1.56	0.0004	0.02	6.87	0.0018	0.07
Workers Commuting (LDGV)	80	190	30	0.02	0.0001	0.010	0.01513	0.0000	0.008	1.86	0.0049	0.93	1.22	0.0032	0.39	14.72	0.0389	4.67
Workers Commuting (LDGT)	80	190	30	0.02	0.0001	0.010	0.01513	0.0000	0.008	2.31	0.0061	1.16	1.82	0.0048	0.58	22.24	0.0588	7.06
Total					0.0003	0.0275		0.0001	0.0159		0.0189	2.4094		0.0090	1.0036		0.1020	11.9030
Total- MD AQCR 115					0.0001	0.0140		0.0000	0.0081		0.0096	1.2227		0.0046	0.5093		0.0518	6.0404
Total- MD AQCR 114					0.0000	0.0013		0.0000	0.0007		0.0009	0.1124		0.0004	0.0468		0.0048	0.5555
Total-PA AQCR 196					0.0000	0.0025		0.0000	0.0015		0.0017	0.2227		0.0008	0.0927		0.0094	1.1000
Total-PA AQCR 045					0.0001	0.0100		0.0000	0.0058		0.0068	0.8737		0.0033	0.3639		0.0370	4.3165

Notes:
1. Period of Construction Activites Used for Calculation: Pipeline Activities occur Feb 2009- Jan 2010 (12 months total); 21 days/month.
2. Pipeline Mileage of Spread 1 and 2 was proportioned between AQCRs according to following lengths: Pipeline Spread 1 (AQCR 115 and 114): 48.21 total miles; AQCR 115: 44.15 miles; AQCR 114: 4.06 miles. Pipeline Spread 2 (AQCR 196 and 045): 39.59 total miles; AQCR 196: 8.04 miles; AQCR 045: 31.55 miles.
3. Emission factors for NOX, VOC and CO obtained from USEPA AP-42, Appendix J (1998), with the following assumptions - 35 mph, 1995 model year, 50% cold start and 50% stabilized operation, low altitude, 100°F ambient temperature.
4. Emission factors for PM obtained from USEPA report, "Mobile 6. 1 Particulate Emmision Factor Model Technical Description", January 2003.
5. Emission factors for Ammonia obtained from Table III-3 of USEPA report, "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources", April 2004.

TABLE 9A-36a: EMISSIONS CALCLUATIONS - CONSTRUCTION PHASE
Mid-Atlantic Express Pipeline
Summary of Total Pipeline Construction Emissions in AQCR 115

AQCR 115 MARYLAND

Total Tons/Year During Construction Period					
Pollutant	**HDD - Total Tons/Yr. During Construction Period (2009)**	**Pipeline Construction - Total Tons/Yr. During Construction Period (2009-2010)**	**Indirect Emissions from Commuting Construction Workers and Haul Trucks**	**Tons Emitted-2009**	**Tons Emitted-2010**
PM_{10}	9.2	21.7	0.0	28.48	2.41
NO_X	121.0	305.6	1.2	393.80	35.17
SO_2	2.6	13.6		14.65	1.51
CO	93.3	223.0	6.0	297.56	30.82
HC	20.4	44.9	0.5	60.84	5.50
NH3**	0.12	0.29	0.01	0.39	0.04

** NH3 emissions from nonroad diesel engines calculated using proportionality of emissions factors, PM emissions * (.0044/.33).

0.0044 g/Bhp-hr derived from 1.83E-04 lb NH3/gal / (7 lb/gal diesel) x 0.367 lb diesel/Bhp-hr x 454 g/lb)

1.83E-04 lb/gal emission factor obtained from Table III-6 of USEPA report, "Estimating Ammonia Emissions from Anthropogenice Nonagricultural Sources", April 2004.

NH3 emissions from indirect sources calculated seperately, as noted on respective worksheets, using Table III-3 from above-noted USEPA reference.

TABLE 9A-36b: EMISSIONS CALCLUATIONS - CONSTRUCTION PHASE
Mid-Atlantic Express Pipeline
Summary of Total Pipeline Construction Emissions in AQCR 114

AQCR 114 MARYLAND

Total Tons/Year During Construction Period					
Pollutant	**HDD - Total Tons/Yr. During Construction Period (2009)**	**Pipeline Construction - Total Tons/Yr. During Construction Period (2009-2010)**	**Indirect Emissions from Commuting Construction Workers and Haul Trucks**	**Tons Emitted-2009**	**Tons Emitted-2010**
PM_{10}	3.1	2.0	0.0	4.84	0.22
NO_X	40.3	28.1	0.1	65.41	3.23
SO_2	0.9	1.2		1.98	0.14
CO	31.1	20.5	0.6	49.88	2.83
HC	6.8	4.1	0.0	10.52	0.51
NH3**	0.04	0.03	0.00	0.07	0.00

** NH3 emissions from nonroad diesel engines calculated using proportionality of emissions factors, PM emissions * (.0044/.33).

0.0044 g/Bhp-hr derived from 1.83E-04 lb NH3/gal / (7 lb/gal diesel) x 0.367 lb diesel/Bhp-hr x 454 g/lb)

1.83E-04 lb/gal emission factor obtained from Table III-6 of USEPA report, "Estimating Ammonia Emissions from Anthropogenice Nonagricultural Sources", April 2004.

NH3 emissions from indirect sources calculated seperately, as noted on respective worksheets, using Table III-3 from above-noted USEPA reference.

TABLE 9A-36c: EMISSIONS CALCLUATIONS - CONSTRUCTION PHASE
Mid-Atlantic Express Pipeline
Summary of Total Pipeline Construction Emissions in AQCR 196

AQCR 196 Pennsylvania

Total Tons/Year During Construction Period				
Pollutant	**Pipeline Construction - Total Tons/Yr. During Construction Period (2009-2010)**	**Indirect Emissions from Commuting Construction Workers and Haul Trucks**	**Tons Emitted-2009**	**Tons Emitted-2010**
PM_{10}	4.8	0.0	4.27	0.54
NO_X	67.8	0.2	60.45	7.75
SO_2	3.0		2.67	0.33
CO	49.5	1.1	45.06	6.60
HC	10.0	0.1	8.95	1.20
NH3**	0.06	0.00	0.06	0.01

** NH3 emissions from nonroad diesel engines calculated using proportionality of emissions factors, PM emissions * (.0044/.33).

0.0044 g/Bhp-hr derived from 1.83E-04 lb NH3/gal / (7 lb/gal diesel) x 0.367 lb diesel/Bhp-hr x 454 g/lb)

1.83E-04 lb/gal emission factor obtained from Table III-6 of USEPA report, "Estimating Ammonia Emissions from Anthropogenice Nonagricultural Sources", April 2004.

NH3 emissions from indirect sources calculated seperately, as noted on respective worksheets, using Table III-3 from above-noted USEPA reference.

TABLE 9A-36d: EMISSIONS CALCLUATIONS - CONSTRUCTION PHASE
Mid-Atlantic Express Pipeline
Summary of Total Pipeline Construction Emissions in AQCR 045

AQCR 045 Pennsylvania

Total Tons/Year During Construction Period				
Pollutant	**Pipeline Construction - Total Tons/Yr. During Construction Period (2009-2010)**	**Indirect Emissions from Commuting Construction Workers and Haul Trucks**	**Tons Emitted-2009**	**Tons Emitted-2010**
PM_{10}	18.9	0.0	16.77	2.11
NO_X	265.9	0.9	237.23	30.42
SO_2	11.8		10.49	1.31
CO	194.1	4.3	176.83	25.88
HC	39.1	0.4	35.12	4.71
NH3**	0.25	0.01	0.23	0.03

** NH3 emissions from nonroad diesel engines calculated using proportionality of emissions factors, PM emissions * (.0044/.33).

0.0044 g/Bhp-hr derived from 1.83E-04 lb NH3/gal / (7 lb/gal diesel) x 0.367 lb diesel/Bhp-hr x 454 g/lb)

1.83E-04 lb/gal emission factor obtained from Table III-6 of USEPA report, "Estimating Ammonia Emissions from Anthropogenice Nonagricultural Sources", April 2004.

NH3 emissions from indirect sources calculated seperately, as noted on respective worksheets, using Table III-3 from above-noted USEPA reference.

TABLE 9A-37a: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE--- 2008 year; AQCR- 115
LNG Terminal
Onshore Construction Activities

Description	**Onshore Construction Equipment**
BSFC, lb/hp-hr (>100 hp)	0.367
BSFC, lb/hp-hr (<100hp)	0.408
% Sulfur Fuel	0.05
Engine Type	Diesel compression ignition
Avg. Load Factor	0.5
Operating hrs/month	200

907185 grams = 1 ton (US)
TPCP= Tons per construction period, construction during 2008 year
AQCR- 115

	1	**Crane-M.888 Crawler**		**4**	**months (CP)**	**2**	**15 Ton Picker**		**10**	**months (CP)**	**1**	**60 Ton Crane**		**1**	**months (CP)**
	350	**Bhp, each unit**				**150**	**Bhp, each unit**				**290**	**Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2008**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2008**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2008**
PM	0.33	1.29	0.041	0.041	0.066	0.33	2.07	0.028	0.057	0.226	0.33	1	0.027	0.027	0.011
NO_X	8.38	0.98	0.798	0.798	1.267	8.38	1.05	0.367	0.733	2.910	8.38	1	0.675	0.675	0.268
SO_2	0.16	0.99	0.016	0.016	0.025	0.16	1.16	0.008	0.016	0.062	0.16	1	0.013	0.013	0.005
CO	2.7	1.5	0.394	0.394	0.625	2.7	2.66	0.299	0.599	2.375	2.7	1	0.218	0.218	0.086
HC	0.68	0.88	0.058	0.058	0.092	0.68	2.23	0.063	0.126	0.501	0.68	1	0.055	0.055	0.022

	3	**Backhoe**		**9**	**months (CP)**	**1**	**450 Dozer**		**7**	**months (CP)**	**1**	**D6 Dozer**		**12**	**months (CP)**
	150	**Bhp, each unit**				**150**	**Bhp, each unit**				**350**	**Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2008**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2008**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2008**
PM	0.33	2.07	0.028	0.085	0.305	0.33	1.29	0.018	0.018	0.049	0.33	1.29	0.041	0.041	0.197
NO_X	8.38	1.05	0.855	2.566	9.166	8.38	0.98	0.342	0.342	0.951	8.38	0.98	0.798	0.798	3.802
SO_2	0.16	1.16	0.018	0.055	0.196	0.16	1	0.007	0.007	0.019	0.16	0.99	0.016	0.016	0.074
CO	2.7	2.66	0.698	2.095	7.481	2.7	1.5	0.169	0.169	0.469	2.7	1.5	0.394	0.394	1.875
HC	0.68	2.23	0.147	0.442	1.580	0.68	0.88	0.025	0.025	0.069	0.68	0.88	0.058	0.058	0.277

	1	**Front End Loader**		**8**	**months (CP)**	**1**	**Bobcat**		**12**	**months (CP)**	**1**	**Cat 225 TrackHoe**		**9**	**months (CP)**
	150	**Bhp, each unit**				**150**	**Bhp, each unit**				**520**	**Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2008**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2008**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2008**
PM	0.33	2.07	0.028	0.028	0.090	0.33	1.29	0.018	0.018	0.084	0.33	2.07	0.099	0.099	0.352
NO_X	8.38	1.05	0.367	0.367	1.164	8.38	0.98	0.342	0.342	1.629	8.38	1.05	1.271	1.271	4.539
SO_2	0.16	1.16	0.008	0.008	0.025	0.16	0.99	0.007	0.007	0.032	0.16	1.16	0.027	0.027	0.097
CO	2.7	2.66	0.299	0.299	0.950	2.7	1.5	0.169	0.169	0.804	2.7	2.66	1.037	1.037	3.705
HC	0.68	2.23	0.063	0.063	0.201	0.68	0.88	0.025	0.025	0.119	0.68	2.23	0.219	0.219	0.782

	2	**Compactor**		**12**	**months (CP)**	**1**	**Pulvimxer Cat**		**3**	**months (CP)**	**1**	**Roller**		**12**	**months (CP)**
	300	**Bhp, each unit**				**300**	**Bhp, each unit**				**300**	**Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2008**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2008**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2008**
PM	0.33	2.07	0.057	0.114	0.542	0.33	2.07	0.057	0.057	0.068	0.33	1.29	0.035	0.035	0.169
NO_X	8.38	1.05	0.733	1.467	6.983	8.38	1.05	0.733	0.733	0.873	8.38	0.98	0.684	0.684	3.259
SO_2	0.16	1.16	0.016	0.031	0.149	0.16	1.16	0.016	0.016	0.019	0.16	0.99	0.013	0.013	0.064
CO	2.7	2.66	0.599	1.197	5.700	2.7	2.66	0.599	0.599	0.713	2.7	1.5	0.338	0.338	1.607
HC	0.68	2.23	0.126	0.253	1.204	0.68	2.23	0.126	0.126	0.150	0.68	0.88	0.050	0.050	0.237

	1	**Scrappers**		**12**	**months (CP)**	**1**	**Asphalt Paver**		**2**	**months (CP)**	**1**	**Tandem Truck**		**12**	**months (CP)**
	350	**Bhp, each unit**				**65**	**Bhp, each unit**				**200**	**Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2008**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2008**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2008**
PM	0.33	1.29	0.041	0.041	0.197	0.722	1.29	0.017	0.017	0.013	0.33	1.29	0.024	0.024	0.113
NO_X	8.38	0.98	0.798	0.798	3.802	8.3	0.98	0.147	0.147	0.117	8.38	0.98	0.456	0.456	2.173
SO_2	0.16	0.99	0.016	0.016	0.074	0.16	1	0.003	0.003	0.002	0.16	0.99	0.009	0.009	0.042
CO	2.7	1.5	0.394	0.394	1.875	2.7	1.5	0.073	0.073	0.058	2.7	1.5	0.225	0.225	1.071
HC	0.68	0.88	0.058	0.058	0.277	0.99	0.88	0.016	0.016	0.012	0.68	0.88	0.033	0.033	0.158

	1	Stake Bed		12	months (CP)	1	Water Truck		12	months (CP)	5	Pickup F150		11	months (CP)
	200	Bhp, each unit				200	Bhp, each unit				200	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008
PM	0.33	2.07	0.038	0.038	0.181	0.33	2.07	0.038	0.038	0.181	0.33	2.07	0.038	0.190	0.828
NO_X	8.38	1.05	0.489	0.489	2.328	8.38	1.05	0.489	0.489	2.328	8.38	1.05	0.489	2.444	10.669
SO_2	0.16	1.16	0.010	0.010	0.050	0.16	1.16	0.010	0.010	0.050	0.16	1.16	0.010	0.052	0.228
CO	2.7	2.66	0.399	0.399	1.900	2.7	2.66	0.399	0.399	1.900	2.7	2.66	0.399	1.995	8.708
HC	0.68	2.23	0.084	0.084	0.401	0.68	2.23	0.084	0.084	0.401	0.68	2.23	0.084	0.421	1.839

	4	Dump Truck 12/14		12	months (CP)	1	Fuel Truck		12	months (CP)	2	Forklift 8000 lbs		11	months (CP)
	340	Bhp, each unit				200	Bhp, each unit				75	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008
PM	0.33	2.07	0.065	0.258	1.229	0.4	2.07	0.046	0.046	0.219	0.722	2.02	0.030	0.061	0.265
NO_X	8.38	1.05	0.831	3.324	15.829	8.38	1.05	0.489	0.489	2.328	8.3	0.96	0.166	0.332	1.449
SO_2	0.16	1.16	0.018	0.071	0.338	0.16	1.16	0.010	0.010	0.050	0.16	1	0.003	0.007	0.029
CO	2.7	2.66	0.678	2.713	12.920	2.7	2.66	0.399	0.399	1.900	2.7	3.68	0.207	0.414	1.807
HC	0.68	2.23	0.143	0.573	2.728	0.68	2.23	0.084	0.084	0.401	0.99	1.07	0.022	0.044	0.193

	2	Diesel Welder		11	months (CP)	2	Generator		8	months (CP)	0	Air Compressor		0	months (CP)
	55	Bhp, each unit				55	Bhp, each unit				55	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008
PM	0.722	2.07	0.023	0.046	0.199	0.722	2.07	0.023	0.046	0.145	0.722	2.07	0.023	0.046	0.000
NO_X	8.3	1.05	0.133	0.266	1.162	8.3	1.05	0.133	0.266	0.845	8.3	1.05	0.133	0.266	0.000
SO_2	0.16	1.16	0.003	0.006	0.025	0.16	1.16	0.003	0.006	0.018	0.16	1.16	0.003	0.006	0.000
CO	2.7	2.66	0.110	0.219	0.958	2.7	2.66	0.110	0.219	0.697	2.7	2.66	0.110	0.219	0.000
HC	0.99	2.23	0.034	0.067	0.294	0.99	2.23	0.034	0.067	0.214	0.99	2.23	0.034	0.067	0.000

	2	Pump 4" & 6"		12	months (CP)	2	Man lifts		3	months (CP)	1	Light Tower		11	months (CP)
	55	Bhp, each unit				50	Bhp, each unit				50	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	Bhp, each unit			TPCP-2008	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008
PM	0.722	2.07	0.023	0.046	0.217	0.722	2.07	0.021	0.042	0.049	0.722	2.07	0.021	0.021	0.091
NO_X	8.3	1.05	0.133	0.266	1.268	8.3	1.05	0.121	0.242	0.288	8.3	1.05	0.121	0.121	0.528
SO_2	0.16	1.16	0.003	0.006	0.027	0.16	1.16	0.003	0.005	0.006	0.16	1.16	0.003	0.003	0.011
CO	2.7	2.66	0.110	0.219	1.045	2.7	2.66	0.100	0.200	0.238	2.7	2.66	0.100	0.100	0.435
HC	0.99	2.23	0.034	0.067	0.321	0.99	2.23	0.031	0.061	0.073	0.99	2.23	0.031	0.031	0.134

	2	Pile Drivers		7	months (CP)	1	Conc. Pump Truck		12	months (CP)
	350	Bhp, each unit				500	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2008
PM	0.33	2.07	0.066	0.133	0.369	0.33	2.07	0.095	0.095	0.452
NO_X	8.38	1.05	0.855	1.711	4.753	8.38	1.05	1.222	1.222	5.820
SO_2	0.16	1.16	0.018	0.037	0.102	0.16	1.16	0.026	0.026	0.124
CO	2.7	2.66	0.698	1.397	3.879	2.7	2.66	0.998	0.998	4.750
HC	0.68	2.23	0.147	0.295	0.819	0.68	2.23	0.211	0.211	1.003

SUMMARY OF EMISSIONS:

	Total g/sec	Daily Avg. Load Fact.	Total Tons per day @ 10 hr/day	TPY-2008	Tons emitted-2008
Pollutant					
PM	1.805	0.5	0.04	6.9	6.9
NO_X	24.107	0.5	0.48	92.5	92.5
SO_2	0.506	0.5	0.01	1.9	1.9
CO	18.088	0.5	0.36	70.5	70.5
HC	3.766	0.5	0.07	14.5	14.5

1 Emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised June 15, 1998, US EPA Office of Mobile Sources. Steady-state emission factors for CI engines obtained from Table 1, assuming 1988-99 model year engines, not subject to Tier 1 or Tier 2 controls. SO2 emission factor based on brake-specific fuel consumption (BSFC) given in Table 1 and assuming default sulfur content (0.05%) required for the construction year in nonroad diesel fuel.
2 In-use adjustment factors obtained from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised April 2004, US EPA Office of Mobile Sources.
3 Sizes of construction equipment diesel engines estimated from data provided by CH-IV.
4 Period of Construction Activites Used for Calculation: Terminal Construction Activities occur January 2008-October 2010
5 Period of Equipment Use referenced from construction activites schedule, provided by CH-IV.

TABLE 9A-37b: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE--- 2009 year; AQCR- 115
LNG Terminal
Onshore Construction Activities

Description	**Onshore Construction Equipment**
BSFC, lb/hp-hr (>100 hp)	0.367
BSFC, lb/hp-hr (<100hp)	0.408
% Sulfur Fuel	0.05
Engine Type	Diesel compression ignition
Avg. Load Factor	0.5
Operating hrs/month	200

907185 grams = 1 ton (US)
TPCP= Tons per construction period, construction during 2009 year
AQCR- 115

	3	**Crane-M.888 Crawler**		**11**	**months (CP)**	**3**	**15 Ton Picker**		**11**	**months (CP)**	**3**	**60 Ton Crane**		**10**	**months (CP)**
	350	**Bhp, each unit**				**150**	**Bhp, each unit**				**290**	**Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2009**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2009**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2009**
PM	0.33	1.29	0.041	0.124	0.542	0.33	2.07	0.028	0.085	0.373	0.33	1	0.027	0.080	0.316
NO_X	8.38	0.98	0.798	2.395	10.456	8.38	1.05	0.367	1.100	4.801	8.38	1	0.675	2.025	8.037
SO_2	0.16	0.99	0.016	0.047	0.204	0.16	1.16	0.008	0.024	0.103	0.16	1	0.013	0.039	0.155
CO	2.7	1.5	0.394	1.181	5.156	2.7	2.66	0.299	0.898	3.919	2.7	1	0.218	0.653	2.589
HC	0.68	0.88	0.058	0.175	0.762	0.68	2.23	0.063	0.190	0.827	0.68	1	0.055	0.164	0.652

	2	**Backhoe**		**12**	**months (CP)**	**0**	**450 Dozer**		**0**	**months (CP)**	**1**	**D6 Dozer**		**1**	**months (CP)**
	150	**Bhp, each unit**				**150**	**Bhp, each unit**				**350**	**Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2009**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2009**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2009**
PM	0.33	2.07	0.028	0.057	0.271	0.33	1.29	0.018	0.000	0.000	0.33	1.29	0.041	0.041	0.016
NO_X	8.38	1.05	0.855	1.711	8.147	8.38	0.98	0.342	0.000	0.000	8.38	0.98	0.798	0.798	0.317
SO_2	0.16	1.16	0.018	0.037	0.174	0.16	1	0.007	0.000	0.000	0.16	0.99	0.016	0.016	0.006
CO	2.7	2.66	0.698	1.397	6.650	2.7	1.5	0.169	0.000	0.000	2.7	1.5	0.394	0.394	0.156
HC	0.68	2.23	0.147	0.295	1.404	0.68	0.88	0.025	0.000	0.000	0.68	0.88	0.058	0.058	0.023

	1	**Front End Loader**		**1**	**months (CP)**	**1**	**Bobcat**		**3**	**months (CP)**	**0**	**Cat 225 TrackHoe**		**0**	**months (CP)**
	150	**Bhp, each unit**				**150**	**Bhp, each unit**				**520**	**Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2009**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2009**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2009**
PM	0.33	2.07	0.028	0.028	0.011	0.33	1.29	0.018	0.018	0.021	0.33	2.07	0.099	0.000	0.000
NO_X	8.38	1.05	0.367	0.367	0.145	8.38	0.98	0.342	0.342	0.407	8.38	1.05	1.271	0.000	0.000
SO_2	0.16	1.16	0.008	0.008	0.003	0.16	0.99	0.007	0.007	0.008	0.16	1.16	0.027	0.000	0.000
CO	2.7	2.66	0.299	0.299	0.119	2.7	1.5	0.169	0.169	0.201	2.7	2.66	1.037	0.000	0.000
HC	0.68	2.23	0.063	0.063	0.025	0.68	0.88	0.025	0.025	0.030	0.68	2.23	0.219	0.000	0.000

	1	**Compactor**		**10**	**months (CP)**	**0**	**Pulvimxer Cat**		**0**	**months (CP)**	**1**	**Roller**		**7**	**months (CP)**
	300	**Bhp, each unit**				**300**	**Bhp, each unit**				**300**	**Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2009**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2009**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2009**
PM	0.33	2.07	0.057	0.057	0.226	0.33	2.07	0.057	0.000	0.000	0.33	1.29	0.035	0.035	0.099
NO_X	8.38	1.05	0.733	0.733	2.910	8.38	1.05	0.733	0.000	0.000	8.38	0.98	0.684	0.684	1.901
SO_2	0.16	1.16	0.016	0.016	0.062	0.16	1.16	0.016	0.000	0.000	0.16	0.99	0.013	0.013	0.037
CO	2.7	2.66	0.599	0.599	2.375	2.7	2.66	0.599	0.000	0.000	2.7	1.5	0.338	0.338	0.938
HC	0.68	2.23	0.126	0.126	0.501	0.68	2.23	0.126	0.000	0.000	0.68	0.88	0.050	0.050	0.139

	0	**Scrappers**		**0**	**months (CP)**	**0**	**Asphalt Paver**		**0**	**months (CP)**	**1**	**Tandem Truck**		**12**	**months (CP)**
	350	**Bhp, each unit**				**65**	**Bhp, each unit**				**200**	**Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2009**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2009**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2009**
PM	0.33	1.29	0.041	0.000	0.000	0.722	1.29	0.017	0.000	0.000	0.33	1.29	0.024	0.024	0.113
NO_X	8.38	0.98	0.798	0.000	0.000	8.3	0.98	0.147	0.000	0.000	8.38	0.98	0.456	0.456	2.173
SO_2	0.16	0.99	0.016	0.000	0.000	0.16	1	0.003	0.000	0.000	0.16	0.99	0.009	0.009	0.042
CO	2.7	1.5	0.394	0.000	0.000	2.7	1.5	0.073	0.000	0.000	2.7	1.5	0.225	0.225	1.071
HC	0.68	0.88	0.058	0.000	0.000	0.99	0.88	0.016	0.000	0.000	0.68	0.88	0.033	0.033	0.158

	1	Stake Bed		12	months (CP)	1	Water Truck		12	months (CP)	5	Pickup F150		12	months (CP)
	200	Bhp, each unit				200	Bhp, each unit				200	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009
PM	0.33	2.07	0.038	0.038	0.181	0.33	2.07	0.038	0.038	0.181	0.33	2.07	0.038	0.190	0.904
NO_X	8.38	1.05	0.489	0.489	2.328	8.38	1.05	0.489	0.489	2.328	8.38	1.05	0.489	2.444	11.639
SO_2	0.16	1.16	0.010	0.010	0.050	0.16	1.16	0.010	0.010	0.050	0.16	1.16	0.010	0.052	0.249
CO	2.7	2.66	0.399	0.399	1.900	2.7	2.66	0.399	0.399	1.900	2.7	2.66	0.399	1.995	9.500
HC	0.68	2.23	0.084	0.084	0.401	0.68	2.23	0.084	0.084	0.401	0.68	2.23	0.084	0.421	2.006

	3	Dump Truck 12/14		12	months (CP)	1	Fuel Truck		10	months (CP)	2	Forklift 8000 lbs		12	months (CP)
	340	Bhp, each unit				200	Bhp, each unit				75	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009
PM	0.33	2.07	0.065	0.194	0.922	0.33	2.07	0.038	0.038	0.151	0.722	2.02	0.030	0.061	0.289
NO_X	8.38	1.05	0.831	2.493	11.872	8.38	1.05	0.489	0.489	1.940	8.3	0.96	0.166	0.332	1.581
SO_2	0.16	1.16	0.018	0.053	0.254	0.16	1.16	0.010	0.010	0.041	0.16	1	0.003	0.007	0.032
CO	2.7	2.66	0.678	2.035	9.690	2.7	2.66	0.399	0.399	1.583	2.7	3.68	0.207	0.414	1.971
HC	0.68	2.23	0.143	0.430	2.046	0.68	2.23	0.084	0.084	0.334	0.99	1.07	0.022	0.044	0.210

	3	Diesel Welder		12	months (CP)	1	Generator		12	months (CP)	1	Air Compressor		10	months (CP)
	55	Bhp, each unit				55	Bhp, each unit				55	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009
PM	0.722	2.07	0.023	0.068	0.326	0.722	2.07	0.023	0.023	0.109	0.722	2.07	0.023	0.068	0.272
NO_X	8.3	1.05	0.133	0.399	1.902	8.3	1.05	0.133	0.133	0.634	8.3	1.05	0.133	0.399	1.585
SO_2	0.16	1.16	0.003	0.009	0.041	0.16	1.16	0.003	0.003	0.014	0.16	1.16	0.003	0.009	0.034
CO	2.7	2.66	0.110	0.329	1.568	2.7	2.66	0.110	0.110	0.523	2.7	2.66	0.110	0.329	1.306
HC	0.99	2.23	0.034	0.101	0.482	0.99	2.23	0.034	0.034	0.161	0.99	2.23	0.034	0.101	0.402

	1	Pump 4" & 6"		5	months (CP)	4	Man lifts		10	months (CP)	1	Light Tower		11	months (CP)
	55	Bhp, each unit				50	Bhp, each unit				50	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009
PM	0.722	2.07	0.023	0.023	0.045	0.722	2.07	0.021	0.083	0.329	0.722	2.07	0.021	0.021	0.091
NO_X	8.3	1.05	0.133	0.133	0.264	8.3	1.05	0.121	0.484	1.921	8.3	1.05	0.121	0.121	0.528
SO_2	0.16	1.16	0.003	0.003	0.006	0.16	1.16	0.003	0.010	0.041	0.16	1.16	0.003	0.003	0.011
CO	2.7	2.66	0.110	0.110	0.218	2.7	2.66	0.100	0.399	1.583	2.7	2.66	0.100	0.100	0.435
HC	0.99	2.23	0.034	0.034	0.067	0.99	2.23	0.031	0.123	0.487	0.99	2.23	0.031	0.031	0.134

	0	Pile Drivers		0	months (CP)	1	Conc. Pump Truck		12	months (CP)
	350	Bhp, each unit				500	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2009
PM	0.33	2.07	0.066	0.000	0.000	0.33	2.07	0.095	0.095	0.452
NO_X	8.38	1.05	0.855	0.000	0.000	8.38	1.05	1.222	1.222	5.820
SO_2	0.16	1.16	0.018	0.000	0.000	0.16	1.16	0.026	0.026	0.124
CO	2.7	2.66	0.698	0.000	0.000	2.7	2.66	0.998	0.998	4.750
HC	0.68	2.23	0.147	0.000	0.000	0.68	2.23	0.211	0.211	1.003

SUMMARY OF EMISSIONS:

Pollutant	Total g/sec	Daily Avg. Load Fact.	Total Tons per day @ 10 hr/day	TPY-2009	Tons emitted-2009
PM	1.489	0.5	0.03	1.5	1.5
NO_X	20.241	0.5	0.40	20.2	20.2
SO_2	0.420	0.5	0.01	0.4	0.4
CO	14.166	0.5	0.28	14.2	14.2
HC	2.961	0.5	0.06	3.0	3.0

1 Emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised June 15, 1998, US EPA Office of Mobile Sources. Steady-state emission factors for CI engines obtained from Table 1, assuming 1988-99 model year engines, not subject to Tier 1 or Tier 2 controls. SO2 emission factor based on brake-specific fuel consumption (BSFC) given in Table 1 and assuming default sulfur content (0.05%) required for the construction year in nonroad diesel fuel.
2 In-use adjustment factors obtained from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised April 2004, US EPA Office of Mobile Sources.
3 Sizes of construction equipment diesel engines estimated from data provided by CH-IV.
4 Period of Construction Activites Used for Calculation: Terminal Construction Activities occur January 2008-October 2010
5 Period of Equipment Use referenced from construction activites schedule, provided by CH-IV.

TABLE 9A-37c: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE--- 2009 year; AQCR- 115
LNG Terminal
Onshore Construction Activities

Description	**Onshore Construction Equipment**
BSFC, lb/hp-hr (>100 hp)	0.367
BSFC, lb/hp-hr (<100hp)	0.408
% Sulfur Fuel	0.05
Engine Type	Diesel compression ignition
Avg. Load Factor	0.5
Operating hrs/month	200

907185 grams = 1 ton (US)
TPCP= Tons per construction period, construction during 2010 year
AQCR- 115

	1	**Crane-M.888 Crawler**		**8**	**months (CP)**	**1**	**15 Ton Picker**		**11**	**months (CP)**	**1**	**60 Ton Crane**		**9**	**months (CP)**
	350	**Bhp, each unit**				**150**	**Bhp, each unit**				**290**	**Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2010**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2010**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2010**
PM	0.33	1.29	0.041	0.041	0.131	0.33	2.07	0.028	0.028	0.124	0.33	1	0.027	0.027	0.095
NO_X	8.38	0.98	0.798	0.798	2.535	8.38	1.05	0.367	0.367	1.600	8.38	1	0.675	0.675	2.411
SO_2	0.16	0.99	0.016	0.016	0.050	0.16	0.16	0.001	0.001	0.005	0.16	1	0.013	0.013	0.047
CO	2.7	1.5	0.394	0.394	1.250	2.7	2.66	0.299	0.299	1.306	2.7	1	0.218	0.218	0.777
HC	0.68	0.88	0.058	0.058	0.185	0.68	2.23	0.063	0.063	0.276	0.68	1	0.055	0.055	0.196

	1	**Backhoe**		**12**	**months (CP)**	**0**	**450 Dozer**		**0**	**months (CP)**	**0**	**D6 Dozer**		**0**	**months (CP)**
	150	**Bhp, each unit**				**150**	**Bhp, each unit**				**350**	**Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2010**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2010**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2010**
PM	0.33	2.07	0.028	0.028	0.136	0.33	1.29	0.018	0.000	0.000	0.33	1.29	0.041	0.000	0.000
NO_X	8.38	1.05	0.855	0.855	4.074	8.38	0.98	0.342	0.000	0.000	8.38	0.98	0.798	0.000	0.000
SO_2	0.16	1.16	0.018	0.018	0.087	0.16	1	0.007	0.000	0.000	0.16	0.99	0.016	0.000	0.000
CO	2.7	2.66	0.698	0.698	3.325	2.7	1.5	0.169	0.000	0.000	2.7	1.5	0.394	0.000	0.000
HC	0.68	2.23	0.147	0.147	0.702	0.68	0.88	0.025	0.000	0.000	0.68	0.88	0.058	0.000	0.000

	0	**Front End Loader**		**0**	**months (CP)**	**0**	**Bobcat**		**0**	**months (CP)**	**0**	**Cat 225 TrackHoe**		**0**	**months (CP)**
	150	**Bhp, each unit**				**150**	**Bhp, each unit**				**520**	**Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2010**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2010**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2010**
PM	0.33	2.07	0.028	0.000	0.000	0.33	1.29	0.018	0.000	0.000	0.33	2.07	0.099	0.000	0.000
NO_X	8.38	1.05	0.367	0.000	0.000	0.33	0.98	0.013	0.000	0.000	8.38	1.05	1.271	0.000	0.000
SO_2	0.16	1.16	0.008	0.000	0.000	0.16	0.99	0.007	0.000	0.000	0.16	1.16	0.027	0.000	0.000
CO	2.7	2.66	0.299	0.000	0.000	2.7	1.5	0.169	0.000	0.000	2.7	2.66	1.037	0.000	0.000
HC	0.68	2.23	0.063	0.000	0.000	0.68	0.88	0.025	0.000	0.000	0.68	2.23	0.219	0.000	0.000

	0	**Compactor**		**0**	**months (CP)**	**0**	**Pulvimxer Cat**		**0**	**months (CP)**	**0**	**Roller**		**0**	**months (CP)**
	300	**Bhp, each unit**				**300**	**Bhp, each unit**				**300**	**Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2010**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2010**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2010**
PM	0.33	2.07	0.057	0.000	0.000	0.33	2.07	0.057	0.000	0.000	0.33	1.29	0.035	0.000	0.000
NO_X	8.38	1.05	0.733	0.000	0.000	8.38	1.05	0.733	0.000	0.000	8.38	0.98	0.684	0.000	0.000
SO_2	0.16	1.16	0.016	0.000	0.000	0.16	1.16	0.016	0.000	0.000	0.16	0.99	0.013	0.000	0.000
CO	2.7	2.66	0.599	0.000	0.000	2.7	2.66	0.599	0.000	0.000	2.7	1.5	0.338	0.000	0.000
HC	0.68	2.23	0.126	0.000	0.000	0.68	2.23	0.126	0.000	0.000	0.68	0.88	0.050	0.000	0.000

	0	**Scrappers**		**0**	**months (CP)**	**1**	**Asphalt Paver**		**3**	**months (CP)**	**1**	**Tandem Truck**		**10**	**months (CP)**
	350	**Bhp, each unit**				**65**	**Bhp, each unit**				**200**	**Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2010**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2010**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP-2010**
PM	0.33	1.29	0.041	0.000	0.000	0.722	1.29	0.017	0.017	0.020	0.33	1.29	0.024	0.024	0.094
NO_X	8.38	0.98	0.798	0.000	0.000	8.3	0.98	0.147	0.147	0.175	8.38	0.98	0.456	0.456	1.811
SO_2	0.16	0.99	0.016	0.000	0.000	0.16	1	0.003	0.003	0.003	0.16	0.99	0.009	0.009	0.035
CO	2.7	1.5	0.394	0.000	0.000	2.7	1.5	0.073	0.073	0.087	2.7	1.5	0.225	0.225	0.893
HC	0.68	0.88	0.058	0.000	0.000	0.99	0.88	0.016	0.016	0.019	0.68	0.88	0.033	0.033	0.132

	1	Stake Bed		10	months (CP)	1	Water Truck		10	months (CP)	5	Pickup F150		10	months (CP)
	200	Bhp, each unit				200	Bhp, each unit				200	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010
PM	0.33	2.07	0.038	0.038	0.151	0.33	2.07	0.038	0.038	0.151	0.33	2.07	0.038	0.190	0.753
NO_X	8.38	1.05	0.489	0.489	1.940	8.38	1.05	0.489	0.489	1.940	8.38	1.05	0.489	2.444	9.699
SO_2	0.16	1.16	0.010	0.010	0.041	0.16	1.16	0.010	0.010	0.041	0.16	1.16	0.010	0.052	0.207
CO	2.7	2.66	0.399	0.399	1.583	2.7	2.66	0.399	0.399	1.583	2.7	2.66	0.399	1.995	7.917
HC	0.68	2.23	0.084	0.084	0.334	0.68	2.23	0.084	0.084	0.334	0.68	2.23	0.084	0.421	1.672

	3	Dump Truck 12/14		10	months (CP)	1	Fuel Truck		10	months (CP)	2	Forklift 8000 lbs		10	months (CP)
	340	Bhp, each unit				200	Bhp, each unit				75	Bhp, each unit			
Pollutant	0.33	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010
PM	0.33	2.07	0.065	0.194	0.768	0.33	2.07	0.038	0.038	0.151	0.722	2.02	0.030	0.061	0.241
NO_X	8.38	1.05	0.831	2.493	9.893	8.38	1.05	0.489	0.000	0.000	8.3	0.96	0.166	0.332	1.317
SO_2	0.16	1.16	0.018	0.053	0.211	0.16	1.16	0.010	0.000	0.000	0.16	1	0.003	0.007	0.027
CO	2.7	2.66	0.678	2.035	8.075	2.7	2.66	0.399	0.000	0.000	2.7	3.68	0.207	0.414	1.643
HC	0.68	2.23	0.143	0.430	1.705	0.68	2.23	0.084	0.000	0.000	0.99	1.07	0.022	0.044	0.175

	2	Diesel Welder		9	months (CP)	1	Generator		10	months (CP)	1	Air Compressor		2	months (CP)
	55	Bhp, each unit				55	Bhp, each unit				55	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010
PM	0.722	2.07	0.023	0.046	0.163	0.722	2.07	0.023	0.023	0.091	0.722	2.07	0.023	0.046	0.036
NO_X	8.3	1.05	0.133	0.266	0.951	8.3	1.05	0.133	0.133	0.528	8.3	1.05	0.133	0.266	0.211
SO_2	0.16	1.16	0.003	0.006	0.020	0.16	1.16	0.003	0.003	0.011	0.16	1.16	0.003	0.006	0.005
CO	2.7	2.66	0.110	0.219	0.784	2.7	2.66	0.110	0.110	0.435	2.7	2.66	0.110	0.219	0.174
HC	0.99	2.23	0.034	0.067	0.241	0.99	2.23	0.034	0.034	0.134	0.99	2.23	0.034	0.067	0.054

	0	Pump 4" & 6"		0	months (CP)	2	Man lifts		9	months (CP)	1	Light Tower		4	months (CP)
	55	Bhp, each unit				50	Bhp, each unit				50	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010
PM	0.722	2.07	0.023	0.000	0.000	0.722	2.07	0.021	0.042	0.148	0.722	2.07	0.021	0.021	0.033
NO_X	8.3	1.05	0.133	0.000	0.000	8.3	1.05	0.121	0.242	0.865	8.3	1.05	0.121	0.121	0.192
SO_2	0.16	1.16	0.003	0.000	0.000	0.16	1.16	0.003	0.005	0.019	0.16	1.16	0.003	0.003	0.004
CO	2.7	2.66	0.110	0.000	0.000	2.7	2.66	0.100	0.200	0.713	2.7	2.66	0.100	0.100	0.158
HC	0.99	2.23	0.034	0.000	0.000	0.99	2.23	0.031	0.061	0.219	0.99	2.23	0.031	0.031	0.049

	0	Pile Drivers		0	months (CP)	1	Conc. Pump Truck		5	months (CP)
	350	Bhp, each unit				500	Bhp, each unit			
Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP-2010
PM	0.33	2.07	0.066	0.000	0.000	0.33	2.07	0.095	0.095	0.188
NO_X	8.38	1.05	0.855	0.000	0.000	8.38	1.05	1.222	1.222	2.425
SO_2	0.16	1.16	0.018	0.000	0.000	0.16	1.16	0.026	0.026	0.052
CO	2.7	2.66	0.698	0.000	0.000	2.7	2.66	0.998	0.998	1.979
HC	0.68	2.23	0.147	0.000	0.000	0.68	2.23	0.211	0.211	0.418

SUMMARY OF EMISSIONS:

Pollutant	Total g/sec	Daily Avg. Load Fact.	Total Tons per day @ 10 hr/day	TPY-2010	Tons emitted- 2010
PM	0.995	0.5	0.02	1.0	1.0
NO_X	11.796	0.5	0.23	11.8	11.8
SO_2	0.241	0.5	0.00	0.2	0.2
CO	8.994	0.5	0.18	9.0	9.0
HC	1.907	0.5	0.04	1.9	1.9

1 Emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised June 15, 1998, US EPA Office of Mobile Sources. Steady-state emission factors for CI engines obtained from Table 1, assuming 1988-99 model year engines, not subject to Tier 1 or Tier 2 controls. SO2 emission factor based on brake-specific fuel consumption (BSFC) given in Table 1 and assuming default sulfur content (0.05%) required for the construction year in nonroad diesel fuel.
2 In-use adjustment factors obtained from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised April 2004, US EPA Office of Mobile Sources.
3 Sizes of construction equipment diesel engines estimated from data provided by CH-IV.
4 Period of Construction Activites Used for Calculation: Terminal Construction Activities occur January 2008-October 2010
5 Period of Equipment Use referenced from construction activites schedule, provided by CH-IV.

TABLE 9A-38: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE--- Construction Period 2009-2010, AQCR 115
LNG Terminal
Pier Rebabilitation

Description	**Onshore Construction Equipment**
BSFC, lb/hp-hr (>100 hp)	0.367
BSFC, lb/hp-hr (<100hp)	0.408
% Sulfur Fuel	0.05
Engine Type	Diesel compression ignition
Avg. Load Factor	0.5
Operating hrs/day	8

TPCP= Tons per construction period, 18 months June 2009-December 2010
AQCR- 115

	3	**400 Amp Welder**		**360**	**days (CP)**	**2**	**Air Compressor**		**360**	**days (CP)**	**1**	**35 Ton Crane**		**360**	**days (CP)**
	30	**Bhp, each unit**				**275**	**Bhp, each unit**				**234**	**Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP**
PM	0.722	2.11	0.013	0.038	0.218	0.33	2.07	0.052	0.104	0.596	0.33	2.07	0.044	0.044	0.25
NO_X	8.3	1.31	0.091	0.272	1.553	8.38	1.05	0.672	1.344	7.682	8.38	1.05	0.572	0.572	3.27
SO_2	0.16	1.29	0.002	0.005	0.030	0.16	1.16	0.014	0.029	0.164	0.16	1.16	0.012	0.012	0.07
CO	2.7	3.22	0.072	0.217	1.242	2.7	2.66	0.549	1.097	6.270	2.7	2.66	0.467	0.467	2.67
HC	0.99	3.16	0.026	0.078	0.447	0.68	2.23	0.116	0.232	1.324	0.68	2.23	0.099	0.099	0.56

	1	**GVW Truck**		**360**	**days (CP)**	**1**	**20 KW Generator**		**360**	**days (CP)**	**1**	**Backhoe**		**360**	**days (CP)**
	340	**Bhp, each unit**				**28**	**Bhp, each unit**				**77**	**Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP**
PM	0.33	2.07	0.065	0.065	0.369	0.722	2.07	0.012	0.012	0.066	0.722	2.07	0.032	0.032	0.183
NO_X	8.38	1.05	0.831	0.831	4.749	8.3	1.05	0.068	0.068	0.387	8.3	1.05	0.186	0.186	1.065
SO_2	0.16	1.16	0.018	0.018	0.101	0.16	1.16	0.001	0.001	0.008	0.16	1.16	0.004	0.004	0.023
CO	2.7	2.66	0.678	0.678	3.876	2.7	2.66	0.056	0.056	0.319	2.7	2.66	0.154	0.154	0.878
HC	0.68	2.23	0.143	0.143	0.818	0.99	2.23	0.017	0.017	0.098	0.99	2.23	0.047	0.047	0.270

	1	**Dump Truck**		**360**	**days (CP)**	**1**	**Conc. Pump Truck**		**360**	**days (CP)**	**1**	**Excavator**		**360**	**days (CP)**
	325	**Bhp, each unit**				**350**	**Bhp, each unit**				**137**	**Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP**
PM	0.33	2.07	0.062	0.062	0.352	0.33	2.07	0.066	0.066	0.380	0.33	0.89	0.011	0.011	0.06
NO_X	8.38	1.05	0.073	0.073	0.419	8.38	1.05	0.855	0.855	4.888	8.38	0.87	0.277	0.277	1.59
SO_2	0.16	1.16	0.002	0.002	0.009	0.16	1.16	0.018	0.018	0.104	0.16	1.03	0.006	0.006	0.04
CO	2.7	2.66	0.060	0.060	0.342	2.7	2.66	0.698	0.698	3.990	2.7	0.44	0.045	0.045	0.26
HC	0.68	2.23	0.013	0.013	0.072	0.68	2.23	0.147	0.147	0.842	0.68	1.4	0.036	0.036	0.21

	Total g/sec	**Daily Avg. Load Fact.**	**Total Tons per day @ 10 hr/day**	**Tons Emissions-2009**	**Tons Emissions-2010**
Pollutant					
PM	0.434	0.5	0.01	1.0	1.5
NOX	4.479	0.5	0.09	10.0	15.6
SO2	0.096	0.5	0.00	0.2	0.3
CO	3.473	0.5	0.07	7.7	12.1
HC	0.812	0.5	0.02	1.8	2.8

Notes:
1 Emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised June 15, 1998, US EPA Office of Mobile Sources. Steady-state emission factors for CI engines obtained from Table 1, assuming 1988-99 model year engines, not subject to Tier 1 or Tier 2 controls. SO2 emission factor based on brake-specific fuel consumption (BSFC) given in Table 1 and assuming default sulfur content (0.05%) required for the construction year in nonroad diesel fuel.
2 In-use adjustment factors obtained from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised April 2004, US EPA Office of Mobile Sources.
3 Sizes of construction equipment diesel engines provided by CH IV.
4 Period of Construction Activites Used for Calculation: Terminal Construction Activities occur January 2008-October 2010

TABLE 9A-39: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE--- Construction Period years 2008-2010, AQCR 115
LNG Terminal
Indirect Emissions from Workers Commuting

Sparrows Point

					PM				NH3				NO_X				VOC				CO			
Vehicle Type	Vehicle Trips per Day	Days per Month	Length of CP (Months)	Round Trip Miles	Emissions Factor (g/mile)	Lbs/day	Tons/CP	TPY	Emissions Factor (g/mile)	Lbs/day	Tons/CP	TPY	Emissions Factor (g/mile)	Lbs/day	Tons/CP	TPY	Emissions Factor (g/mile)	Lbs/day	Tons/CP	TPY	Emissions Factor (g/mile)	Lbs/day	Tons/CP	TPY
Workers Commuting (LDGV)	100	20	32	25	0.02	0.1	0.0	0.0	0.01513	0.1	0.0	0.0	1.86	10.3	3.3	1.2	1.22	6.7	2.2	0.8	14.72	81.1	26.0	9.7
Workers Commuting (LDGT)	100	20	32	25	0.02	0.1	0.0	0.0	0.01513	0.1	0.0	0.0	2.31	12.7	4.1	1.5	1.82	10.0	3.2	1.2	22.24	122.6	39.2	14.7
Site Transportation (Buses)	4	20	36	3	0.3	0.0	0.0	0.0	0.02704	0.0	0.0	0.0	2.31	0.1	0.0	0.0	1.82	0.0	0.0	0.0	22.24	0.6	0.2	0.1
Total						0.2	0.0	0.0		0.2	0.0	0.0		23.0	7.4	2.8		16.8	0.0	2.0		204.3	65.4	24.5

Notes:

Emissions represent total construction worker commuting for both pipeline constrution spreads and the compressor station.

Total of 200 workers assumed to commute to the project sites each day, 20 days/month, for length of construction period (32 months).

Emission factors for NOX, VOC and CO obtained from USEPA AP-42, Appendix J (1998), with the following assumptions - 35 mph, 1995 model year, 50% cold start and 50% stabilized operation, low altitude.

Workers commuting are divided into half Light Duty Gasoline Vehicles (LDGV) and half Light Duty Gasoline Trucks (LDGT).

Emission factors for Ammonia obtained from Table III-3 of USEPA report, "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources", April 200

TABLE 9A-40: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE--- Construction Period years 2008-2010, AQCR 115
LNG Terminal
Summary of Total Onshore Construction Activities

Total Tons/Year During Construction Period									
Pollutant	**Term. Construction Tons Emitted - 2008**	**Term. Construction Tons Emitted - 2009**	**Term. Construction Tons Emitted - 2010**	**Pier Rehab Construction - Tons Emitted- 2009**	**Pier Rehab Construction - Tons Emitted- 2010**	**Indirect Emissions from Commuting Construction Workers (TPY)**	**Total Tons Emitted- 2008**	**Total Tons Emitted- 2009**	**Total Tons Emitted- 2010**
PM_{10}	6.91	1.49	0.99	0.96	1.52	0.03	6.94	2.48	2.54
NO_X	92.50	20.24	11.80	9.95	15.64	2.77	95.26	32.96	30.20
SO_2	1.94	0.42	0.24	0.21	0.33		1.94	0.63	0.58
CO	70.53	14.17	8.99	7.72	12.13	24.52	95.05	46.40	45.64
VOC	14.50	2.96	1.91	1.81	2.84	2.02	16.52	6.78	6.76
NH3**	0.09	0.02	0.01	0.01	0.02	0.02	0.11	0.05	0.05

** NH3 emissions from nonroad diesel engines calculated using proportionality of emissions factors, PM emissions * (.0044/.33).

0.0044 g/Bhp-hr derived from 1.83E-04 lb NH3/gal / (7 lb/gal diesel) x 0.367 lb diesel/Bhp-hr x 454 g/lb)

1.83E-04 lb/gal emission factor obtained from Table III-6 of USEPA report, "Estimating Ammonia Emissions from Anthropogenice Nonagricultural Sources", April 2004.

NH3 emissions from indirect sources calculated seperately, as noted on respective worksheets, using Table III-3 from above-noted USEPA reference.

TABLE 9A-41: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE---- Construction years 2008-2010, AQCR 115
LNG Terminal Dredging Activities
Onshore Start-up Construction Activities

Description	**Onshore Start-Up Const. Equip.**
No. of Units	1 cranes, 1 backhoes, 2 dozers, 2 excavators, 1 loader, 2 trucks, 1 graders and 1 skid steer
BSFC, lb/hp-hr	0.367
% S in Fuel	0.05
Engine Type	Diesel compression ignition
Avg. Load Factor	0.5
Operating hrs/day	12

	1 Cranes				**1 Backhoes**				**2 Dozers**				**2 Excavator**			
	400 Bhp, each unit				**85 Bhp, each unit**				**185 Bhp, each unit**				**225 Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**
PM	0.33	1	0.037	0.037	0.33	2.07	0.016	0.016	0.33	1.29	0.022	0.044	0.33	0.89	0.018	0.037
NO_X	8.38	1	0.931	0.931	8.38	1.05	0.208	0.208	8.38	0.98	0.422	0.844	8.38	0.87	0.456	0.911
SO_2	0.16	1	0.018	0.018	0.16	1.16	0.004	0.004	0.16	0.99	0.008	0.016	0.16	1.03	0.010	0.021
CO	2.7	1	0.300	0.300	2.7	2.66	0.170	0.170	2.7	1.5	0.208	0.416	2.7	0.44	0.074	0.149
HC	0.68	1	0.076	0.076	0.68	2.23	0.036	0.036	0.68	0.88	0.031	0.062	0.68	1.4	0.060	0.119

	1 Loader				**2 Trucks**				**1 Graders**				**1 Skid Steers**			
	300 Bhp, each unit				**355 Bhp, each unit**				**215 Bhp, each unit**				**80 Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**
PM	0.33	2.07	0.076	0.076	0.33	2.07	0.016	0.016	0.33	1.29	0.022	0.044	0.33	1.74	0.036	0.072
NO_X	8.38	1.05	0.978	0.978	8.38	1.05	0.208	0.208	8.38	0.98	0.422	0.844	8.38	0.95	0.498	0.995
SO_2	0.16	1.16	0.021	0.021	0.16	1.16	0.004	0.004	0.16	0.99	0.008	0.016	0.16	1.09	0.011	0.022
CO	2.7	2.66	0.798	0.798	2.7	2.66	0.170	0.170	2.7	1.5	0.208	0.416	2.7	1.83	0.309	0.618
HC	0.68	2.23	0.168	0.168	0.68	2.23	0.036	0.036	0.68	0.88	0.031	0.062	0.68	1.49	0.063	0.127

Pollutant	**Total g/sec**	**Daily Avg. Load Fact.**	**Total Tons per day @ 12 hr/day**	**Total TPY @ 180 day constr sched**
PM	0.341	0.5	0.01	1.5
NO_X	5.919	0.5	0.14	25.4
SO_2	0.124	0.5	0.00	0.5
CO	3.036	0.5	0.07	13.0
HC	0.684	0.5	0.02	2.9

Notes:
1 Emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised June 15, 1998, US EPA Office of Mobile Sources. Steady-state emission factors for CI engines obtained from Table 1, assuming 1988-99 model year engines, not subject to Tier 1 or Tier 2 controls. SO2 emission factor based on brake-specific fuel consumption (BSFC) given in Table 1 and assuming default sulfur content (0.05%) required for the construction year in nonroad diesel fuel.
2 In-use adjustment factors obtained from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised April 2004, US EPA Office of Mobile Sources.
3 Sizes of construction equipment diesel engines provided by Clean Earth Technologies, Inc.
4 Period of Construction Activites Used for Calculation: Dredging Start-up Activities occur during 2008 year.

TABLE 9A-42: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE---- Construction years 2008-2010, AQCR 115
LNG Terminal Dredging Activities
Onshore Processing and Stockpiling Activities

Description	**Onshore Processing Equip.**
No. of Units	2 water trucks, 2 backhoes, 2 dozers, 6 excavators, 4 loaders, 6 trucks, 1 broom sweeper and 2 skid steers
BSFC, lb/hp-hr	0.367
% S in Fuel	0.05
Engine Type	Diesel compression ignition
Avg. Load Factor	0.5
Operating hrs/day	12

	2 Water Trucks				**2 Backhoes**				**2 Dozers**				**6 Excavator**			
	300 Bhp, each unit				**85 Bhp, each unit**				**185 Bhp, each unit**				**300 Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**
PM	0.33	2.07	0.057	0.114	0.33	2.07	0.016	0.032	0.33	1.29	0.022	0.044	0.33	1.29	0.035	0.213
NO_X	8.38	1.05	0.733	1.467	8.38	1.05	0.208	0.416	8.38	0.98	0.422	0.844	8.38	0.98	0.684	4.106
SO_2	0.16	1.16	0.016	0.031	0.16	1.16	0.004	0.009	0.16	0.99	0.008	0.016	0.16	0.99	0.013	0.080
CO	2.7	2.66	0.599	1.197	2.7	2.66	0.170	0.339	2.7	1.5	0.208	0.416	2.7	1.5	0.338	2.025
HC	0.68	2.23	0.126	0.253	0.68	2.23	0.036	0.072	0.68	0.88	0.031	0.062	0.68	0.88	0.050	0.299

	4 Loaders				**6 Trucks**				**1 Sweeper**				**2 Skid Steers**			
	300 Bhp, each unit				**355 Bhp, each unit**				**200 Bhp, each unit**				**80 Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**
PM	0.33	2.07	0.057	0.114	0.33	2.07	0.016	0.032	0.33	2.07	0.035	0.070	0.33	1.74	0.048	0.287
NO_X	8.38	1.05	0.733	1.467	8.38	1.05	0.208	0.416	8.38	1.05	0.452	0.904	8.38	0.95	0.663	3.981
SO_2	0.16	1.16	0.016	0.031	0.16	1.16	0.004	0.009	0.16	1.16	0.010	0.019	0.16	1.09	0.015	0.088
CO	2.7	2.66	0.599	1.197	2.7	2.66	0.170	0.339	2.7	2.66	0.369	0.738	2.7	1.83	0.412	2.471
HC	0.68	2.23	0.126	0.253	0.68	2.23	0.036	0.072	0.68	2.23	0.078	0.156	0.68	1.49	0.084	0.507

Pollutant	**Total g/sec**	**Daily Avg. Load Fact.**	**Total Tons per day @ 12 hr/day**	**Total TPY @ 552 day (2-yr) constr sched**
PM	0.906	0.5	0.02	6.0
NO_X	13.599	0.5	0.32	89.4
SO_2	0.285	0.5	0.01	1.9
CO	8.722	0.5	0.21	57.3
HC	1.672	0.5	0.04	11.0

Notes:
1 Emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised June 15, 1998, US EPA Office of Mobile Sources. Steady-state emission factors for CI engines obtained from Table 1, assuming 1988-99 model year engines, not subject to Tier 1 or Tier 2 controls. SO2 emission factor based on brake-specific fuel consumption (BSFC) given in Table 1 and assuming default sulfur content (0.05%) required for the construction year in nonroad diesel fuel.
2 In-use adjustment factors obtained from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised April 2004, US EPA Office of Mobile Sources.
3 Sizes of construction equipment diesel engines provided by Clean Earth Technologies, Inc.
4 Period of Construction Activites Used for Calculation: Dredging Process Activities occur March 2008-May 2010 (27 months)

TABLE 9A-43: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE---- Construction years 2008-2010, AQCR 115
LNG Terminal Dredging Activities
Offshore - Dredging and Marine Vessel Emissions

Description	**Off-shore Start-Up Const. Equip.**
No. of Units	1 Dredge, 1 Tug, 1 Work/Survey boat, 1 Crew boat, 1 Inspecting/Contractor
BSFC, lb/hp-hr	0.367
% S in Fuel	0.05
Engine Type	Diesel compression ignition
# Operating Days	1
Operating hrs/day	12

	1 Dredge					1 Tug					1 Survey/Work Boat				
	1800 Bhp, each unit					2400 Bhp, each unit					250 Bhp, each unit				
Pollutant	**Factor based on Fractional Load**	**Emissions Factor, g/kw-hr**	**kwhrs/day**	**Ea. Unit g/day**	**Total g/day**	**Factor based on Fractional Load**	**Emissions Factor, g/kw-hr**	**kwhrs/day**	**Ea. Unit g/day**	**Total g/day**	**Factor based on Fractional Load**	**Emissions Factor, g/kw-hr**	**kwhrs/day**	**Ea. Unit g/day**	**Total g/day**
PM	1	0.261	16113.6	4206	4206	0.5	0.272	21485	5839	5839	0.5	0.272	2238	608	608
NO_X	1	10.575	16113.6	170403	170403	0.5	10.805	21485	232134	232134	0.5	10.805	2238	24181	24181
SO_2	1	0.16	16113.6	2578	2578	0.50	0.16	21485	3438	3438	0.16	0.642	2238	1437	1437
CO	1	0.0059	16113.6	95	95	0.5	0.017	21485	359	359	0.5	0.017	2238	37	37
HC	1	0.0067	16113.6	108	108	0.5	0.019	21485	407	407	0.5	0.019	2238	42	42

	1 Crew Boat					1 Inspecting/Contracting Vessel				
	200 Bhp, each unit					684 Bhp, each unit				
Pollutant	**Factor based on Fractional Load**	**Emissions Factor, g/kw-hr**	**kwhrs/day**	**Ea. Unit g/day**	**Total g/day**	**Factor based on Fractional Load**	**Emissions Factor, g/kw-hr**	**kwhrs/day**	**Ea. Unit g/day**	**Total g/day**
PM	0.5	0.272	1790	487	487	0.5	0.272	6123	1664	1664
NO_X	0.5	10.805	1790	19344	19344	0.5	10.805	6123	66158	66158
SO_2	0.50	0.160	1790	286	286	0.50	0.160	6123	980	980
CO	0.5	0.017	1790	30	30	0.5	0.017	6123	102	102
HC	0.5	0.019	1790	34	34	0.5	0.019	6123	116	116

Pollutant	**Total g/day**	**Total Tons per day @ 12 hr/day**	**Total TPY @ 552 days (2-yr) constr sched**
PM	12804	0.01	3.90
NO_X	512220	0.56	155.83
SO_2	8719	0.01	2.65
CO	623	0.001	0.19
HC	707	0.001	0.22

Notes:
1 Emission factors from "Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data" EPA guidance report, February 2000, Office of Air and radiation.
2 Equipment list provided by Han Padron, Inc. and Clean Earth Technologies, Inc.

TABLE 9A-44: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE---- Construction years 2008-2010, AQCR 115
LNG Terminal Dredging Activities
Indirect Emissions from Haul Trucks and Workers Commuting

Vehicle Type	Vehicle Trips per Day	Days per Year	Round Trip Miles	PM			NH3			NO_X			VOC			CO		
				Emissions Factor (g/mile)	Tons/day	Tons/Year	Emissions Factor (g/mile)	Tons/day	Tons/Year	Emissions Factor (g/mile)	Tons/day	Tons/Year	Emissions Factor (g/mile)	Tons/day	Tons/Year	Emissions Factor (g/mile)	Tons/day	Tons/Year
Spoils Haul Trucks (HDDV)	218	276	20	0.3	0.0014	0.40	0.02704	0.0001	0.04	12.69	0.0610	16.83	1.56	0.0075	2.07	6.87	0.0330	9.11
Additive Supply Trucks (HDDV	27	276	20	0.3	0.0002	0.05	0.02704	0.0000	0.00	12.69	0.0076	2.08	1.56	0.0009	0.26	6.87	0.0041	1.13
Workers Commuting (LDGV)	15	276	30	0.02	0.0000	0.00	0.01513	0.0000	0.00	1.86	0.0009	0.25	1.22	0.0006	0.17	14.72	0.0073	2.02
Workers Commuting (LDGT)	15	276	30	0.02	0.0000	0.00	0.01513	0.0000	0.00	2.31	0.0011	0.32	1.82	0.0009	0.25	22.24	0.0110	3.04
Total					0.0016	0.4527		0.0002	0.0445		0.0706	19.4884		0.0099	2.7417		0.0554	15.3014

Notes:

Emission factors for NOX, VOC and CO obtained from USEPA AP-42, Appendix J (1998), with the following assumptions - 35 mph, 1995 model year, 50% cold start and 50% stabilized operation, low altitude, 100°F ambient temperature.

Total days of operation = approximately 12 months x 23 days/month = 276 days @ 2years = 552 Days

Emission factors for Ammonia obtained from Table III-3 of USEPA report, "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources", April 2004.

TABLE 9A-45: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE---- Construction years 2008-2010, AQCR 115
LNG Terminal Dredging Activities
Summary of Total Emissions from Dredging Activities

Total Tons/Year During Construction Period								
Pollutant	**Start-Up Construction - Total Tons/Yr During Construction Period**	**Onshore Construction - Total Tons/Yr During Construction Period**	**Offshore Construction - Total Tons/Yr During Construction Period**	**Indirect Emissions from Commuting Construction Workers and Haul Trucks**	**Total Tons/Yr During Construction Period**	**Tons Emitted 2008**	**Tons Emitted 2009**	**Tons Emitted 2010**
PM_{10}	1.46	5.95	3.90	0.00	11.31	9.67	9.85	4.10
NO_X	25.37	89.37	155.83	19.49	290.05	245.94	264.69	102.17
SO_2	0.53	1.87	2.65		5.06	4.30	4.52	1.89
CO	13.01	57.32	0.19	15.30	85.82	73.68	72.81	23.96
VOC	2.93	10.99	0.22	2.74	16.88	14.55	13.94	4.67
NH3**	0.02	0.08	0.05	0.04	0.20	0.17	0.18	0.05

Maximum Tons/Day During Construction Period					
Pollutant	**Start-Up Construction - Total Tons During Construction Period**	**Processing Construction - Total Tons During Construction Period**	**Offshore Construction - Total Tons During Construction Period**	**Indirect Emissions from Commuting Construction Workers and Haul Trucks**	**Total Tons/Day During Construction Period**
PM_{10}	0.01	0.02	0.01		0.04
NO_X	0.14	0.32	0.56	0.07	1.10
SO_2	0.00	0.01	0.01		0.02
CO	0.07	0.21	0.00	0.06	0.34
VOC	0.02	0.04	0.00	0.01	0.07

** NH3 emissions from nonroad diesel engines calculated using proportionality of emissions factors, PM emissions * (.0044/.33).

0.0044 g/Bhp-hr derived from 1.83E-04 lb NH3/gal / (7 lb/gal diesel) x 0.367 lb diesel/Bhp-hr x 454 g/lb)

1.83E-04 lb/gal emission factor obtained from Table III-6 of USEPA report, "Estimating Ammonia Emissions from Anthropogenice Nonagricultural Sources", April 2004.

NH3 emissions from indirect sources calculated seperately, as noted on respective worksheets, using Table III-3 from above-noted USEPA reference.

TABLE 9A-46: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE---- Construction years 2008-2010, AQCR 115
Power Plant
Onshore Construction Activities

Description	**Onshore Construction Equipment**
BSFC, lb/hp-hr (>100 hp)	0.367
BSFC, lb/hp-hr (<100hp)	0.408
% Sulfur Fuel	0.05
Engine Type	Diesel compression ignition
Avg. Load Factor	0.5
Operating hrs/month	200

907185 grams = 1 ton (US)
TPCP= Tons per construction period

	1	**Crane-M.888 Crawler**		**9**	**months (CP)**	**1**	**15 Ton Picker**		**22**	**months (CP)**	**2**	**60 Ton Crane**		**12**	**months (CP)**
	350	**Bhp, each unit**				**150**	**Bhp, each unit**				**290**	**Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP**
PM	0.33	1.29	0.041	0.041	0.148	0.33	2.07	0.028	0.028	0.248	0.33	1	0.027	0.053	0.253
NO_X	8.38	0.98	0.798	0.798	2.852	8.38	1.05	0.367	0.367	3.201	8.38	1	0.675	1.350	6.429
SO_2	0.16	0.99	0.016	0.016	0.056	0.16	1.16	0.008	0.008	0.068	0.16	1	0.013	0.026	0.124
CO	2.7	1.5	0.394	0.394	1.406	2.7	2.66	0.299	0.299	2.613	2.7	1	0.218	0.435	2.071
HC	0.68	0.88	0.058	0.058	0.208	0.68	2.23	0.063	0.063	0.552	0.68	1	0.055	0.110	0.522

	1	**Backhoe**		**18**	**months (CP)**	**1**	**450 Dozer**		**3**	**months (CP)**	**1**	**D6 Dozer**		**3**	**months (CP)**
	150	**Bhp, each unit**				**150**	**Bhp, each unit**				**350**	**Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP**
PM	0.33	2.07	0.028	0.028	0.203	0.33	1.29	0.018	0.018	0.021	0.33	1.29	0.041	0.041	0.049
NO_X	8.38	1.05	0.855	0.855	6.111	8.38	0.98	0.342	0.342	0.407	8.38	0.98	0.798	0.798	0.951
SO_2	0.16	1.16	0.018	0.018	0.131	0.16	1	0.007	0.007	0.008	0.16	0.99	0.016	0.016	0.019
CO	2.7	2.66	0.698	0.698	4.988	2.7	1.5	0.169	0.169	0.201	2.7	1.5	0.394	0.394	0.469
HC	0.68	2.23	0.147	0.147	1.053	0.68	0.88	0.025	0.025	0.030	0.68	0.88	0.058	0.058	0.069

	1	**Front End Loader**		**14**	**months (CP)**	**1**	**Bobcat**		**22**	**months (CP)**	**1**	**Cat 225 Tracl**		**9**	**months (CP)**
	150	**Bhp, each unit**				**150**	**Bhp, each unit**				**520**	**Bhp, each unit**			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP**
PM	0.33	2.07	0.028	0.028	0.158	0.33	1.29	0.018	0.018	0.155	0.33	2.07	0.099	0.099	0.352
NO_X	8.38	1.05	0.367	0.367	2.037	8.38	0.98	0.342	0.342	2.987	8.38	1.05	1.271	1.271	4.539
SO_2	0.16	1.16	0.008	0.008	0.044	0.16	0.99	0.007	0.007	0.058	0.16	1.16	0.027	0.027	0.097
CO	2.7	2.66	0.299	0.299	1.663	2.7	1.5	0.169	0.169	1.473	2.7	2.66	1.037	1.037	3.705
HC	0.68	2.23	0.063	0.063	0.351	0.68	0.88	0.025	0.025	0.218	0.68	2.23	0.219	0.219	0.782

	1	**Compactor**		**11**	**months (CP)**	**0**	**Pulvimxer Cat**		**0**	**months (CP)**	**1**	**Roller**		**13**	**months (CP)**
	300	**Bhp, each unit**				**300**	**Bhp, each unit**				**300**	**Bhp, each unit**			

Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP
PM	0.33	2.07	0.057	0.057	0.248	0.33	2.07	0.057	0.000	0.000	0.33	1.29	0.035	0.035	0.183
NO_X	8.38	1.05	0.733	0.733	3.201	8.38	1.05	0.733	0.000	0.000	8.38	0.98	0.684	0.684	3.531
SO_2	0.16	1.16	0.016	0.016	0.068	0.16	1.16	0.016	0.000	0.000	0.16	0.99	0.013	0.013	0.069
CO	2.7	2.66	0.599	0.599	2.613	2.7	2.66	0.599	0.000	0.000	2.7	1.5	0.338	0.338	1.741
HC	0.68	2.23	0.126	0.126	0.552	0.68	2.23	0.126	0.000	0.000	0.68	0.88	0.050	0.050	0.257

	0	Scrappers	0	months (CP)	1	Asphalt Paver	3	months (CP)	1	Tandem Truc	23	months (CP)
	350	Bhp, each unit			65	Bhp, each unit			200	Bhp, each unit		

Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP
PM	0.33	1.29	0.041	0.000	0.000	0.722	1.29	0.017	0.017	0.020	0.33	1.29	0.024	0.024	0.216
NO_X	8.38	0.98	0.798	0.000	0.000	8.3	0.98	0.147	0.147	0.175	8.38	0.98	0.456	0.456	4.164
SO_2	0.16	0.99	0.016	0.000	0.000	0.16	1	0.003	0.003	0.003	0.16	0.99	0.009	0.009	0.081
CO	2.7	1.5	0.394	0.000	0.000	2.7	1.5	0.073	0.073	0.087	2.7	1.5	0.225	0.225	2.054
HC	0.68	0.88	0.058	0.000	0.000	0.99	0.88	0.016	0.016	0.019	0.68	0.88	0.033	0.033	0.303

	1	Stake Bed	28	months (CP)	1	Water Truck	18	months (CP)	4	Pickup F150	17	months (CP)
	200	Bhp, each unit			200	Bhp, each unit			200	Bhp, each unit		

Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP
PM	0.33	2.07	0.038	0.038	0.422	0.33	2.07	0.038	0.038	0.271	0.33	2.07	0.038	0.152	1.024
NO_X	8.38	1.05	0.489	0.489	5.432	8.38	1.05	0.489	0.489	3.492	8.38	1.05	0.489	1.955	13.191
SO_2	0.16	1.16	0.010	0.010	0.116	0.16	1.16	0.010	0.010	0.075	0.16	1.16	0.010	0.042	0.282
CO	2.7	2.66	0.399	0.399	4.433	2.7	2.66	0.399	0.399	2.850	2.7	2.66	0.399	1.596	10.767
HC	0.68	2.23	0.084	0.084	0.936	0.68	2.23	0.084	0.084	0.602	0.68	2.23	0.084	0.337	2.273

	2	Dump Truck 12/14	4	months (CP)	1	Fuel Truck	24	months (CP)	2	Forklift 8000	16	months (CP)
	340	Bhp, each unit			200	Bhp, each unit			75	Bhp, each unit		

Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP
PM	0.33	2.07	0.065	0.129	0.205	0.33	2.07	0.038	0.038	0.361	0.722	2.02	0.030	0.061	0.386
NO_X	8.38	1.05	0.831	1.662	2.638	8.38	1.05	0.489	0.489	4.656	8.3	0.96	0.166	0.332	2.108
SO_2	0.16	1.16	0.018	0.036	0.056	0.16	1.16	0.010	0.010	0.100	0.16	1	0.003	0.007	0.043
CO	2.7	2.66	0.678	1.357	2.153	2.7	2.66	0.399	0.399	3.800	2.7	3.68	0.207	0.414	2.629
HC	0.68	2.23	0.143	0.286	0.455	0.68	2.23	0.084	0.084	0.802	0.99	1.07	0.022	0.044	0.280

	1	Diesel Welder	20	months (CP)	1	Generator	23	months (CP)	1	Air Compress	8	months (CP)
	55	Bhp, each unit			55	Bhp, each unit			55	Bhp, each unit		

Pollutant	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP	Em. Factor[1] g/Bhp-hr	In-use Adj. Factor[2]	Ea. Unit g/sec	Total g/sec	TPCP
PM	0.722	2.07	0.023	0.023	0.181	0.722	2.07	0.023	0.023	0.208	0.722	2.07	0.023	0.023	0.072
NO_X	8.3	1.05	0.133	0.133	1.057	8.3	1.05	0.133	0.133	1.215	8.3	1.05	0.133	0.133	0.423
SO_2	0.16	1.16	0.003	0.003	0.023	0.16	1.16	0.003	0.003	0.026	0.16	1.16	0.003	0.003	0.009
CO	2.7	2.66	0.110	0.110	0.871	2.7	2.66	0.110	0.110	1.001	2.7	2.66	0.110	0.110	0.348
HC	0.99	2.23	0.034	0.034	0.268	0.99	2.23	0.034	0.034	0.308	0.99	2.23	0.034	0.034	0.107

	1	Pump 4" & 6"		10	months (CP)	2	Man lifts		19	months (CP)	1	Light Tower		7	months (CP)
	55	Bhp, each unit				50	Bhp, each unit				50	Bhp, each unit			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP**
PM	0.722	2.07	0.023	0.023	0.091	0.722	2.07	0.021	0.042	0.313	0.722	2.07	0.021	0.021	0.058
NO_X	8.3	1.05	0.133	0.133	0.528	8.3	1.05	0.121	0.242	1.825	8.3	1.05	0.121	0.121	0.336
SO_2	0.16	1.16	0.003	0.003	0.011	0.16	1.16	0.003	0.005	0.039	0.16	1.16	0.003	0.003	0.007
CO	2.7	2.66	0.110	0.110	0.435	2.7	2.66	0.100	0.200	1.504	2.7	2.66	0.100	0.100	0.277
HC	0.99	2.23	0.034	0.034	0.134	0.99	2.23	0.031	0.061	0.462	0.99	2.23	0.031	0.031	0.085

	1	Pile Drivers		3	months (CP)	1	Conc. Pump Truck		17	months (CP)
	350	Bhp, each unit				500	Bhp, each unit			
Pollutant	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP**	**Em. Factor[1] g/Bhp-hr**	**In-use Adj. Factor[2]**	**Ea. Unit g/sec**	**Total g/sec**	**TPCP**
PM	0.33	2.07	0.066	0.066	0.079	0.33	2.07	0.095	0.095	0.640
NO_X	8.38	1.05	0.855	0.855	1.018	8.38	1.05	1.222	1.222	8.244
SO_2	0.16	1.16	0.018	0.018	0.022	0.16	1.16	0.026	0.026	0.176
CO	2.7	2.66	0.698	0.698	0.831	2.7	2.66	0.998	0.998	6.729
HC	0.68	2.23	0.147	0.147	0.176	0.68	2.23	0.211	0.211	1.421

SUMMARY OF EMISSIONS:

	Total g/sec	Daily Avg. Load Fact.	Total Tons per day @ 10 hr/day	Avg. Tons/Month	Average TPY
Pollutant					
PM	1.259	0.5	0.02	0.5	5.99
NO_X	16.901	0.5	0.34	6.7	80.48
SO_2	0.352	0.5	0.01	0.1	1.68
CO	12.126	0.5	0.24	4.8	57.74
HC	2.499	0.5	0.05	1.0	11.90

Notes:
1 Emission factors from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised June 15, 1998, US EPA Office of Mobile Sources. Steady-state emission factors for CI engines obtained from Table 1, assuming 1988-99 model year engines, not subject to Tier 1 or Tier 2 controls. SO2 emission factor based on brake-specific fuel consumption (BSFC) given in Table 1 and assuming default sulfur content (0.05%) required for the construction year in nonroad diesel fuel.
2 In-use adjustment factors obtained from "Exhaust Emission Factors for Nonroad Engine Modeling --Compression-Ignition", Report No. NR-009A, revised April 2004, US EPA Office of Mobile Sources.
3 Sizes of construction equipment diesel engines provided by CH IV.
4 Period of Construction Activites Used for Calculation: Power Plant Construction Activities occur June 2008-April 2010

TABLE 9A-47: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE---- Construction years 2008-2010, AQCR 115
Power Plant
Indirect Emissions from Onshore Construction Activities

Sparrows Point

Vehicle Type	Vehicle Trips per Day	Days per Month	Length of Construction Period (CP, Months)	Round Trip Miles	PM				NH3				NO_X				VOC				CO			
					Emissions Factor (g/mile)	Lbs/day	Tons/CP	TPY	Emissions Factor (g/mile)	Lbs/day	Tons/CP	TPY	Emissions Factor (g/mile)	Lbs/day	Tons/CP	TPY	Emissions Factor (g/mile)	Lbs/day	Tons/CP	TPY	Emissions Factor (g/mile)	Lbs/day	Tons/CP	TPY
Workers Commuting (LDGV)	100	20	32	25	0.02	0.1	0.0	0.0	0.01513	0.1	0.0	0.0	1.86	10.3	3.3	1.2	1.22	6.7	2.2	0.8	14.72	81.1	26.0	9.7
Workers Commuting (LDGT)	100	20	32	25	0.02	0.1	0.0	0.0	0.01513	0.1	0.0	0.0	2.31	12.7	4.1	1.5	1.82	10.0	3.2	1.2	22.24	122.6	39.2	14.7
Site Transportation (Buses)	4	20	36	3	0.3	0.0	0.0	0.0	0.02704	0.0	0.0	0.0	2.31	0.1	0.022	0.01	1.82	0.048	0.017	0.01	22.24	0.6	0.2	0.1
Total						0.2	0.0	0.0		0.2	0.0	0.0		23.0	7.4	2.8		16.8	0.0	2.0		204.3	65.4	24.5

Notes:

Emissions represent total construction worker commuting for both pipeline constrution spreads and the compressor station.

Total of 200 workers assumed to commute to the project sites each day, 20 days/month, for length of construction period (32 months).

Emission factors for NOX, VOC and CO obtained from USEPA AP-42, Appendix J (1998), with the following assumptions - 35 mph, 1995 model year, 50% cold start and 50% stabilized operation, low altitude.

Workers commuting are divided into half Light Duty Gasoline Vehicles (LDGV) and half Light Duty Gasoline Trucks (LDGT).

Emission factors for Ammonia obtained from Table III-3 of USEPA report, "Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources", April 2004.

TABLE 9A-48: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE---- Construction years 2
Power Plant
Summary of Total Emissions from Power Plant Construction

Total Tons/Year During Construction Period						
Pollutant	**Power Plant Construction - Total Tons/Yr During Construction Period**	**Indirect Emissions from Commuting Construction Workers**	**Total Tons/Yr During Construction Period**	**Tons Emitted 2008**	**Tons Emitted 2009**	**Tons Emitted 2010**
PM_{10}	5.99	0.03	6.02	3.51	6.02	2.01
NO_X	80.48	2.77	83.25	48.56	83.25	27.75
SO_2	1.68		1.68	0.98	1.68	0.56
CO	57.74	24.52	82.26	47.98	82.26	27.42
VOC	11.90	2.02	13.92	8.12	13.92	4.64
NH3 **	0.08	0.02	0.10	0.06	0.10	0.03

** NH3 emissions from nonroad diesel engines calculated using proportionality of emissions factors, PM emissions * (.0044/.33).

0.0044 g/Bhp-hr derived from 1.83E-04 lb NH3/gal / (7 lb/gal diesel) x 0.367 lb diesel/Bhp-hr x 454 g/lb)

1.83E-04 lb/gal emission factor obtained from Table III-6 of USEPA report, "Estimating Ammonia Emissions from Anthropogenice Nonagricultural Sources", April 2004.

NH3 emissions from indirect sources calculated seperately, as noted on respective worksheets, using Table III-3 from above-noted USEPA reference.

TABLE 9A-49: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE
Sparrows Point Project
AQCR 115 Construction Emissions Summary (Annual Emissions in Tons/Year)

2008- Tons Emitted

AQCR 115- Baltimore and Harford Counties	NOX	CO	VOC	PM-10/2.5	SOX	NH3	Acetaldehyde	Acrolein	Benzene	1,3-Butadiene	Formaldehyde
Terminal	95.26	95.05	16.52	6.94	1.94	0.11	0.88	0.05	0.33	0.03	1.95
Dredging	245.94	73.68	14.55	9.67	4.30	0.17	0.77	0.04	0.29	0.03	1.72
TOTAL (w/o powerplant)	341.20	168.73	31.07	16.61	6.25	0.28	1.65	0.09	0.62	0.06	3.67
Powerplant	48.56	47.98	8.12	3.51	0.98	0.06	0.43	0.02	0.16	0.02	0.96
TOTAL (w/ powerplant)	389.76	216.71	39.19	20.12	7.22	0.34	2.08	0.12	0.78	0.08	4.62

2009- Tons Emitted

AQCR 115- Baltimore and Harford Counties	NOX	CO	VOC	PM-10/2.5	SOX	NH3	Acetaldehyde	Acrolein	Benzene	1,3-Butadiene	Formaldehyde
Pipeline	393.80	297.56	60.84	28.48	14.65	0.39	3.22	0.18	1.22	0.12	7.18
Terminal	32.96	46.40	6.78	2.48	0.63	0.05	0.36	0.02	0.14	0.01	0.80
Dredging	264.69	72.81	13.94	9.85	4.52	0.18	0.74	0.04	0.28	0.03	1.65
TOTAL (w/o powerplant)	691.45	416.76	81.57	40.81	19.81	0.23	4.32	0.24	1.63	0.16	9.63
Powerplant	83.25	82.26	13.92	6.02	1.68	0.10	0.74	0.04	0.28	0.03	1.64
TOTAL (w/ powerplant)	774.70	499.02	95.48	46.83	21.48	0.33	5.06	0.29	1.91	0.19	11.27

2010- Tons Emitted

AQCR 115- Baltimore and Harford Counties	NOX	CO	VOC	PM-10/2.5	SOX	NH3	Acetaldehyde	Acrolein	Benzene	1,3-Butadiene	Formaldehyde
Pipeline	35.17	30.82	5.50	2.41	1.51	0.04	0.29	0.02	0.11	0.01	0.65
Terminal	30.20	45.64	6.76	2.54	0.58	0.05	0.36	0.02	0.14	0.01	0.80
Dredging	102.17	23.96	4.67	4.10	4.52	0.05	0.25	0.01	0.09	0.01	0.55
TOTAL (w/o powerplant)	167.55	100.42	16.93	9.05	6.61	0.11	0.90	0.05	0.34	0.03	2.00
Powerplant	27.75	27.42	4.64	2.01	0.56	0.03	0.25	0.01	0.09	0.01	0.55
TOTAL (w/ powerplant)	195.29	127.84	21.57	11.06	7.16	0.14	1.14	0.06	0.43	0.04	2.54

	Air Toxics Fractions of VOC[1]
Acetaldehyde	0.053
Acrolein	0.003
Benzene	0.02
1,3-Butadiene	0.002
Formaldehyde	0.118

1. Identified hazardous air pollutants are EPA-targeted Mobile Source Air Toxics (MSAT). Air toxics VOC fractions were obtained from Table 3.1-3, "Final Regulatory Analylsis: Control of Emissions from Nonroad Diesel Engines", EPA420-R-04-007, May 2004).
2. The project schedule that serves as a basis for emissions calculations is based on multiple factors, with both dependant and independant variables associated with project planning as of the time of this filing. Variations in the project schedule may occur as the project permitting and planning proceeds; these schedule variations may result in a change in the period over which emissions occur. This change could shift the timing of emissions occurrence; however, the total emissions quantity and duration are not expected to change.

TABLE 9A-50: EMISSIONS CALCULATIONS - CONSTRUCTION PHASE
Sparrows Point Project
AQCRs 115, 114, 196, and 045 Construction Emissions Summary (Annual Emissions in Tons)
All Emissions From LNG Terminal Construction Activities in AQCR 115
All Emissions From Pipeline Construction Activities in AQCR 114, 196 and 045

AQCR-115 (MD)	2008	2009	2010
$PM_{10}/PM_{2.5}$	20.12	46.83	11.06
NO_X	389.76	774.70	195.29
SO_2	7.22	21.48	7.16
CO	216.71	499.02	127.84
VOC	39.19	95.48	21.57
NH3	0.34	0.33	0.14
Acetaldehyde	2.08	5.06	1.14
Acrolein	0.12	0.29	0.06
Benzene	0.78	1.91	0.43
1,3-Butadiene	0.08	0.19	0.04
Formaldehyde	4.62	11.27	2.54

AQCR-196 (PA)	2008	2009	2010
$PM_{10}/PM_{2.5}$		4.27	0.54
NO_X		60.45	7.75
SO_2		2.67	0.33
CO		45.06	6.60
VOC		8.95	1.20
NH3		0.06	0.01
Acetaldehyde		0.47	0.06
Acrolein		0.03	0.00
Benzene		0.18	0.02
1,3-Butadiene		0.02	0.00
Formaldehyde		1.06	0.14

AQCR-114 (MD)	2008	2009	2010
$PM_{10}/PM_{2.5}$		4.84	0.22
NO_X		65.41	3.23
SO_2		1.98	0.14
CO		49.88	2.83
VOC		10.52	0.51
NH3		0.07	0.00
Acetaldehyde		0.56	0.03
Acrolein		0.03	0.00
Benzene		0.21	0.01
1,3-Butadiene		0.02	0.00
Formaldehyde		1.24	0.06

AQCR-045 (PA)	2008	2009	2010
$PM_{10}/PM_{2.5}$		16.77	2.11
NO_X		237.23	30.42
SO_2		10.49	1.31
CO		176.83	25.88
VOC		35.12	4.71
NH3		0.23	0.03
Acetaldehyde		1.86	0.25
Acrolein		0.11	0.01
Benzene		0.70	0.09
1,3-Butadiene		0.07	0.01
Formaldehyde		4.14	0.56

Total MD	2008	2009	2010
$PM_{10}/PM_{2.5}$	20.12	51.67	11.28
NO_X	389.76	840.11	198.53
SO_2	7.22	23.46	7.30
CO	216.71	548.89	130.67
VOC	39.19	106.00	22.07
NH3	0.34	0.39	0.15
Acetaldehyde	2.08	5.62	1.17
Acrolein	0.12	0.32	0.07
Benzene	0.78	2.12	0.44
1,3-Butadiene	0.08	0.21	0.04
Formaldehyde	4.62	12.51	2.60

Total PA	2008	2009	2010
$PM_{10}/PM_{2.5}$		21.05	2.64
NO_X		297.69	38.17
SO_2		13.16	1.64
CO		221.90	32.48
VOC		44.06	5.91
NH3		0.29	0.04
Acetaldehyde		2.34	0.31
Acrolein		0.13	0.02
Benzene		0.88	0.12
1,3-Butadiene		0.09	0.01
Formaldehyde		5.20	0.70