Construction Operations Emissions Summary

Table 1. Estimated Daily Construction Emissions

Phase	NO_X	SO_X	CO	PM_{10}	VOC
	lbs/day	lbs/day	lbs/day	lbs/day	lbs/day
Mooring	3,366	47	744	117	235
Offshore Pipelay	14,527	203	3,209	507	1,013
Onshore Pipelay	1,337	19	295	47	93

Table 2. Estimated Project Construction Emissions

Phase	NO_X	SO_X	CO	PM_{10}	VOC
	tons	tons	tons	tons	tons
Mooring	75.7	1.1	16.7	2.6	5.3
Offshore Pipelay	326.8	4.6	72.2	11.4	22.8
Onshore Pipelay	30.1	0.4	6.6	1.0	2.1

Mooring

Equipment Type	Number of Devices	Engine Rating BHP Each	Operation hrs/day	Average Load	Working Days	Power Output bhp-hr/day	NOX lbs/day	SOX lbs/day	CO lbs/day	PM10 lbs/day	ROC lbs/day	NOX lbs	SOX lbs	CO lbs	PM10 lbs	ROC lbs
AHTS Mains	1	10,750	12	35%	45	45150	1046.60	14.60	231.23	36.51	73.02	47,097	657	10,405	1,643	3,286
AHTS Bow Thruster	1	1,000	2	80%	45	1600	37.09	0.52	8.19	1.29	2.59	1,669	23	369	58	116
AHTS Generators	1	250	12	50%	45	1500	34.77	0.49	7.68	1.21	2.43	1,565	22	346	55	109
AHTS Mains	1	13,750	12	35%	45	57750	1338.68	18.68	295.75	46.70	93.40	60,241	841	13,309	2,101	4,203
AHTS Bow Thruster	1	1,000	2	80%	45	1600	37.09	0.52	8.19	1.29	2.59	1,669	23	369	58	116
AHTS Generators	1	250	12	50%	45	1500	34.77	0.49	7.68	1.21	2.43	1,565	22	346	55	109
Supply Boat Mains	2	3,750	12	35%	45	31500	730.19	10.19	161.32	25.47	50.94	32,858	458	7,259	1,146	2,292
Supply Boat Bow Thruster	2	500	2	80%	45	1600	37.09	0.52	8.19	1.29	2.59	1,669	23	369	58	116
Supply Boat Generators	2	250	12	50%	45	3000	69.54	0.97	15.36	2.43	4.85	3,129	44	691	109	218
TOTAL EMISSIONS, lbs							**3,366**	**47**	**744**	**117**	**235**	**151,462**	**2,113**	**33,463**	**5,284**	**10,567**

TOTAL EMISSIONS, tons	**75.7**	**1.1**	**16.7**	**2.6**	**5.3**

Emission Factors	Units	NOX	SOX	CO	PM10	ROC	Reference
Diesel	lb/BHP-hr	0.0232	0.0003	0.0051	0.0008	0.0016	SCAQMD CEQA Air Quality Handbook, Table A9-3-A, 37.1% efficiency, 0.05% S
Gasoline	lb/BHP-hr	0.0062	0.0003	0.2350	0.0003	0.0089	SCAQMD CEQA Air Quality Handbook, Table A9-3-A, 37.1% efficiency
Truck	grams/mile	13.050		1.390	0.280	0.480	CARB EMFAC 2001 (70 F, 50% RH, non-enhanced I/M, 35 mph)

Mooring Assumptions

1x AHTS @ 12,000 Hp
1x AHTS @ 15,000 Hp
2x Supply vessels @ 4,500 Hp each
2x Barges to transport anchors and equipment (not powered)

Onshore Pipelay

Equipment Type	Number of Devices	Engine Rating BHP Each	Operation hrs/day	Average Load	Working Days	Power Output bhp-hr/day	NOX lbs/day	SOX lbs/day	CO lbs/day	PM10 lbs/day	ROC lbs/day	NOX lbs	SOX lbs	CO lbs	PM10 lbs	ROC lbs
Large Drilling Rig (onshore)	2	500	24	80%	45	19200	445.07	6.21	98.33	15.53	31.05	20,028	279	4,425	699	1,397
Mud Cleaner Generator	1	400	24	80%	45	7680	178.03	2.48	39.33	6.21	12.42	8,011	112	1,770	279	559
Mud Pumps	2	500	24	80%	45	19200	445.07	6.21	98.33	15.53	31.05	20,028	279	4,425	699	1,397
Fluid Handling Pumps	4	75	24	80%	45	5760	133.52	1.86	29.50	4.66	9.32	6,008	84	1,327	210	419
Track Backhoe	1	200	12	50%	45	1200	27.82	0.39	6.15	0.97	1.94	1,252	17	277	44	87
All Terrain Forklift	1	100	12	50%	45	600	13.91	0.19	3.07	0.49	0.97	626	9	138	22	44
Light Towers	6	20	12	100%	45	1440	33.38	0.47	7.37	1.16	2.33	1,502	21	332	52	105
18 Wheeler Truck (mi/day)	120				45		3.45	0.00	0.37	0.07	0.13	155	-	17	3	6
Welding Generator	6	50	2	80%	45	480	11.13	0.16	2.46	0.39	0.78	501	7	111	17	35
Large Crane (100 ton)	2	200	6	50%	45	1200	27.82	0.39	6.15	0.97	1.94	1,252	17	277	44	87
Small Crane (35 ton)	2	130	6	50%	45	780	18.08	0.25	3.99	0.63	1.26	814	11	180	28	57
TOTAL EMISSIONS, lbs							**1,337**	**19**	**296**	**47**	**93**	**60,177**	**838**	**13,277**	**2,097**	**4,193**

TOTAL EMISSIONS, tons	**30.1**	**0.4**	**6.6**	**1.0**	**2.1**

Emission Factors	Units	NOX	SOX	CO	PM10	ROC	Reference
Diesel	lb/BHP-hr	0.0232	0.0003	0.0051	0.0008	0.0016	SCAQMD CEQA Air Quality Handbook, Table A9-3-A, 37.1% efficiency, 0.05% S
Gasoline	lb/BHP-hr	0.0062	0.0003	0.2350	0.0003	0.0089	SCAQMD CEQA Air Quality Handbook, Table A9-3-A, 37.1% efficiency
Truck	grams/mile	13.050		1.390	0.280	0.480	CARB EMFAC 2001 (70 F, 50% RH, non-enhanced I/M, 35 mph)

Pipelay Assumptions

1x Large drilling rig (onshore) with auxiliaries, 2700 total Hp
1x Track backhoe, 200 Hp
1x All terrain forklift, 100 Hp
6x Light towers, 20 Hp each
6x Diesel welding generators, 50 Hp each
2x Cranes (shore side), 100 ton capacity (pipe handling / loading), 200 Hp
2x Cranes (shore side), 35 ton capacity (pipe handling / loading), 130 Hp
2x 18 wheelers each traveling total of 2,700 mi/construction period

Offshore Pipelay

Equipment Type	Number of Devices	Engine Rating BHP Each	Operation hrs/day	Average Load	Working Days	Power Output bhp-hr/day	NOX lbs/day	SOX lbs/day	CO lbs/day	PM10 lbs/day	ROC lbs/day	NOX lbs	SOX lbs	CO lbs	PM10 lbs	ROC lbs
Small Drilling Rig (offshore)	1	400	24	80%	45	7680	178.03	2.48	39.33	6.21	12.42	8,011	112	1,770	279	559
Light Towers	4	20	12	100%	45	960	22.25	0.31	4.92	0.78	1.55	1,001	14	221	35	70
Welding Generator	4	50	2	50%	45	200	4.64	0.06	1.02	0.16	0.32	209	3	46	7	15
Lorelay Pipe Ship	1	22,721	24	100%	45	545310	12640.60	176.38	2792.69	440.95	881.90	568,827	7,937	125,671	19,843	39,686
Supply Boat Mains	4	3,750	12	35%	45	63000	1460.38	20.38	322.64	50.94	101.89	65,717	917	14,519	2,292	4,585
Supply Boat Bow Thruster	4	500	2	80%	45	3200	74.18	1.04	16.39	2.59	5.18	3,338	47	737	116	233
Supply Boat Generators	4	250	12	50%	45	6000	139.08	1.94	30.73	4.85	9.70	6,259	87	1,383	218	437
Welding Generator	4	50	2	80%	45	320	7.42	0.10	1.64	0.26	0.52	334	5	74	12	23
TOTAL EMISSIONS, lbs							**14,527**	**203**	**3,209**	**507**	**1,013**	**653,696**	**9,121**	**144,421**	**22,803**	**45,607**

TOTAL EMISSIONS, tons	**326.8**	**4.6**	**72.2**	**11.4**	**22.8**

Emission Factors	Units	NOX	SOX	CO	PM10	ROC	Reference
Diesel	lb/BHP-hr	0.0232	0.0003	0.0051	0.0008	0.0016	SCAQMD CEQA Air Quality Handbook, Table A9-3-A, 37.1% efficiency, 0.05% S
Gasoline	lb/BHP-hr	0.0062	0.0003	0.2350	0.0003	0.0089	SCAQMD CEQA Air Quality Handbook, Table A9-3-A, 37.1% efficiency
Truck	grams/mile	13.050		1.390	0.280	0.480	CARB EMFAC 2001 (70 F, 50% RH, non-enhanced I/M, 35 mph)

Pipelay Assumptions

1x Small Drilling Rig (offshore) with auxiliaries, 400 Hp
4x Light towers, 20 Hp each
1x Dynamically positioned pipelay vessel "Lorelay", average Hp
4x Supply vessels @ 4,500 Hp each
4x Pipe barges to transport pipe and material offshore (not powered)
4x Diesel welding generators, 50 Hp each

Lorelay Pipe Ship	Qty	Each KW	All KW	Avg Load	Total KW	Total HP
Bow Thruster, tunnel	2	2,600	5,200	35%	1,820	2,441
Bow Thruster, retractable	1	3,000	3,000	35%	1,050	1,408
Stern Thruster, propeller	1	6,000	6,000	35%	2,100	2,816
Stern Thruster, azimuth	2	3,000	6,000	35%	2,100	2,816
Stern Thruster, tunnel	1	1,000	1,000	35%	350	469
Generator Capacity, total	1	19,047	19,047	50%	9,524	12,771
					16,944	22,721