

CRC GRUBB LEASE INTAKE AND OUTFALL DECOMMISSIONING PROJECT
CRITERIA POLLUTANTS & GREENHOUSE GAS EMISSIONS
TABLE 1: CONSTRUCTION EMISSIONS SUMMARY

Source	Peak Day Emissions, lbs/day										Annual Emissions, tons/year										
	NO _x	ROG	PM ₁₀	PM _{2.5}	DPM	CO	SO ₂	N ₂ O	CH ₄	CO ₂	NO _x	ROG	PM ₁₀	PM _{2.5}	DPM	CO	SO ₂	N ₂ O	CH ₄	CO ₂	MTCO ₂ e
Offshore Intake Structure Removal	37.54	1.49	1.83	1.81	1.69	27.70	7.17	0.11	0.50	3,902	0.075	0.003	0.004	0.004	0.003	0.055	0.014	0.000	0.001	7.8	7.2
Onshore Casing & Pipeline Decommissioning	9.21	0.52	0.30	0.16	0.22	14.79	0.05	0.32	0.71	4,768	0.009	0.001	0.000	0.000	0.000	0.048	0.000	0.000	0.003	12.0	11.0
Onshore Pipeline Recovery & Removal	8.00	0.67	0.25	0.14	0.24	21.19	0.06	0.27	1.39	6,095	0.018	0.003	0.001	0.000	0.001	0.094	0.000	0.000	0.006	22.9	21.1
Onshore Vault Removal and Seawall Construction	9.63	0.60	2.20	0.18	0.25	15.87	0.05	0.33	1.06	5,393	0.016	0.002	0.010	0.002	0.001	0.076	0.000	0.000	0.005	19.4	17.9
Offshore Pipeline Removal Option*	38.66	1.52	1.85	1.82	1.70	27.74	7.17	0.16	0.50	4,133	0.076	0.003	0.004	0.004	0.003	0.055	0.014	0.000	0.001	7.8	7.2
Average Peak Pounds/Day	20.61	0.96	1.29	0.82	0.82	21.46	2.90	0.24	0.83	4,858	-	-	-	-	-	-	-	-	-	-	-
Peak Day within Ventura County	38.66	1.52	2.20	1.82	1.70	27.74	7.17	0.33	1.39	6,095	-	-	-	-	-	-	-	-	-	-	-
Total Annual Emissions within Ventura County	-	-	-	-	-	-	-	-	-	-	0.194	0.012	0.018	0.010	0.009	0.328	0.029	0.002	0.017	70.1	64.4
GHG - MTCO₂e conversions																		298	25	1	-
Total MTCO₂e, tons/yr																		64.4			
Daily Peak NOx lbs	38.66																				
Daily Peak ROG, lbs	1.52																				

Notes:

- EPA Emission Factors for Greenhouse Gas Inventories (298 for N₂O, 25 for CH₄, and 1 for CO₂, April 2014, Table 9- Global Warming Potentials (GWPs) - http://www.epa.gov/sites/production/files/2015-07/documents/emission-factors_2014.pdf

* - This option, if implemented, will take place within the Onshore Pipeline Recovery & Removal phase and would result in peak NOx emissions of 46.96 lbs/day for four days only.

CH₄ - Methane

CO - Carbon monoxide

CO₂ - Carbon Dioxide

DPM - Diesel Particulate Matter

GHG - Greenhouse Gas

MTCO₂e - Metric tons of carbon dioxide equivalent

NO_x - Oxides of Nitrogen

N₂O - Nitrous Oxide

PM_{2.5} - Particulate Matter 2.5 Microns or Less

PM₁₀ - Particulate Matter 10 Microns or Less

ROG - Reactive Organic Gases

SO₂ - Sulfur Dioxide

CRC GRUBB LEASE INTAKE AND OUTFALL DECOMMISSIONING PROJECT
CRITERIA POLLUTANTS & GREENHOUSE GAS EMISSIONS
TABLE 4: ONSHORE PIPELINE RECOVERY AND REMOVAL

On-Site Sources

Source	BHP	Load Factor	Number	Hours/Day	Duration (days)	Emission Factors (g/bhp-hr)										Emissions (lb/day)										Total Emissions (tons)									
						NO _x	ROG	PM ₁₀	PM _{2.5}	DPM	CO	SO ₂	N ₂ O	CH ₄	CO ₂	NO _x	ROG	PM ₁₀	PM _{2.5}	DPM	CO	SO ₂	N ₂ O	CH ₄	CO ₂	NO _x	ROG	PM ₁₀	PM _{2.5}	DPM	CO	SO ₂	N ₂ O	CH ₄	CO ₂
Bulldozer	435	43	1	2	9	0.260	0.060	0.008	0.008	0.018	2.200	0.005	0.004	0.154	510	0.21	0.049	0.007	0.007	0.015	1.814	0.004	0.003	0.127	421	0.001	0.000	0.000	0.000	0.000	0.008	0.000	0.000	0.001	1.894
Excavator	310	38	3	10	9	0.260	0.060	0.008	0.008	0.018	2.200	0.005	0.004	0.152	504	2.03	0.467	0.062	0.062	0.140	17.140	0.039	0.033	1.184	3929	0.009	0.002	0.000	0.000	0.001	0.077	0.000	0.000	0.005	17.680
Winch	50	40	1	10	9	0.260	0.060	0.008	0.008	0.018	3.700	0.005	0.004	0.153	506	0.11	0.026	0.004	0.004	0.008	1.631	0.002	0.002	0.067	223	0.001	0.000	0.000	0.000	0.000	0.007	0.000	0.000	0.000	1.005
Total																2.35	0.543	0.072	0.072	0.163	20.59	0.045	0.038	1.379	4573	0.011	0.002	0.000	0.000	0.001	0.093	0.000	0.000	0.006	20.58

On-Road Sources

Source	Peak Round Trips/Day	Average Round Trips/Day	Number of Vehicles	Length of Round Trip (miles)	Duration (days)	Emission Factors (g/mile)										Peak Day Emissions (lb/day)										Total Emissions (tons)										
						NO _x	ROG	PM ₁₀	PM _{2.5}	DPM	CO	SO ₂	N ₂ O	CH ₄	CO ₂	NO _x	ROG	PM ₁₀	PM _{2.5}	DPM	CO	SO ₂	N ₂ O	CH ₄	CO ₂	NO _x	ROG	PM ₁₀	PM _{2.5}	DPM	CO	SO ₂	N ₂ O	CH ₄	CO ₂	
Passenger Vehicle - LDA	1	1	3	20	9	0.100	0.025	0.0471	0.0015	0.0000	0.822	0.003	0.009	0.006	322	0.013	0.003	0.006	0.000	0.000	0.109	0.000	0.001	0.001	42.6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.192
Light-Duty Truck - LDT2 (offsite)	1	1	4	20	9	0.075	0.011	0.1090	0.0057	0.0060	0.096	0.004	0.014	0.008	399	0.013	0.002	0.019	0.001	0.001	0.017	0.001	0.002	0.001	70.4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.317	
Light-Duty Truck - LDT2 (onsite)	1	1	1	1	9	0.114	0.097	0.1157	0.0122	0.0127	0.767	0.005	0.089	0.005	647	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	1.43	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006		
Med-Heavy Duty - T6 Utility (offsite)	1	1	1	20	2	1.629	0.014	0.1578	0.0084	0.009	0.053	0.010	0.162	0.001	1060	0.072	0.001	0.007	0.000	0.000	0.002	0.000	0.007	0.000	46.7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.047		
Heavy Duty Haul Truck - T7T (offsite)	1	1	1	150	2	5.987	0.135	0.1618	0.0754	0.079	0.508	0.014	0.236	0.014	1470	1.98	0.045	0.054	0.025	0.026	0.168	0.005	0.078	0.005	486	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.49		
Heavy Duty Haul Truck - T7T (offsite)	1	1	5	54	3	5.987	0.135	0.1618	0.0754	0.079	0.508	0.014	0.236	0.014	1470	3.56	0.080	0.096	0.045	0.047	0.302	0.008	0.140	0.009	875	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.31		
Total																5.64	0.131	0.182	0.071	0.074	0.600	0.015	0.229	0.016	1522	0.008	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	2.360	

Notes:

- Hours per day and durations provided by Project Applicant.
- Round trips for LDA and LDT2 is estimated from Ventura Area (20-miles).
- Estimated trucks to transport rental equipment from the Paso Robles area, 150 mile round trip.
- Estimated trucks to transport demolition debris to Ventura Regional Sanitation Landfill, 54 mile round trip.
- Estimated service truck from Ventura area, 20 mile round trip.

**CRC GRUBB LEASE INTAKE AND OUTFALL DECOMMISSIONING PROJECT
 CRITERIA POLLUTANTS & GREENHOUSE GAS EMISSIONS
 TABLE 5: ONSHORE VAULT REMOVAL AND SEAWALL CONSTRUCTION**

On-Site Sources

Source	BHP	Load Factor	Number	Hours/Day	Duration (days)	Emission Factors (g/bhp-hr)										Emissions (lb/day)										Total Emissions (tons)									
						NO _x	ROG	PM ₁₀	PM _{2.5}	DPM	CO	SO ₂	N ₂ O	CH ₄	CO ₂	NO _x	ROG	PM ₁₀	PM _{2.5}	DPM	CO	SO ₂	N ₂ O	CH ₄	CO ₂	NO _x	ROG	PM ₁₀	PM _{2.5}	DPM	CO	SO ₂	N ₂ O	CH ₄	CO ₂
Crane	220	29	3	10	10	0.260	0.060	0.008	0.008	0.018	2.200	0.005	0.004	0.153	507	1.10	0.253	0.034	0.034	0.076	9.283	0.021	0.018	0.646	2140	0.005	0.001	0.000	0.000	0.000	0.046	0.000	0.000	0.003	10.700
Excavator	310	38	1	10	10	0.260	0.060	0.008	0.008	0.018	2.200	0.005	0.004	0.152	504	0.68	0.156	0.021	0.021	0.047	5.713	0.013	0.011	0.395	1310	0.003	0.001	0.000	0.000	0.000	0.029	0.000	0.000	0.002	6.548
Total															1.77	0.409	0.055	0.055	0.122	15.00	0.034	0.029	1.040	3450	0.009	0.002	0.000	0.000	0.001	0.075	0.000	0.000	0.005	17.25	

On-Road Sources

Source	Peak Round Trips/Day	Average Round Trips/Day	Number of Vehicles	Length of Round Trip (miles)	Duration (days)	Emission Factors (g/mile)										Peak Day Emissions (lb/day)										Total Emissions (tons)									
						NO _x	ROG	PM ₁₀	PM _{2.5}	DPM	CO	SO ₂	N ₂ O	CH ₄	CO ₂	NO _x	ROG	PM ₁₀	PM _{2.5}	DPM	CO	SO ₂	N ₂ O	CH ₄	CO ₂	NO _x	ROG	PM ₁₀	PM _{2.5}	DPM	CO	SO ₂	N ₂ O	CH ₄	CO ₂
Passenger Vehicle - LDA	1	1	3	20	10	0.100	0.025	0.0471	0.0015	0.0000	0.822	0.003	0.009	0.006	322	0.013	0.003	0.006	0.000	0.000	0.109	0.000	0.001	0.001	42.56	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.213
Light-Duty Truck - LDT2 (offsite)	1	1	4	20	10	0.075	0.011	0.1090	0.0057	0.0060	0.096	0.004	0.014	0.008	399	0.013	0.002	0.019	0.001	0.001	0.017	0.001	0.002	0.001	70.38	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.352	
Light-Duty Truck - LDT2 (onsite)	1	1	1	1	10	0.114	0.097	0.1157	0.0122	0.0127	0.767	0.005	0.089	0.005	647	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	1.43	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	
Med-Heavy Duty - T6 Utility (offsite)	1	1	1	20	2	1.629	0.014	0.1578	0.0084	0.009	0.053	0.010	0.162	0.001	1060	0.072	0.001	0.007	0.000	0.000	0.002	0.000	0.007	0.000	46.74	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.047	
Heavy Duty Haul Truck - T7T (offsite)	1	1	1	150	2	5.987	0.135	0.1618	0.0754	0.079	0.508	0.014	0.236	0.014	1470	1.98	0.045	0.054	0.025	0.026	0.168	0.005	0.078	0.005	486	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.49	
Heavy Duty Haul Truck - T7T (offsite)	1	1	5	54	2	5.987	0.135	0.1618	0.0754	0.079	0.508	0.014	0.236	0.014	1470	3.56	0.080	0.096	0.045	0.047	0.302	0.008	0.140	0.009	875	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.87	
Heavy Duty Trucks - T7TC (offsite)	1	1	5	5	1	8.023	0.236	0.2640	0.1732	0.1810	0.995	0.015	0.245	0.016	1531	0.442	0.013	0.015	0.010	0.010	0.055	0.001	0.014	0.001	84.4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.042	
Heavy Duty Trucks - T7TC (offsite)	1	1	5	20	1	8.023	0.236	0.2640	0.1732	0.1810	0.995	0.015	0.245	0.016	1531	1.769	0.052	0.058	0.038	0.040	0.219	0.003	0.054	0.003	337	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.169	
Total															7.85	0.196	0.255	0.119	0.124	0.874	0.019	0.297	0.020	1944	0.007	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	2.190	

Notes:

- Hours per day and durations provided by Project Applicant.
- Round trips for LDA and LDT2 is estimated from Ventura Area (20-miles).
- Estimated trucks to transport rental equipment from the Paso Robles area, 150 mile round trip.
- Estimated trucks to transport demolition debris to Ventura Regional Sanitation Landfill, 54 mile round trip.
- Estimated vacuum truck from Ventura area, 20 mile round trip.
- Estimated vacuum truck on offsite roads near site, 5 mile round trip.
- Estimated service truck from Ventura area, 20 mile round trip.

**CRC GRUBB LEASE INTAKE AND OUTFALL DECOMMISSIONING PROJECT
CRITERIA POLLUTANTS & GREENHOUSE GAS EMISSIONS
TABLE 6: OFFSHORE PIPELINE REMOVAL OPTION***

On-Site Sources

Source	BHP	Load Factor	Number	Hours/Day	Duration (days)	Emission Factors (g/bhp-hr)										Emissions (lb/day)										Total Emissions (tons)									
						NO _x	ROG	PM ₁₀	PM _{2.5}	DPM	CO	SO ₂	N ₂ O	CH ₄	CO ₂	NO _x	ROG	PM ₁₀	PM _{2.5}	DPM	CO	SO ₂	N ₂ O	CH ₄	CO ₂	NO _x	ROG	PM ₁₀	PM _{2.5}	DPM	CO	SO ₂	N ₂ O	CH ₄	CO ₂
Dive Support Vessel	1000	45	1	3	4	9.119	0.362	0.402	0.402	0.402	6.705	1.743	0.027	0.121	925	27.14	1.078	1.197	1.197	1.197	19.955	5.188	0.080	0.359	2754	0.054	0.002	0.002	0.002	0.002	0.040	0.010	0.000	0.001	5.508
Dive Air System	50	43	1	24	4	9.119	0.362	0.536	0.536	0.429	6.705	1.743	0.027	0.121	925	10.37	0.412	0.610	0.610	0.488	7.627	1.983	0.031	0.137	1053	0.021	0.001	0.001	0.001	0.001	0.015	0.004	0.000	0.000	2.105
Total															37.51	1.49	1.81	1.81	1.69	27.58	7.17	0.11	0.50	3806	0.075	0.003	0.004	0.004	0.003	0.055	0.014	0.000	0.001	7.6	

On-Road Sources

Source	Peak Round Trips/Day	Average Round Trips/Day	Number of Vehicles	Length of Round Trip (miles)	Duration (days)	Emission Factors (g/mile)										Peak Day Emissions (lb/day)										Total Emissions (tons)										
						NO _x	ROG	PM ₁₀	PM _{2.5}	DPM	CO	SO ₂	N ₂ O	CH ₄	CO ₂	NO _x	ROG	PM ₁₀	PM _{2.5}	DPM	CO	SO ₂	N ₂ O	CH ₄	CO ₂	NO _x	ROG	PM ₁₀	PM _{2.5}	DPM	CO	SO ₂	N ₂ O	CH ₄	CO ₂	
Passenger Vehicle - LDA	1	1	3	10	4	0.100	0.025	0.0471	0.0015	0.000	0.822	0.003	0.009	0.006	322	0.007	0.002	0.003	0.000	0.000	0.054	0.000	0.001	0.000	21.3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.043
Light-Duty Truck - LDT2 (offsite)	1	1	3	10	4	0.075	0.011	0.1090	0.0057	0.006	0.096	0.004	0.014	0.008	399	0.005	0.001	0.007	0.000	0.000	0.006	0.000	0.001	0.001	26.4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.053
Heavy Duty Haul Truck - T7T (offsite)	1	1	2	43	1	5.987	0.135	0.1618	0.0754	0.079	0.508	0.014	0.236	0.014	1470	1.135	0.026	0.031	0.014	0.015	0.096	0.003	0.045	0.003	279	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.139
Total															1.15	0.028	0.041	0.015	0.015	0.157	0.003	0.046	0.004	326	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.23	

Notes:

*Hours per day and durations provided by Project Applicant.

*Round trips for LDA and LDT2 is estimated from Ventura Area (10-miles).

*Estimated trucks to transport demolition debris to Ventura Regional Sanitation Landfill, 43 mile round trip.

* - This option, if implemented, will take place within the Onshore Pipeline Recovery & Removal phase.

CRC GRUBB LEASE INTAKE AND OUTFALL DECOMMISSIONING PROJECT
CRITERIA POLLUTANTS & GREENHOUSE GAS EMISSIONS
TABLE 7: CONSTRUCTION ACTIVITY - FUGITIVE DUST EMISSIONS

Activity	Source	Source Units	Number of Days	Emission Factor	Emission Factor, Units	Peak Day Emissions (lbs/day)		Total Emissions (tons)	
						PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Onshore Casing & Pipeline Decommissioning - Pot Hole Excavation	0.02	acres/day	5	0.429	lbs PM10/day/acre	0.0086	0.0008	0.00002	0.00000
Onshore Vault Removal and Seawall Construction - Grading	0.06	acres/day	10	0.429	lbs PM10/day/acre	0.0257	0.0023	0.00013	0.00001
Onshore Vault Removal and Seawall Construction - Vault Demolition	230	tons/day	10	0.007917	lbs/ton	1.8209	0.0000	0.0091	0.0014
Onshore Vault Removal and Seawall Construction - Truck Loading	230	tons/day	10	1.72E-04	lbs/ton	0.0396	0.0060	0.0002	0.0000
Total						1.89	0.01	0.0095	0.0014

Fugitive Dust Emissions: Inputs for the Table

Emission factors based on following inputs

Mean number of rain days per year	0	worst case
Silt content of soil, fill storage pile, %	1.5	SCAQMD default value
Roadway inputs (paved and unpaved, as per URBEMIS)		
Roads mean vehicle weight, tons	20.61	based on project description, HHDT + LDT and vehicles weight (average of full and empty)
unpaved dirt road silt content, %	8.4	AP-42 construction sites
Truck Loading inputs		
k, particle size multiplier, default=0.35 for pm10	0.35	
U, mean wind speed, mph range 1.3-15	8.15	
M, moisture content, default=12%	12	
PM2.5/PM10 ratio truck loading	0.15	
Site grading emissions from CalEEMod for grading	0.091	ratio of PM2.5/PM10 CalEEMod
Demolition materials, tons/yds ³	1.000	estimated for concrete debris
Fill materials, tons/yds ³	1.000	estimated for soils
Mitigation: demolition area watering (fraction reduction)	0.61	0.61 for watering every 3 hours (SCAQMD)
Mitigation: grading/dist area watering (fraction reduction)	0.61	0.61 for watering every 3 hours (SCAQMD)
Mitigation: dumping soil moisture (fraction reduction)	0.69	0.69 for minimum 12% soil moisture (SCAQMD)
Mitigation: storage piles (fraction reduction)	0.90	0.90 for watering by hand and covering (SCAQMD)
Mitigation: roads (fraction reduction)	0.55	0.55 for watering 3X per day (SCAQMD), 0.80 for soil binders applied monthly (AP-42)

Notes:

PM2.5/PM10 ratio as per AP-42 k factor for PM10 and PM2.5

Demolition dust calculations as per EPA AP-42 11.19 and 13.2.4

Truck loading dumping cut/fill based on CalEEMod

Storage pile emissions based on SCAQMD Handbook (URBEMIS does not address emissions from storage piles)

Paved and unpaved road dust emissions based on AP-42 2006 (unpaved) Chapt 13. EPA AP-42 2006 is the same as URBEMIS and CalEEMod

One month assumes 22 days of activity, as per URBEMIS

