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# FINAL INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL IMPACT STATEMENT / ENVIRONMENTAL IMPACT REPORT (EIS/EIR)

## APPENDIX H: AIR QUALITY ANALYSIS

PORT OF LONG BEACH  
DEEP DRAFT NAVIGATION STUDY  
Los Angeles County, California

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October 2021



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## **Appendix H1. Criteria Pollutant and GHG Emission Calculations**

### **H1.1 Introduction**

This appendix describes the methods and assumptions used to quantify criteria pollutant and greenhouse gas (GHG) emissions generated from construction of the Deep Draft Navigation Project and Alternatives. Section H1.2 defines the pollutants, averaging times, analysis years, emission sources, and geographical boundaries included in the emission calculations under NEPA and CEQA. Section H1.3 describes the methodology for the construction emission calculations. Detailed source activity and emission calculation tables for the Action Alternatives are included as attachments at the end of this appendix.

Implementation of the No Action and Action Alternatives would not result in operational activities and would therefore not result in operational impacts. Furthermore, the No Action Alternative would not construct an Approach Channel to Pier J South, deepen the West Basin Channel, deepen the Approach Channel, widen portions of the Main Channel, or construct the Local Service Facilities. However maintenance dredging of existing channel depths would continue, when and where needed. The No Action Alternative would not increase ship calls or throughput, and would not incrementally increase operational emissions within the study area. Future maintenance dredging and disposal of dredged material would be subject to separate detailed analysis under CEQA and/or NEPA. Emission calculations associated with maintenance dredging are not included in this appendix. Please refer to Chapter 2 and Chapter 4 for a detailed explanation of the No Action Alternative and Action Alternatives, respectively.

The Action Alternatives are described in detail in Section 4 (Plan Formulation). The No Action Alternative is also described in detail in Section 4 (Plan Formulation), is assessed qualitatively in Sections 5.5 (Air Quality Environmental Consequences) and 5.6 (Greenhouse Gas Environmental Consequences) of the DEIS/DEIR, and therefore is not included in this appendix.

### **H1.2 Emission Parameters**

#### **Pollutants**

The air quality analysis quantified emissions of the following criteria pollutants or precursors: volatile organic compounds (VOC), carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>), particulate matter less than 10 microns (PM<sub>10</sub>), particulate matter less than 2.5 microns (PM<sub>2.5</sub>), and sulfur oxides (SO<sub>x</sub>). Emissions of diesel particulate matter (DPM), a subset of PM<sub>10</sub>, were also quantified because DPM is the dominant toxic air contaminant in the health risk evaluation conducted for this EIS/EIR. Estimates of lead emissions were not calculated. Lead emissions from mobile sources in California have significantly decreased due to the near elimination of lead in fuels. Emission factors developed by the U.S. Environmental Protection Agency, the California Air Resources Board, and the South Coast Air Quality Management District (SCAQMD), including those in CalEEMod, the SCAQMD-approved emission modeling software, do not provide estimated emissions for lead. Little to no quantifiable and foreseeable lead emissions would be generated by the Action Alternatives.

The air quality analysis also quantified emissions of the following GHGs: carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), and methane (CH<sub>4</sub>), which are products of engine exhaust. Global warming potential (GWP) is the ability of a gas or aerosol to trap heat in the atmosphere. GHGs have varying amounts of GWP. By convention, CO<sub>2</sub> is assigned a GWP of 1. In comparison, CH<sub>4</sub> has a GWP of 25, which means that it has a global warming effect 25 times greater than CO<sub>2</sub> on an equal-mass basis. N<sub>2</sub>O has a GWP of 298 (IPCC, 2007). To account for their GWP, GHG emissions are reported in the emission tables as carbon dioxide

equivalent (CO<sub>2</sub>e). CO<sub>2</sub>e was calculated by multiplying each GHG emission by its GWP and adding the results together to produce a single, combined emission rate representing all GHGs. The GWPs used in the emission calculations are shown in tables at the end of this appendix.

### Averaging Times

For criteria pollutants, annual emissions were calculated for comparison against the General Conformity applicability rates in nonattainment or maintenance areas (40 CFR Part 93). For CEQA impacts, peak daily (24-hour) emissions were calculated for comparison against the South Coast Air Quality Management District (SCAQMD) daily significance thresholds (SCAQMD 2019). Annual, peak 24-hour, peak 8-hour (for CO), and peak 1-hour criteria pollutant emissions were calculated to support the dispersion modeling analysis used to predict local ambient pollutant concentrations.

For GHG, annual and total construction emissions were calculated for presentation under NEPA. For CEQA impacts, total construction emissions were amortized over a 30-year period in accordance with SCAQMD guidance (SCAQMD 2008) for comparison against the SCAQMD CO<sub>2</sub>e annualized significant emissions threshold for industrial projects (SCAQMD 2019).

### Analysis Years

Construction emissions were based on anticipated equipment utilization in each construction year. Tables detailing construction schedules for all Action Alternatives are included as attachments at the end of this appendix. The following general construction schedules were used for the Action Alternatives:

- All Action Alternatives include widening of the Main channel to the authorized depth of -76' mean lower low water (MLLW), construction of structural improvements to the Pier J breakwater as described in Section 4.6.5, deepening Pier J Basin, berth dredging at the Pier J South Slips in the Pier J Basin and along Pier T, and, with implementation of MM-AQ-1, use of electric clamshell dredges and construction of an electrical substation at Pier J. Dredged material would be disposed at the Surfside Borrow Area, LA-2, and/or LA-3.
- Alternative 2. In addition, Alternative 2 includes constructing an approach channel to Pier J South to -53 ft MLLW; constructing a turning basin outside of Pier J South to -53 ft MLLW; deepening the West Basin to -53 ft MLLW; and the deepening of the Approach Channel to -78' MLLW. Construction activities associated with Alternative 2 would occur over approximately 34 months, from January 2024 through October 2026.
- Alternative 3. In addition to activities common to all Action Alternatives, Alternative 3 includes constructing an approach channel to Pier J South to -55 ft MLLW; constructing a turning basin outside of Pier J South to -55 ft MLLW; deepening the West Basin to -55 ft MLLW; and deepening of the Approach Channel to -80' MLLW. Construction activities associated with Alternative 3 would occur over approximately 40 months, from January 2024 through April 2027.
- Alternative 4. In addition to activities common to all Action Alternatives, Alternative 4 includes constructing an approach channel to Pier J South to -57 ft MLLW; constructing a turning basin outside of Pier J South to -57 ft MLLW; deepening the West Basin to -57 ft MLLW; deepening of the Approach Channel to -82' MLLW, Pier T wharf upgrades, and Pier J wharf upgrades. Construction activities associated with Alternative 4 would take occur over approximately 62 months, from January 2024 through February 2029.
- Alternative 5. In addition to activities common to all Action Alternatives, Alternative 5 includes constructing an approach channel to Pier J South to -55 ft MLLW; constructing a turning basin outside of Pier J South to -55 ft MLLW; deepening the West Basin to -55 ft MLLW; the deepening of the Approach Channel to -80' MLLW (like Alternative 3), and the construction of a Standby Area adjacent



to the Main Channel dredged to -67' MLLW, with a 300-foot diameter center anchor placement with a depth of -73' MLLW. Construction activities associated with Alternative 5 would take occur over approximately 50 months, from January 2024 through February 2028.

For the purposes of the emission calculations, construction activities were assumed to occur in the earliest foreseeable years. Should construction be delayed beyond the assumed dates, emissions would be lower due to the gradual replacement of older construction equipment with newer equipment meeting the existing State and federal off-road engine emission standards.

## Emission Sources

Criteria pollutant and GHG emission sources associated with construction activities would include dredging equipment (hopper and clamshell dredges), harbor craft, off-road construction equipment, on-road vehicles, and worker vehicles. Earth-disturbance activities, such as grading, bulldozing, material handling, and driving over paved and unpaved surfaces, would be minimal and would generate particulate matter (PM) emissions in the form of fugitive dust. The same emission sources and utilization assumptions were analyzed under both NEPA (including General Conformity applicability) and CEQA. The emission calculation approach for each source category is described in Section H1.3 of this appendix.

## Geographical Boundaries

All activity and therefore all emissions would occur within the South Coast Air Basin (SCAB). Therefore, criteria pollutant and GHG construction emissions were calculated within the SCAB to align with the General Conformity applicability rates in nonattainment and maintenance areas and SCAQMD daily emission significance thresholds.

### H1.3 Methodology for Construction Emission Calculations

Air pollutant emissions from the proposed construction activities were calculated using the most current emission factors and methods available at the time the calculations were performed. Annual emissions, which were used for General Conformity applicability, GHG impacts, and dispersion modeling, were quantified based on the annual construction activity assumptions in each year of construction. To estimate peak daily construction emissions, emissions were first calculated for the individual construction activities and then summed for overlapping construction activities, per the anticipated construction schedule. The combination of construction activities producing the highest daily emissions was then selected as the peak day and compared to the SCAQMD emission thresholds for construction. The specific emission calculation approach for each construction source category is described below.

The Federal actions annual VOC, CO, NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> (including precursors) emission rates for each Action Alternative were first calculated for the applicable analysis years. For purposes of this evaluation, emissions of NO<sub>2</sub> are assumed to equal emissions of NO<sub>x</sub> since NO<sub>2</sub> is the predominant form of NO<sub>x</sub>. These emissions are associated with mobile and area sources expected to be used for on-site construction-related purposes. The annual emissions (tons per year) from each of the Action Alternatives were then compared to the General Conformity applicability rates, presented in Table 5.5-2, to assess General Conformity applicability under the Clean Air Act.

**Dredging Equipment.** As described in Section 4, hopper dredges would be used to dredge sediment in the Approach Channel and transport and place the dredged sediment at nearshore (primarily), LA-2, and/or LA-3 placement sites. Hopper dredge engines are large marine engines used for propulsion and operation of the dredging equipment. Emission factors for hopper dredge propulsion and auxiliary engines therefore

reflect existing USEPA marine engine standards (USEPA 2016a). Hopper dredge propulsion and auxiliary engines were assumed to be Tier 2 marine diesel engines, per USACE.

As described in Section 4, clamshell dredges would be used to dredge the Main Channel, West Basin, Pier J Basin (including berth dredging at Pier J South), Pier J Approach Channel and turning basin, Pier T Berths, and Standby Area (Alternative 5 only). Clamshell dredges are not self-propelled and emission factors for these engines reflect existing USEPA non-road engine standards; clamshell dredge engines were assumed to be Tier 3 non-road diesel engines, per USACE and the Port.

Both hopper dredge and clamshell dredge utilization, schedule, activity, engine size, and load factors were based on project-specific dredging requirements presented in tables at the end of this appendix.

**Harbor Craft.** Tugboats would be used to position clamshell dredges and transport sediment-laden barges to the nearshore, LA-2, and/or LA-3 placement sites. Crew boats and survey boats would also be used to support dredging activities. Harbor craft utilization, schedule, activity, and engine sizes, provided by the USACE and the Port, were used in the analysis. Harbor craft load factors were obtained from the Port 2013 Emissions Inventory (POLB 2013), which is consistent with the most recent Port emissions inventory (POLB 2017) available at the time the emission calculations were performed.

Emission factors for harbor craft reflect USEPA marine engine standards (USEPA 2016a) and harbor craft engine types common at the Port, as documented in the Port's Air Emissions Inventory (POLB 2017). The Port's 2017 Air Emissions Inventory identifies that most harbor craft propulsion engines operating at the Port in 2017 were USEPA Tier 2 diesel engines and that approximately half of all harbor craft auxiliary engines were Tier 3. This analysis conservatively used USEPA Tier 2 harbor craft emission standards for both propulsion and auxiliary engines.

**Off-road Construction Equipment.** Off-road construction equipment would be used during non-dredging activities such as construction of the electrical substation at Pier J (only for mitigated emissions), Pier J breakwater improvements, and wharf upgrades. Equipment type, utilization, schedule, activity, and engine sizes, provided by the Port, were used in the analysis, as shown in Table H1.6.

Criteria pollutant and GHG emission factors for off-road construction equipment reflect USEPA non-road engine standards (USEPA 2016b) and CARB requirements. Emission factors were generated using CARB's 2017 OFFROAD Inventory Model (CARB 2017a) for an average equipment fleet composition in the SCAB.

**On-Road Construction Vehicles and Worker Vehicles.** Construction vehicles would be used during non-dredging activities to deliver construction materials, such as sheetpiles (for wharf upgrades and Pier J breakwater improvements) and concrete (for the electrical substation), and haul away waste. Vehicle type, utilization, schedule, activity, and engine sizes, provided by the Port, were used in the analysis, as shown in Table H1.6.

Criteria pollutant and GHG emission factors reflect USEPA on-road engine standards and CARB requirements. Emission factors were generated using CARB's on-road EMFAC2017 model for truck and passenger vehicle fleets representative of the South Coast region (CARB 2017b). Emissions include engine exhaust, entrained road dust, and brake and tire wear.

**Fugitive Dust.** PM<sub>10</sub> and PM<sub>2.5</sub> fugitive dust emissions from construction activities, such as grading, bulldozing, and material and debris loading and handling were calculated using emission factors from EPA's AP-42 emission factor handbook (USEPA 2006) and default parameters for soil and wind conditions

from CalEEMod (CAPCOA 2016). PM<sub>10</sub> and PM<sub>2.5</sub> emissions from on- and off-site paved road dust were calculated using CARB's Miscellaneous Process Methodology (CARB 2016).

#### **H1.4 Quantified Regulations for Construction**

The following regulations were incorporated into the unmitigated emission calculations for the Action Alternatives, as applicable. These regulations are described in greater detail in the Air Quality Regulatory Setting and GHG Regulatory Setting of the EIS/EIR.

- Dredging Equipment: USEPA Emission Standards for Nonroad Diesel Engines; USEPA Emission Standards for Marine Diesel Engines; CARB In-Use Off-Road Diesel-Fleets Regulation; CARB Portable Diesel-Fueled Engines Air Toxic Control Measure (ATCM).
- Harbor Craft: USEPA Emission Standards for Marine Diesel Engines; CARB Commercial Harbor Craft Regulation.
- Off-Road Construction Equipment: USEPA Emission Standards for Nonroad Diesel Engines; California Diesel Fuel Regulations (Ultra Low Sulfur Diesel [ULSD] fuel); CARB In-Use Off-Road Diesel-Fleets Regulation; CARB Portable Diesel-Fueled Engines ATCM; Statewide Portable Equipment Registration Program.
- On-Road Construction Vehicles and Worker Vehicles: USEPA Emission Standards for On-Road Trucks; California Diesel Fuel Regulations (ULSD fuel); Heavy Duty Vehicle National Program to reduce fuel consumption and GHG; State Standards for Light-Duty Vehicle GHG Emissions and Corporate Average Fuel Economy Standards.
- Fugitive Dust: SCAQMD Rule 403 Compliance.

#### **H1.5 Quantified Mitigation Measures for Construction**

The EIS/EIR identifies mitigation measures designed to reduce construction emissions. The following three measures were quantified in the mitigated emission calculations for the Action Alternatives. The remaining mitigation measures were assessed qualitatively in the EIS/EIR.

**MM-AQ-1:** Electric clamshell dredge. This mitigation measure requires the use of an electric clamshell dredge and requires the construction of an electrical substation at Pier J to provide electric power to the clamshell dredge. The analysis assumes that it would not be possible to electrify all equipment on a clamshell dredge. Therefore, per communication with Dutra Group, a dredging contractor, the analysis conservatively assumes that 90 percent of clamshell dredge horsepower-hours would be electric (Dutra Group 2019). Criteria pollutant and GHG emissions associated with construction of the electrical substation, and indirect GHG emissions associated with clamshell dredge electricity consumption, were quantified for all mitigated Action Alternatives.

**MM-AQ-2:** Fleet Modernization of Harbor Craft. Harbor craft (tugboats, crew boats, and survey boats) with Category 1 or Category 2 marine engines shall meet USEPA Tier 3 emission standards for marine engines. In addition, the construction contractor shall require all construction tugboats that home fleet in the San Pedro Bay Ports: 1) to shut down their main engines and 2) to refrain from using auxiliary engines while at dock and instead to use electrical shore power, if feasible.

**MM-AQ-3:** Fleet Modernization of Construction Equipment. Self-propelled, diesel-fueled off-road construction equipment 25 hp or greater shall meet USEPA/CARB Tier 4 emission standards for non-road equipment.

## H1.6 References for Appendix H1

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USEPA 2016b. Non-road Compression-Ignition Engines: Exhaust Emissions Standards. EPA-420-B-16-022. March 2016. Available: <https://www.epa.gov/emission-standards-reference-guide/epa-emission-standards-non-road-engines-and-vehicles>. Accessed: June 2019.

## **Appendix H1. Tables**

H1.1	Construction Schedule: Alternative 2. (-53 and -78 MLLW)
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**Table H1.1****Construction Schedule: Alternative 2. (-53 and -78 MLLW)**

Task ID	Alternative 2	Start Date	End Date	Duration (days)
1	Electrical Substation Construction at Pier J (mitigation only)	1/1/2024	12/31/2024	60
2	Pier J Breakwater Construction	1/1/2024	3/2/2024	54
3	Approach Channel (hopper dredge 1,144,000 CY)	1/1/2025	3/8/2025	66
4	Main Channel Widening (clam shell dredge 1,065,000 CY)	1/1/2025	6/28/2025	178
5	West Basin (clam shell dredge 501,000 CY)	6/29/2025	9/21/2025	84
6	Pier J Basin (clam shell dredge 202,000 CY)	9/22/2025	10/26/2025	34
7	Pier J Approach (clam shell dredge 270,000 CY)	10/27/2025	12/11/2025	45
8	Pier J Approach (clam shell dredge 1,699,000 CY)	1/1/2026	10/11/2026	283

Source:

*Dredging Alternative 2: POLB Channel Deepening - 53 and 78 Rev4.xlsx.*

Substation and Pier J Breakwater - Email From: Khan, Naser <naser.khan@aecom.com>, Sent: Friday, May 31, 2019 10:54 PM, To: Barrera, Baron <baron.barrera@polb.com>.

**Table H1.2****Construction Schedule: Alternative 3 NED (-55 and -80 MLLW)**

Task ID	Alternative 3	Start Date	End Date	Duration (days)
1	Electrical Substation Construction at Pier J (mitigation only)	1/1/2024	12/31/2024	60
2	Pier J Breakwater Construction	1/1/2024	3/2/2024	54
3	Approach Channel (hopper dredge 2,600,000 CY)	1/1/2025	5/31/2025	150
4	Main Channel Widening (clam shell dredge 1,065,000 CY)	1/1/2025	6/27/2025	177
5	West Basin (clam shell dredge 717,000 CY)	6/28/2025	10/26/2025	120
6	Pier J Basin (clam shell dredge 258,000 CY)	10/27/2025	12/9/2025	43
7	Pier J Basin (clam shell dredge 46,000 CY)	1/1/2026	1/9/2026	8
8	Pier J Approach (clam shell dredge 1,994,000 CY)	1/10/2026	12/8/2026	332
9	Pier J Approach (clam shell dredge 679,000 CY)	1/1/2027	4/24/2027	113

Source:

*Dredging Alternative 3: POLB Channel Deepening - NED 55 and 80 Rev4.xlsx.*

Substation and Pier J Breakwater - Email From: Khan, Naser <naser.khan@aecom.com>, Sent: Friday, May 31, 2019 10:54 PM, To: Barrera, Baron <baron.barrera@polb.com>.

**Table H1.3****Construction Schedule: Alternative 4: (-57 and -83 MLLW)**

Task ID	Alternative 4	Start Date	End Date	Duration (days)
1	Electrical Substation Construction at Pier J (mitigation only)	1/1/2024	12/31/2024	60
2	Pier J Breakwater Construction	1/1/2024	3/2/2024	54
3	Pier J Wharf Upgrade	1/1/2024	6/24/2024	175
4	Pier T Wharf Upgrade	1/1/2024	11/16/2024	320
5	Approach Channel (hopper dredge 5,447,000 CY)	1/1/2025	2/4/2026	399
6	Main Channel Widening (clam shell dredge 1,065,000 CY)	1/1/2026	6/28/2026	178
7	West Basin (clam shell dredge 975,000 CY)	6/29/2026	12/9/2026	163
8	West Basin (clam shell dredge 513,000 CY)	1/1/2027	3/28/2027	86
9	Pier T Berths (clam shell dredge Berths T132 to T140, 44,000 CY)	3/29/2027	4/5/2027	7
10	Pier J Basin (clam shell dredge 408,000 CY)	4/6/2027	6/13/2027	68
11	Pier J Approach (clam shell dredge 1,066,000 CY)	6/14/2027	12/9/2027	178
12	Pier J Approach (clam shell dredge 2,040,000 CY)	1/1/2028	12/6/2028	340
13	Pier J Approach (clam shell dredge 297,000 CY)	1/1/2029	2/20/2029	50

Source:

*Dredging Alternative 4: POLB Channel Deepening - 57 and 83 Rev4.xlsx.*

Substation and Pier J Breakwater - Email From: Khan, Naser <naser.khan@aecom.com>, Sent: Friday, May 31, 2019 10:54 PM, To: Barrera, Baron <baron.barrera@polb.com>.



**Table H1.4****Construction Schedule: Alternative 5 and Standby Area (-55 and -80 MLLW)**

<b>Task ID</b>	<b>Alternative 5</b>	<b>Start Date</b>	<b>End Date</b>	<b>Duration (days)</b>
1	Electrical Substation Construction at Pier J (mitigation only)	1/1/2024	12/31/2024	60
2	Pier J Breakwater Construction	1/1/2024	3/2/2024	54
3	Approach Channel (hopper dredge 2,600,000 CY)	1/1/2025	5/31/2025	150
4	Main Channel Widening (clam shell dredge 1,065,000 CY)	1/1/2025	6/27/2025	177
5	West Basin (clam shell dredge 717,000 CY)	6/28/2025	10/26/2025	120
6	Pier J Basin (clam shell dredge 258,000 CY)	10/27/2025	12/9/2025	43
7	Pier J Basin (clam shell dredge 46,000 CY)	1/1/2026	1/9/2026	8
8	Pier J Approach (clam shell dredge 1,994,000 CY)	1/10/2026	12/8/2026	332
9	Pier J Approach (clam shell dredge 679,000 CY)	1/1/2027	4/24/2027	113
10	Standby Area (clam shell dredge 921,000 CY)	4/25/2027	12/8/2027	227
11	Standby Area (clam shell dredge 118,000 CY)	1/1/2028	2/24/2028	54

Source:

*Dredging Alternative 5: POLB Channel Deepening - NED and Standby Area Rev4.xlsx.*

Substation and Pier J Breakwater - Email From: Khan, Naser <naser.khan@aecom.com>, Sent: Friday, May 31, 2019 10:54 PM, To: Barrera, Baron <baron.barrera@polb.com>.

**Table H1.5**  
**Dredging Activity**

[illegible]

**Table H1.6**  
**Landside Construction Equipment Activity**

[illegible]

Table H1.7  
Soil Handling - Electrical Substation Construction

Task	Peak Day Volume of Soil Handled (cyd/day)	Total Volume of Soil Handled (cyd)	Peak Day Volume of Soil Handled (ton/day)	Total Volume of Soil Handled (ton)
Electrical Substation Construction at Pier J	72	1500	91.8	1912.5

Table H1.8

## Wharf Upgrades: Pier J, Berths 266-270

Activity No.	Description	No. of Working Days	Equipment	Horsepower	No. of People	Notes
1	Mobilize/Demobilize	5	Construction Barge with piling crane and long arm excavator. Tug boat	Piling Crane: 250 HP	8	Assume piling frame is constructed off site and placed onto barge at contractors' yard
		5		Long Arm Excavator: 315 HP		
		5		Tugboat: 2,000 HP		
2	Sheet Pile Delivery	10	As Activity No. 1	Construction Barge Deck Equipment: 100 HP	As above	Assume sheet piles are delivered onsite via a small barge as needed. Sheet piles will be loaded onto the small barge at the contractors' yard and delivered onsite from the waterside.
		10	Small barge for sheet piles	Sheet pile Barge Deck Equipment: 100 HP		
		10	Tug Boat	Survey Boat: 400 HP		
3	Clearing of seabed of any obstruction prior to pile driving	20	As Activity No. 1	Crew Boat: 400 HP	As above	Any debris will be cleared using the long arm excavator mounted on the construction barge, includes team of four divers
		20	Survey boat		7	
4	Driving of bulkhead wall	135	As Activity No. 3		19	Assumes driving rate of 20 LF per day
		135	Crew Boat		2	
5	Installation of anti-scour rock in front of new bulkhead wall	130	Small barge for storage of rock		4	Long arm excavator on construction barge used to place rock. Overlaps with activity No. 4, finish at probably the same time.
		130	Tug Boat			
6	Survey of installed bulkhead wall	5	Survey boat		3	Survey team

## Source:

E-mail: From: Barrera, Baron <baron.barrera@polb.com>, Sent: Thursday, June 6, 2019 1:13 PM, To: Lora Granovsky <lora.granovsky@ilancoenvironmental.com>, Subject: FW: LB Deep Draft Nav Study - Construction Schedule for Pier J and T Sheet Pile Wall.

Duration: 175 working days for Pier J, Berths 266-270

Wharf upgrades apply to Alternative 4 only.

Table H1.9

## Wharf Upgrades: Pier T, Berths 134-140

Activity No.	Description	No. of Working Days	Equipment	Horsepower	No. of People	Notes
1	Mobilize/Demobilize	5	Construction Barge with piling crane and long arm excavator. Tug boat	Piling Crane: 250 HP	8	Assume piling frame is constructed off site and placed onto barge at contractors' yard
		5		Long Arm Excavator: 315 HP		
		5		Tugboat: 2,000 HP		
2	Sheet Pile Delivery	20	As Activity No. 1	Construction Barge Deck Equipment: 100 HP	As above	Assume sheet piles are delivered onsite via a small barge as needed. Sheet piles will be loaded onto the small barge at the contractors' yard and delivered onsite from the waterside.
		20	Small barge for sheet piles	Sheet pile Barge Deck Equipment: 100 HP		
		20	Tug Boat	Survey Boat: 400 HP		
3	Clearing of seabed of any obstruction prior to pile driving	35	As Activity No. 1	Crew Boat: 400 HP	As above	Any debris will be cleared using the long arm excavator mounted on the construction barge, includes team of four divers
		35	Survey boat		7	
4	Driving of bulkhead wall	250	As Activity No. 3		19	Assumes driving rate of 20 LF per day
		250	Crew Boat		2	
5	Installation of anti-scour rock in front of new bulkhead wall	245	Small barge for storage of rock		4	Long arm excavator on construction barge used to place rock. Overlaps with activity No. 4, finish at probably the same time.
		245	Tug Boat			
6	Survey of installed bulkhead wall	10	Survey boat		3	Survey team

## Source:

E-mail: From: Barrera, Baron <baron.barrera@polb.com>, Sent: Thursday, June 6, 2019 1:13 PM, To: Lora Granovsky <lora.granovsky@ilancoenvironmental.com>, Subject: FW: LB Deep Draft Nav Study - Construction Schedule for Pier J and T Sheet Pile Wall.

Duration: 320 working days for Pier T, Berths 134-140

Wharf upgrades apply to Alternative 4 only.



Table H1.10

## Offroad Engine Emission Factors - USEPA Standards

Emission Factor (g/hp-hr)								
	High HP	PM10	PM2.5	DPM	NOX	SOX	CO	VOC
Tier 1	50	0.6	0.6	0.6	6.745	0.005552	4.1	
	100	0.6	0.6	0.6	6.9	0.005552	4.1	
	175	0.6	0.6	0.6	6.9	0.004994	4.1	
	300	0.4	0.4	0.4	6.9	0.004994	8.5	1.053
	600	0.4	0.4	0.4	6.9	0.004994	8.5	1.053
	750	0.4	0.4	0.4	6.9	0.004994	8.5	1.053
Tier 2	>750	0.4	0.4	0.4	6.9	0.004994	8.5	1.053
	50	0.45	0.45	0.45	5.32	0.005552	4.1	0.29484
	100	0.3	0.3	0.3	5.32	0.005552	3.7	0.29484
	175	0.22	0.22	0.22	4.655	0.004994	3.7	0.257985
	300	0.15	0.15	0.15	4.655	0.004994	2.6	0.257985
	600	0.15	0.15	0.15	4.56	0.004994	2.6	0.25272
Tier 3	750	0.15	0.15	0.15	4.56	0.004994	2.6	0.25272
	>750	0.15	0.15	0.15	4.56	0.004994	2.6	0.25272
	50	0.45	0.45	0.45	5.32	0.005552	4.1	0.29484
	100	0.3	0.3	0.3	3.325	0.005552	3.7	0.184275
	175	0.22	0.22	0.22	2.85	0.004994	3.7	0.15795
	300	0.15	0.15	0.15	2.85	0.004994	2.6	0.15795
Tier 4 Interim	600	0.15	0.15	0.15	2.85	0.004994	2.6	0.15795
	750	0.15	0.15	0.15	2.85	0.004994	2.6	0.15795
	>750	0.15	0.15	0.15	4.56	0.004994	2.6	0.25272
	50	0.22	0.22	0.22	5.32	0.005552	4.1	0.29484
	75	0.22	0.22	0.22	3.325	0.005552	3.7	0.184275
	175	0.015	0.015	0.015	0.3	0.004994	3.7	0.14742
Tier 4 Final	750	0.015	0.015	0.015	0.3	0.004994	2.6	0.14742
	>750	0.075	0.075	0.075	2.6	0.004994	2.6	0.3159
	50	0.022	0.022	0.022	3.325	0.005552	4.1	0.184275
	75	0.022	0.022	0.022	3.325	0.005552	3.7	0.184275
	175	0.015	0.015	0.015	0.3	0.004994	3.7	0.14742
	750	0.015	0.015	0.015	0.3	0.004994	2.6	0.14742
	>750	0.03	0.03	0.03	2.6	0.004994	2.6	0.3159

## Source:

USEPA Engine Standards. DieselNet: <https://www.dieselnet.com/standards/us/nonroad.php#tier3>

NMHC+NOx Pollutant Fractions (2017 Carl Moyer Program Guidelines, Table D-25):

NOx = 0.95

HC 0.05

SOx is a function of fuel sulfur content and does not change with Tier.

Used for Marine Offroad Equipment: Tier 3

Used for Mitigation: Tier 4 offroad equipment

Table H1.11

## Harbor Craft Emission Factors - USEPA Standards

Engine Displacement	(kW)	EPA Tier	MY	g/kw-hr											
				NMHC+NOx	PM10	PM2.5	DPM	NOx	SOX	CO	HC	VOC	CO2	CH4	N2O
Category 1 HC auxiliary engines															
>2.5	>37	Tier 1	2004		0.54	0.4806	0.54	17	0.00552	11.4	1.3	1.3689	652	0.026	0.031
<0.9	≥37	Tier 2	2005	7.5	0.4	0.356	0.4	7.125	0.00552	5	0.375	0.394875	652	0.0075	0.031
0.9 < displ < 1.2	75-130	Tier 2	2004	7.2	0.3	0.267	0.3	6.84	0.00552	5	0.36	0.37908	652	0.0072	0.031
1.2 < displ < 2.5	130-560	Tier 2	2004	7.2	0.3	0.267	0.3	6.84	0.00552	5	0.36	0.37908	652	0.0072	0.031
2.5 < displ < 5	>560	Tier 2	2007	7.2	0.2	0.178	0.2	6.84	0.00552	5	0.36	0.37908	652	0.0072	0.031
<0.9	<19	Tier 3	2009	7.5	0.4	0.356	0.4	7.125	0.00552	6.6	0.375	0.394875	652	0.0075	0.031
<0.9	19-75	Tier 3	2009-2013	7.5	0.3	0.267	0.3	7.125	0.00552	5.5	0.375	0.394875	652	0.0075	0.031
<0.9	19-75	Tier 3	2014+	4.7	0.3	0.267	0.3	4.465	0.00552	5.5	0.235	0.247455	652	0.0047	0.031
<0.9	>75	Tier 3	2012+	5.4	0.14	0.1246	0.14	5.13	0.00552	5.5	0.27	0.28431	652	0.0054	0.031
0.9 < displ < 1.2	all	Tier 3	2013+	5.4	0.14	0.1246	0.14	5.13	0.00552	5	0.27	0.28431	652	0.0054	0.031
1.2 < displ < 2.5	<600	Tier 3	2014-2017	5.6	0.11	0.0979	0.11	5.32	0.00552	5	0.28	0.29484	652	0.0056	0.031
1.2 < displ < 2.5	<600	Tier 3	2018+	5.6	0.1	0.089	0.1	5.32	0.00552	5	0.28	0.29484	652	0.0056	0.031
1.2 < displ < 2.5	≥600	Tier 3	2014+	5.6	0.11	0.0979	0.11	5.32	0.00552	5	0.28	0.29484	652	0.0056	0.031
2.5 < displ < 3.5	<600	Tier 3	2013-2017	5.6	0.11	0.0979	0.11	5.32	0.00552	5	0.28	0.29484	652	0.0056	0.031
2.5 < displ < 3.5	<600	Tier 3	2018+	5.6	0.1	0.089	0.1	5.32	0.00552	5	0.28	0.29484	652	0.0056	0.031
2.5 < displ < 3.5	≥600	Tier 3	2013+	5.6	0.11	0.0979	0.11	5.32	0.00552	5	0.28	0.29484	652	0.0056	0.031
3.5 ≤ D < 7	<600	Tier 3	2012-2017	5.8	0.11	0.0979	0.11	5.51	0.00552	5	0.29	0.30537	652	0.0058	0.031
3.5 ≤ D < 7	<600	Tier 3	2018+	5.8	0.1	0.089	0.1	5.51	0.00552	5	0.29	0.30537	652	0.0058	0.031
3.5 ≤ D < 7	≥600	Tier 3	2012+	5.8	0.11	0.0979	0.11	5.51	0.00552	5	0.29	0.30537	652	0.0058	0.031
	600-1400	Tier 4	2017+		0.04	0.0356	0.04	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
	1400-2000	Tier 4	2016+		0.04	0.0356	0.04	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
	2000-3700	Tier 4	2014+		0.04	0.0356	0.04	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
<15.0	>3700	Tier 4	2014-2015		0.12	0.1068	0.12	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
15 < displ < 30	>3700	Tier 4	2014-2015		0.25	0.2225	0.25	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
all	>3700	Tier 4	2016+		0.06	0.0534	0.06	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
Category 2 HC propulsion engines															
>2.5	>37	Tier 1	2004		0.54	0.4806	0.54	17	0.00552	11.4	1.3	1.3689	652	0.026	0.031
5.0 ≤ D < 15	all	Tier 2	2007	7.8	0.27	0.2403	0.27	7.41	0.00552	5	0.39	0.41067	652	0.0078	0.031
15 ≤ D < 20	< 3300 kW	Tier 2	2007	8.7	0.5	0.445	0.5	8.265	0.00552	5	0.435	0.458055	652	0.0087	0.031
15 ≤ D < 20	≥ 3300 kW	Tier 2	2007	9.8	0.5	0.445	0.5	9.31	0.00552	5	0.49	0.51597	652	0.0098	0.031
20 ≤ D < 25	all	Tier 2	2007	9.8	0.5	0.445	0.5	9.31	0.00552	5	0.49	0.51597	652	0.0098	0.031
25 ≤ D < 30	all	Tier 2	2007	11	0.5	0.445	0.5	10.45	0.00552	5	0.55	0.57915	652	0.011	0.031
7 ≤ D < 15	<2000	Tier 3	2013+	6.2	0.14	0.1246	0.14	5.89	0.00552	5	0.31	0.32643	652	0.0062	0.031
7 ≤ D < 15	2000-3700	Tier 3	2013+	7.8	0.14	0.1246	0.14	7.41	0.00552	5	0.39	0.41067	652	0.0078	0.031
15 ≤ D < 20	<2000	Tier 3	2014+	7	0.34	0.3026	0.34	6.65	0.00552	5	0.35	0.36855	652	0.007	0.031
20 ≤ D < 25	<2000	Tier 3	2014+	9.8	0.27	0.2403	0.27	9.31	0.00552	5	0.49	0.51597	652	0.0098	0.031
25 ≤ D < 30	<2000	Tier 3	2014+	11	0.27	0.2403	0.27	10.45	0.00552	5	0.55	0.57915	652	0.011	0.031
all	2000-3700	Tier 4	2014		0.04	0.0356	0.04	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
<15	>3700	Tier 4	2014		0.12	0.1068	0.12	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
15 ≤ D < 30	>3700	Tier 4	2014		0.25	0.2225	0.25	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
all	>3700	Tier 4	2016		0.06	0.0534	0.06	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
all	1400-2000	Tier 4	2016		0.04	0.0356	0.04	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
all	600-1400	Tier 4	2017		0.04	0.0356	0.04	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
	600-1400	Tier 4	2017+		0.04	0.0356	0.04	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
	1400-2000	Tier 4	2016+		0.04	0.0356	0.04	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
	2000-3700	Tier 4	2014+		0.04	0.0356	0.04	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
<15.0	>3700	Tier 4	2014-2015		0.12	0.1068	0.12	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
15 < displ < 30	>3700	Tier 4	2014-2015		0.25	0.2225	0.25	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
all	>3700	Tier 4	2016+		0.06	0.0534	0.06	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031

## Source:

Federal Marine Compression-Ignition Engines - Exhaust Emission Standards Reference Guide, <http://epa.gov/OMS/standards/nonroad/marineci.htm>

Tier 1 and Tier 2 standards: 40CFR Part 94.8

Tier 3 and Tier 4 standards: 40CFR Part 1042.101

EPA Tier 1 emissions standards for marine engines do not specify restrictions to PM, SOx, CO, or VOC. NOx reflects Marpol Annex VI (17 g/kw-hr). PM10, SOx, CO and VOC emissions factors were obtained from EPA offroad emission engine standards for Tier 1 engines.

EPA Tier 2 and Tier 3 emission standards are reported as NOx+THC. 5% is HC per Carl Moyer Program guidelines. 95% is NOx.

SOx emission factor is based on 15 ppm fuel sulfur content.

PM2.5 is 89% of PM10, per SCAQMD 2006 Final Methodology to Calculate PM2.5 and PM 2.5 Significance Thresholds, Table 5.

CO2 and N2O emission factors are from IVL: Methodology for Calculating Emissions from Ships: Update on Emission Factors, 2004, also summarized in POLA 2009 Emissions Inventory, Appendix B. CH4 is 2% of HC, per IVL study.

**Table H1.12**

**SOx Emission Factor - Harbor Craft**

Harbor Craft	0.00552 g/hp-hr
Dredging Equipment	use OFFROAD BSCF and convert to g SOx /hp-hr
SOx (gms/hp-hr) = (S content in X/1,000,000) x (MW SO2/ MW S) x BSF =	
Where:	
X = S content in parts per million (ppm)	15 ppm
S MW = Molecular Weight	32
SO2 MW = Molecular Weight	64
BSFC for harbor craft = Brake Specific Fuel Consumption (per CARB 2007 Harbor Craft Methodology)	184 (g/hp-hr)

**Table H1.13**

**Harbor Craft Load Factor**

Type	Main Engine	Auxiliary Engine
Assist tugboat	0.31	0.43
Commercial fishing	0.27	0.43
Crew boat	0.38	0.32
Excursion	0.42	0.43
Ferry	0.42	0.43
Government	0.51	0.43
Ocean tug	0.68	0.43
Tugboat	0.31	0.43
Workboat      Diveboat	0.38	0.32

**Source:**

2013 POLB Emissions Inventory, Table 3.4.

Table H1.14

Paved Road Dust Emission Factor Derivation							
Emission Source	(sL) Silt Loading (g/m2)	(K) Particle Size Multiplier - PM10 (g/VMT)	(K) Particle Size Multiplier - PM2.5 (g/VMT)	(W) Average Vehicle Weight on Road (tons)	(E) Uncontrol- led PM10 Emission Factor (g/VMT)	(E) Uncontrol- led PM2.5 Emission Factor (g/VMT)	
Onsite Trucks	0.6	1.00	0.25	20.0	13.34	3.34	
Offsite Roadway (all vehicles) - CARB 2016							
Freeway							
Statewide	0.015	1.00	0.25	2.4	0.05	0.01	
Major LA County	0.013	1.00	0.25	2.4	0.05	0.01	
Collector LA County	0.013	1.00	0.25	2.4	0.05	0.01	
Local LA County	0.135	1.00	0.25	2.4	0.39	0.10	
Notes:							
1. Emission factors are calculated using CARB's Miscellaneous Process Methodology 7.9, Entrained Road Travel, Paved Road Dust.							
November 2016. Available: <a href="https://ww3.arb.ca.gov/ei/areasrc/fullpdf/full7-9_2016.pdf">https://ww3.arb.ca.gov/ei/areasrc/fullpdf/full7-9_2016.pdf</a> . Accessed 7/2019.							
Because the emissions are primarily used for peak day or peak hour calculations, downward adjustment due to annual precipitation was not made.							
2. Emission factors exclude engine exhaust, tire wear, and brake wear, which are accounted for in EMFAC calculations.							
3. The equation is: $E = k (sL)^{0.91} \times (W)^{1.02}$							
Summary of Daily VMT by Roadway Type							
Los Angeles - Long Beach - Santa Ana Metro Area							
Metropolitan Area	Interstate/ Other Fwy/ Exprwy	Other Principal Arterial	Minor Arterial	Collector	Local		
Daily Vehicle- Miles Travelled (Thousands)	132,796	67,118	49,528	15,304	14,481		
Travel Fraction	0.48	0.24	0.18	0.05	0.05		
Source: Federal Highway Administration. Highway Statistics 2016 - Urbanized Areas - 2016 Miles and Daily Last accessed February 2019. <a href="https://www.fhwa.dot.gov/policyinformation/statistics/2016/">https://www.fhwa.dot.gov/policyinformation/statistics/2016/</a>							
Composite Paved Road Dust Emission Factors for Project Trips							
Road Type	Fraction of Travel by Roadway Type					Composite EF	
	Interstate/ Other Fwy/ Exprwy	Other Principal Arterial	Minor Arterial	Collector	Local	PM10 (g/VMT)	PM2.5 (g/VMT)
Vehicle Trips in Los Angeles - Long Beach - Santa Ana Metro Area	0.48	0.24	0.18	0.05	0.05	0.068	0.017

**Table H1.15****Material Loading/Handling Dust Emission Factors**

PM10 (lb/ton)	0.0560274
PM2.5 (lb/ton)	0.0084841
$EF = (k)(0.0032)[(U/5)^{-1.3}]/[(M/2)^{-1.4}]$ EF = lb/ton k = Particle Size Constant (0.35 for PM10 and 0.053 for PM2.5) U = average wind speed = 2.2 m/s (CalEEMod), 4.9 mph M = moisture content = 12% (CalEEMod)	
Soil density (ton/cyd):	1.26
Truck capacity (cyd)	20
Truck capacity (ton)	25.28
Source: AP-42, p. 13.2.4 & CalEEMod	

**Table H1.16****Asphalt Paving**

VOC (lb/acre)	2.62	(lb/ft <sup>2</sup> )	6.015E-05
Source: CalEEMod, Appendix A, Section 4.8.			

Table H1.17  
OFFROAD 2017 Output

OFFROAD2017 (v1.0.1) Emissions Inventory

Region Type: Air District

Region: South Coast AQMD

Calendar Year: 2024

Scenario: All Adopted Rules - Exhaust

Vehicle Classification: OFFROAD2017 Equipment Types

Units: Emissions: tons/day, Fuel Consumption: gallons/year, Activity: hours/year, HP-Hours: HP-hours/year

Region	CalYr	VehClass	MdYr	HP_Bin	Fuel	HC tpd	ROG tpd	TOG tpd	CO tpd	NOx tpd	CO2 tpd	PM10 tpd	PM2.5 tpd	PM tpd	SOx tpd	NH3 tpd	Fuel gpy	Total Acti- vity hpy	Total Pop- ulation	Horsepower Hours hppy
South Coast	2024	Industrial - Aerial Lifts	Aggregated	25	Diesel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
South Coast	2024	Industrial - Aerial Lifts	Aggregated	50	Diesel	0.003326937	0.004025594	0.004790789	0.079014703	0.073312641	14.908399	0.000549907	0.000505915	0.000549907	0.000137736	0.00012168	483686.6	591600.15	1911.1402	27291100
South Coast	2024	Industrial - Aerial Lifts	Aggregated	75	Diesel	0.00196584	0.002378667	0.00283081	0.068456702	0.035496583	11.411501	0.000789221	0.000726084	0.000789221	0.000105446	9.31391E-05	370233.6	332424.62	1079.5822	23226784.67
South Coast	2024	Industrial - Aerial Lifts	Aggregated	100	Diesel	0.002124473	0.002570612	0.003059241	0.087821283	0.039766347	14.601892	0.000515682	0.000474427	0.000515682	0.000134938	0.000119179	473742.3	382664.21	1235.6121	29712613.35
South Coast	2024	Industrial - Aerial Lifts	Aggregated	175	Diesel	0.000214867	0.000259898	0.000309409	0.008606927	0.001722874	1.589344	7.29618E-05	6.71248E-05	7.29618E-05	1.46924E-05	1.2976E-05	51580.414	24809.443	80.269691	3236722.847
South Coast	2024	Industrial - Aerial Lifts	Aggregated	300	Diesel	1.20506E-05	1.45812E-05	1.73529E-05	0.000174235	0.000123207	0.095005	1.66541E-06	1.53218E-06	1.66541E-06	7.75418E-07	3082.3312	840.96234	2.7057199	193421.391	
South Coast	2024	Industrial - Aerial Lifts	Aggregated	600	Diesel	6.889E-06	8.33569E-06	9.92015E-06	0.000122497	3.36709E-05	0.0674673	1.17545E-06	1.08141E-06	1.17545E-06	6.23562E-07	5.50659E-07	2188.9019	280.32078	0.9019066	137357.1828
South Coast	2024	OFF - ConstMin - Plate Compactors	Aggregated	25	Diesel	0.00057186	0.000680561	0.000823478	0.004319479	0.005156935	0.7074236	0.000201509	0.000185389	0.000201509	1.10081E-05	5.93633E-06	23597.25	119822.2	199.52	958577.6
South Coast	2024	OFF - Light Commercial - Air Compressors	Aggregated	25	Diesel	0.000876803	0.001043468	0.001262597	0.004623625	0.00778996	1.0040399	0.000324279	0.000298337	0.000324279	1.33207E-05	8.40727E-06	33419.4	61002.45	74.88	1218428.4
South Coast	2024	OFF - Light Commercial - Air Compressors	Aggregated	50	Diesel	0.009822428	0.011689501	0.014144297	0.09693465	0.076597813	11.231237	0.002732976	0.002514338	0.002732976	0.000145192	9.4613E-05	376092.35	368463.85	452.64	13633162.45
South Coast	2024	ConstMin - Cranes	Aggregated	25	Diesel	2.0286E-05	2.4546E-05	2.92118E-05	0.000113714	9.66561E-05	0.0116572	7.59123E-06	6.98393E-06	7.59123E-06	1.07168E-07	9.51442E-08	378.20384	913.58918	1.8645734	22839.72944
South Coast	2024	ConstMin - Cranes	Aggregated	50	Diesel	0.000533764	0.000645855	0.000768621	0.00240237	0.001906914	0.1888651	0.000192194	0.000176818	0.000192194	1.73014E-06	1.54149E-06	6127.5216	8886.7971	19.888783	366338.4637
South Coast	2024	ConstMin - Cranes	Aggregated	75	Diesel	0.000150058	0.000181571	0.000216084	0.0006252	0.001360003	0.0247463	0.000128061	0.000117816	0.000128061	6.65577E-07	5.91542E-07	2351.413	2336.9873	6.2152447	156830.8722
South Coast	2024	ConstMin - Cranes	Aggregated	100	Diesel	0.00341141	0.004127807	0.004912431	0.033268294	0.03700243	4.5468204	0.002322333	0.002136547	0.002322333	4.19353E-05	3.71105E-05	147516.58	111966.96	244.88064	9930003.218
South Coast	2024	ConstMin - Cranes	Aggregated	175	Diesel	0.007878513	0.009533001	0.011345059	0.082290973	0.091768248	12.794175	0.004960442	0.004563606	0.004960442	0.000118052	0.000104424	415092.91	188449.19	404.61243	27828778.99
South Coast	2024	ConstMin - Cranes	Aggregated	300	Diesel	0.010227138	0.012374837	0.014727078	0.070919069	0.13264119	22.212489	0.005532029	0.005089647	0.005532029	0.000205059	0.000181295	720659.73	220360.18	456.82048	48391095.85
South Coast	2024	ConstMin - Cranes	Aggregated	600	Diesel	0.013079131	0.015825749	0.018833949	0.126470765	0.160367746	39.707164	0.006453087	0.00639684	0.006453087	0.00036662	0.000324085	122875.52	235911.53	465.52183	86509887
South Coast	2024	ConstMin - Cranes	Aggregated	750	Diesel	0.000414325	0.000501334	0.000596629	0.003739171	0.005075816	0.683406	0.000251319	0.000231319	0.000251319	6.306E-06	5.57787E-06	22172.354	2334.8086	5.5937022	1489529.811
South Coast	2024	ConstMin - Cranes	Aggregated	9999	Diesel	0.001949465	0.002358853	0.00280723	0.020123424	0.028121534	2.1690511	0.00124691	0.001147157	0.00124691	1.99955E-05	1.77035E-05	70372.473	5039.9912	9.9443915	4725395.503
South Coast	2024	ConstMin - Bore/Drill Rigs	Aggregated	25	Diesel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
South Coast	2024	ConstMin - Bore/Drill Rigs	Aggregated	50	Diesel	0.00051222	0.000619786	0.000737597	0.004409124	0.004234062	0.6033835	0.000223061	0.000205216	0.000223061	5.56321E-06	4.92474E-06	19576.114	17120.573	47.013303	664158.3093
South Coast	2024	ConstMin - Bore/Drill Rigs	Aggregated	75	Diesel	0.000263062	0.000318305	0.000378809	0.004716774	0.004288804	0.7420072	0.000228886	0.000210575	0.000228886	6.85234E-06	6.05617E-06	24073.619	12982.677	26.228474	943030.4836
South Coast	2024	ConstMin - Bore/Drill Rigs	Aggregated	100	Diesel	0.00093599	0.000960255	0.001142782	0.010937587	0.011339025	3.029392	0.000420387	0.000386756	0.000420387	2.79844E-05	2.47255E-05	98285.289	45684.545	113.28582	3828325.49
South Coast	2024	ConstMin - Bore/Drill Rigs	Aggregated	175	Diesel	0.000864172	0.001045648	0.001244408	0.024581837	0.008641458	4.4183065	0.000395182	0.000363567	0.000395182	4.08235E-05	3.60616E-05	143347.09	36690.577	113.7682	5472037.01
South Coast	2024	ConstMin - Bore/Drill Rigs	Aggregated	300	Diesel	0.001173139	0.001414948	0.00168932	0.012973941	0.013711353	6.437411	0.000444948	0.000409352	0.000444948	5.94819E-05	5.25413E-05	208854.71	13539.793	116.79094	8081075.955
South Coast	2024	ConstMin - Bore/Drill Rigs	Aggregated	600	Diesel	0.001554492	0.001880935	0.002238468	0.018645424	0.014595768	9.165954	0.00052562	0.00048357	0.00052562	9.16372E-05	8.09379E-05	321733.02	12470.72	52.541974	12510630.99
South Coast	2024	ConstMin - Bore/Drill Rigs	Aggregated	750	Diesel	0.000781732	0.000945895	0.001125694	0.011646979	0.006753384	6.4171702	0.000260066	0.000239621	0.000260066	5.93065E-05	5.23761E-05	208198.02	12460.525	20.784828	7940119.213
South Coast	2024	ConstMin - Bore/Drill Rigs	Aggregated	9999	Diesel	0.000874856	0.001058576	0.001259793	0.0061952	0.024104296	3.295717	0.000556735	0.000512196	0.000556735	3.04443E-05	2.68992E-05	106925.91	2215.243	2.9692612	4121374.97
South Coast	2024	ConstMin - Excavators	Aggregated	25	Diesel	2.61182E-05	3.16031E-05	3.76103E-05	8.87472E-05	6.0281E-05	0.0046697	8.40136E-06	7.72925E-06	8.40136E-06	4.23906E-06	3.81139E-06	151.50483	275.77022	1.1054457	6894.255522
South Coast	2024	ConstMin - Excavators	Aggregated	50	Diesel	0.014301432	0.017304733	0.020594062	0.174964361	0.14597323	24.486123	0.004967812	0.004570387	0.004967812	0.000225957	0.000199852	794425.29	1009598	1349.1965	36148196.64
South Coast	2024	ConstMin - Excavators	Aggregated	75	Diesel	0.000507738	0.000614363	0.000731143	0.003570783	0.005562328	0.459396	0.000486584	0.000447657	0.000486584	4.23211E-06	3.74953E-06	14904.596	10331.373	17.687131	754837.4229
South Coast	2024	ConstMin - Excavators	Aggregated	100	Diesel	0.010208364	0.01235212	0.014700044	0.205627234	0.129200323	31.273571	0.005594634	0.005594634	0.000288833	0.000255251	1014636.6	633591.45	954.55236	51613820.79	
South Coast	2024	ConstMin - Excavators	Aggregated	175	Diesel	0.018032642	0.021819497	0.025967005	0.391556344	0.169853816	67.036141	0.008413443	0.007140638	0.008413443	0.000619241	0.00054714	2174913.8	753439.12	1245.846	110081748.9
South Coast	2024	ConstMin - Excavators	Aggregated	300	Diesel	0.018873432	0.022837941	0.027179038	0.179374516	0.03983627	85.411425	0.006010834	0.005529967	0.006010834	0.000789105	0.000697117	2771079.6	640988.81	1072.835	140136243.1
South Coast	2024	ConstMin - Excavators	Aggregated	600	Diesel	0.028770215	0.03481196	0.041429109	0.301095489	0.23734104	151.63373	0.008158568	0.007137361	0.008158568	0.001401063	0.001237611	4919577.8	79249.137	125.3473	24947153.47
South Coast	2024	ConstMin - Excavators	Aggregated	750	Diesel	0.00057652	0.000695789	0.000830189	0.005593627	0.007306292	1.8945769	0.000289998	0.000267968	0.000289998	1.7499E-05	1.54633E-05	61467.46	5041.3638	8.8435656	3094568.773
South Coast	2024	ConstMin - Excavators	Aggregated	9999	Diesel	0.000527283	0.000638013	0.000759288	0.007852624	0.0186676	4.2238993	0.000168585	0.000155098	0.000168585	3.90362E-05	3.44749E-05	137039.76	5756.9455	8.2908427	6862542.808
South Coast	2024	Industrial - Forklifts	Aggregated	25	Diesel	0	0	0	0	0	0	0	0	0</						



Table H1.17  
OFFROAD 2017 Output

OFFROAD2017 (v1.0.1) Emissions Inventory

Region Type: Air District

Region: South Coast AQMD

Calendar Year: 2024

Scenario: All Adopted Rules - Exhaust

Vehicle Classification: OFFROAD2017 Equipment Types

Units: Emissions: tons/day, Fuel Consumption: gallons/year, Activity: hours/year, HP-Hours: HP-hours/year

Region	CalYr	VehClass	MdYr	HP_Bin	Fuel	HC_tpd	ROG_tpd	TOG_tpd	CO_tpd	NOx_tpd	CO2_tpd	PM10_tpd	PM2_5_tpd	PM_tpd	SOx_tpd	NH3_tpd	Fuel_gpy	Total_Acti vity_hpy	Total_Pop ulation	Horsepower_ Hours_hhpy
South Coast	2024	ConstMin - Rollers	Aggregated	25	Diesel	1.23124E-05	1.4898E-05	1.77299E-05	4.09387E-05	2.81896E-05	0.0021541	3.87551E-06	3.56547E-06	3.87551E-06	1.95467E-08	1.75818E-08	69.888498	129.65933	0.5548322	3241.483206
South Coast	2024	ConstMin - Rollers	Aggregated	50	Diesel	0.011992489	0.014510912	0.017269184	0.098438392	0.0895041	13.770478	0.00450214	0.004141969	0.00450214	0.000126955	0.000112393	446767.98	579437.17	1636.2003	20710298.11
South Coast	2024	ConstMin - Rollers	Aggregated	75	Diesel	0.000421644	0.00051019	0.000607168	0.001676968	0.004108178	0.1440202	0.000292348	0.00026896	0.000292348	1.31889E-06	1.17547E-06	4672.576	3397.0744	14.425638	240816.2704
South Coast	2024	ConstMin - Rollers	Aggregated	100	Diesel	0.008695146	0.010521127	0.012521011	0.138388178	0.11129523	21.378227	0.005815078	0.005349871	0.005815078	0.000197391	0.000174486	693593.04	409397.38	1206.2053	35725253.04
South Coast	2024	ConstMin - Rollers	Aggregated	175	Diesel	0.004923844	0.005957852	0.007090336	0.122822641	0.055812137	22.25171	0.002550065	0.00234606	0.002550065	0.00020558	0.000181615	721932.22	258909.58	705.74662	37231225.07
South Coast	2024	ConstMin - Rollers	Aggregated	300	Diesel	0.001262148	0.001527199	0.001817493	0.010840604	0.01678491	3.7610907	0.000644822	0.000593237	0.000644822	3.47353E-05	3.06975E-05	122024.44	28939.962	91.547321	6285112.896
South Coast	2024	ConstMin - Rollers	Aggregated	600	Diesel	0.000458011	0.000554193	0.000659535	0.005551711	0.005568297	2.0783996	0.000192721	0.000177303	0.000192721	1.93021E-05	1.69636E-05	67431.385	9829.4737	31.625438	3457290.353
South Coast	2024	OFF - ConstMin - Concrete/Industrial Saws	Aggregated	25	Diesel	2.77468E-05	3.3021E-05	3.99554E-05	0.000136373	0.000252486	0.0331201	9.43423E-06	8.6795E-06	9.43423E-06	4.20231E-07	2.74549E-07	1091.35	1460	2.47	26280
South Coast	2024	OFF - ConstMin - Concrete/Industrial Saws	Aggregated	50	Diesel	0.000357428	0.000425369	0.000514696	0.003966817	0.003389996	0.5205313	0.000106107	9.76183E-05	0.000106107	6.72917E-06	4.37259E-06	17381.3	12574.25	21.69	414950.25
South Coast	2024	ConstMin - Sweepers/Scrubbers	Aggregated	25	Diesel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
South Coast	2024	ConstMin - Sweepers/Scrubbers	Aggregated	50	Diesel	0.006662172	0.008061228	0.009593528	0.05406046	0.044072078	6.3492579	0.0025773	0.002371116	0.0025773	5.85022E-05	5.18218E-05	205994.68	220674.69	305.16729	7861115.123
South Coast	2024	ConstMin - Sweepers/Scrubbers	Aggregated	75	Diesel	0.001452469	0.001757487	0.002091555	0.008058636	0.012884958	0.9662441	0.001160007	0.001067206	0.001160007	8.88983E-06	7.88635E-06	31348.724	18620.121	37.808336	1339585.937
South Coast	2024	ConstMin - Sweepers/Scrubbers	Aggregated	100	Diesel	0.003624851	0.004386069	0.005219785	0.060272849	0.044447771	8.8467446	0.002327824	0.002141598	0.002327824	8.16838E-05	7.22059E-05	287022.89	154842.87	210.64644	12174024.85
South Coast	2024	ConstMin - Sweepers/Scrubbers	Aggregated	175	Diesel	0.001017612	0.00123131	0.001465361	0.014956776	0.010422026	2.4477513	0.000495738	0.000456079	0.000495738	2.26001E-05	1.99782E-05	79414.597	21078.906	28.626312	3369090.779
South Coast	2024	ConstMin - Sweepers/Scrubbers	Aggregated	300	Diesel	0.000432949	0.000523869	0.000623447	0.003152671	0.005546099	1.4699861	0.000178266	0.000164005	0.000178266	1.35778E-05	1.19978E-05	47692.079	9648.3328	12.962858	2023292.245
South Coast	2024	ConstMin - Sweepers/Scrubbers	Aggregated	600	Diesel	2.29474E-05	2.77664E-05	3.30443E-05	0.000366227	0.000100205	0.1985199	3.56024E-06	3.27542E-06	3.56024E-06	1.83473E-06	1.62029E-06	6440.7599	828.00972	1.0802382	273243.2084
South Coast	2024	ConstMin - Sweepers/Scrubbers	Aggregated	9999	Diesel	2.27293E-05	2.75024E-05	3.27301E-05	0.000455952	0.00019877	0.255068	8.77137E-06	8.06966E-06	8.77137E-06	2.35755E-06	2.08183E-06	8275.4006	414.00486	0.5401191	351076.1223
South Coast	2024	ConstMin - Off-Highway Trucks	Aggregated	25	Diesel	0.000128867	0.000155929	0.000185568	0.000546659	0.000360918	0.0371849	0.04906E-05	3.72513E-05	0.04906E-05	3.39926E-07	3.03498E-07	1206.4216	2198.4654	1.6210636	54961.63618
South Coast	2024	ConstMin - Off-Highway Trucks	Aggregated	50	Diesel	0.000791984	0.0009583	0.001140456	0.008510279	0.006412569	0.944039	0.000285524	0.000262682	0.000285524	8.70435E-06	7.70512E-06	30628.306	48486.833	29.179145	1406479.035
South Coast	2024	ConstMin - Off-Highway Trucks	Aggregated	75	Diesel	0.000119463	0.00014455	0.000172027	0.002441878	0.001010142	0.3278079	1.57444E-05	1.44848E-05	1.57444E-05	3.02716E-06	2.67552E-06	10635.365	7435.1319	4.8631908	536120.823
South Coast	2024	ConstMin - Off-Highway Trucks	Aggregated	100	Diesel	0.000367415	0.000444572	0.000529077	0.004878728	0.003805187	0.6478043	0.000249476	0.000229518	0.000249476	5.97825E-06	5.28729E-06	21017.297	12066.305	9.1860271	1061262.052
South Coast	2024	ConstMin - Off-Highway Trucks	Aggregated	175	Diesel	0.008357059	0.010112041	0.012034165	0.1477215904	0.067944933	23.215059	0.003228043	0.002969799	0.003228043	0.000214384	0.000189478	753187.01	242050.29	168.59062	38211388.35
South Coast	2024	ConstMin - Off-Highway Trucks	Aggregated	300	Diesel	0.015129065	0.018306168	0.021785853	0.114997517	0.123528153	47.238543	0.004959633	0.004562862	0.004959633	0.00043629	0.000385555	1532602.5	370015.88	284.76684	77867725.97
South Coast	2024	ConstMin - Off-Highway Trucks	Aggregated	600	Diesel	0.058236141	0.07046573	0.083860042	0.459017571	0.474739913	202.75199	0.017019359	0.01565781	0.017019359	0.001872796	0.001654835	6578065.1	884662.62	634.37623	333092899.3
South Coast	2024	ConstMin - Off-Highway Trucks	Aggregated	750	Diesel	0.027894111	0.033751875	0.04016752	0.215852461	0.269766929	68.782433	0.010317412	0.009492019	0.010317412	0.000635091	0.000561393	2231570.3	170543.3	136.7097	113065982.5
South Coast	2024	ConstMin - Off-Highway Trucks	Aggregated	9999	Diesel	0.036383424	0.044023943	0.05239213	0.277142358	0.743397735	121.84398	0.013918208	0.012804751	0.013918208	0.001125417	0.000994474	3953093.8	157171.97	108.61126	199864257.2
South Coast	2024	Portable Equipment - Non-Rental Generator	Aggregated	9999	Diesel	0.054834837	0.066350153	0.078962166	0.364390609	0.860047669	173.40668	0.022422232	0.020628453	0.022422232	0.001601586	0.001415322	5625988.8	287460.91	209.54657	355674068.2
South Coast	2024	ConstMin - Other Construction Equipment	Aggregated	175	Diesel	0.003873866	0.004687378	0.005578367	0.05614685	0.045236761	9.3493624	0.0023471	0.002159332	0.0023471	8.63233E-05	7.63082E-05	303329.77	93141.719	220.48396	14171966.91
South Coast	2024	ConstMin - Other Construction Equipment	Aggregated	300	Diesel	0.004011354	0.004853739	0.00577635	0.030878801	0.051786757	12.214429	0.002006795	0.001846252	0.002006795	0.000112808	9.96925E-05	396283.68	84034.967	201.66216	18414850.18
South Coast	2024	ConstMin - Other Construction Equipment	Aggregated	600	Diesel	0.012213304	0.014777778	0.017586777	0.118138309	0.141507367	47.820916	0.005305875	0.004881405	0.005305875	0.000441762	0.000390308	1551496.9	188946.41	411.92856	72164310.34
South Coast	2024	ConstMin - Other Construction Equipment	Aggregated	750	Diesel	0.002402639	0.002907193	0.0034598	0.018556932	0.030189068	8.9145077	0.001049856	0.000965868	0.001049856	0.000082347	0.000072759	289221.38	21884.983	44.634557	13442495.18
South Coast	2024	ConstMin - Other Construction Equipment	Aggregated	9999	Diesel	0.000651657	0.000788505	0.000938386	0.005748044	0.016643808	3.0263327	0.000306163	0.00028167	0.000306163	2.79604E-05	2.47005E-05	98186.033	4977.8299	10.217549	4572752.526

Table H1.18

## Onroad Vehicles Emission Factors

	Year	Vehicle Type	Units	PM10 brake wear	PM10 tire wear	PM2.5 brake wear	PM2.5 tire wear	PM10	PM2.5	DPM	NOX	SOX	CO	HC	VOC	CO2	CH4	N2O
Onsite Transit																		
	2024	Construction Trucks	g/mi					0.0138088	0.0132114	0.01380879	7.1482981	0.0222671	0.8332295		0.0954593	2356.9337	0.0044338	0.3704772
	2024	Worker Vehicles	g/mi					0.0094329	0.0086791	0.000157774	0.0773779	0.0062548	1.2481561		0.0622942	632.26873	0.0159141	0.0087178
	2025	Construction Trucks	g/mi					0.0125616	0.0120182	0.012561611	7.2105688	0.0220306	0.8408242		0.0902488	2331.8994	0.0041918	0.3665421
	2025	Worker Vehicles	g/mi					0.009093	0.0083658	0.000134133	0.0698737	0.0060653	1.1723031		0.0552776	613.11787	0.0142835	0.008216
	2026	Construction Trucks	g/mi					0.0114689	0.0109728	0.011468947	7.2869609	0.0218538	0.8488409		0.0855193	2313.1788	0.0039721	0.3635995
	2026	Worker Vehicles	g/mi					0.0087032	0.0080066	0.000111355	0.0637728	0.0058973	1.1099064		0.0494789	596.14033	0.0129276	0.0078087
Offsite Transit																		
	2024	Construction Trucks	g/mi	0.13034	0.012	0.05586	0.003	0.0100878	0.0096514	0.010087792	1.4591341	0.0086835	0.0838267		0.0115988	919.13301	0.0005387	0.1444749
	2024	Worker Vehicles	g/mi	0.03675	0.008	0.01575	0.002	0.0016106	0.0014829	5.21621E-05	0.0419133	0.0026543	0.6905881		0.0107865	268.3068	0.002754	0.0047139
	2025	Construction Trucks	g/mi	0.13034	0.012	0.05586	0.003	0.0099871	0.0095551	0.009987136	1.446922	0.0085844	0.0832898		0.0110903	908.64595	0.0005151	0.1428265
	2025	Worker Vehicles	g/mi	0.03675	0.008	0.01575	0.002	0.0015419	0.0014195	4.56363E-05	0.0376355	0.0025626	0.6460573		0.0094866	259.03839	0.0024539	0.004419
	2026	Construction Trucks	g/mi	0.13034	0.012	0.05586	0.003	0.00992	0.0094909	0.009920032	1.4390438	0.008509	0.0828843		0.0106317	900.66095	0.0004938	0.1415714
	2026	Worker Vehicles	g/mi	0.03675	0.008	0.01575	0.002	0.0014682	0.0013515	3.93525E-05	0.0342168	0.0024832	0.6098724		0.0084219	251.01696	0.0022067	0.0041838

Source: EMFAC2017

Notes: Refer to Table H1.19 for onsite and offsite transit vehicles speeds and worker vehicle fleet mix.

Table H1.19

## EMFAC2017 Output Onsite Transit

Fleet Mix Exhaust

EMFAC2017 (v1.0.2) Emission Rates

Region Type: Air District

Region: SOUTH COAST AQMD

Calendar Year: 2024, 2025, 2026

Season: Annual

Vehicle Classification: EMFAC2011 Categories

Units: miles/day for VMT, g/mile for RUNEX, PMBW and PMTW

Region	CalYr	VehClass	Mdlyr	Speed	Fuel	VMT	ROG_RUN EX	TOG_RUN EX	CO_RUNEX	NOx_RUNE X	SOx_RUNE X	CO2_RUNE X	CH4_RUNE X	PM10_RU NEX	PM2_5_RU NEX	N2O_RUN EX	DPM
SOUTH COAST	2024	LDA	Aggregated	5	GAS	720460.97	0.0470391	0.0686394	1.05892149	0.0546265	0.0058733	593.51674	0.01285	0.0090214	0.0082949	0.0068814	0
SOUTH COAST	2024	LDA	Aggregated	5	DSL	7337.2646	0.1570907	0.1788373	3.091287246	0.1141596	0.0045594	482.29097	0.007297	0.018095	0.0173122	0.0758094	0.018095
SOUTH COAST	2024	LDT1	Aggregated	5	GAS	81952.175	0.1245176	0.1816814	2.038238071	0.1624728	0.0068432	691.52653	0.029136	0.0120593	0.0110882	0.0127061	0
SOUTH COAST	2024	LDT1	Aggregated	5	DSL	23.045112	0.7094762	0.8076915	3.723673086	0.7190657	0.0097987	1036.5024	0.032954	0.4710287	0.4506522	0.1629237	0.4710287
SOUTH COAST	2024	LDT2	Aggregated	5	GAS	247273.33	0.0816633	0.1191576	1.473764265	0.1137081	0.0072224	729.84822	0.020747	0.0094428	0.0086823	0.009991	0
SOUTH COAST	2024	LDT2	Aggregated	5	DSL	2002.5419	0.257779	0.2934642	2.356618059	0.1521124	0.0060967	644.90278	0.011973	0.0117186	0.0112117	0.1013697	0.0117186
SOUTH COAST	2024	T6 instate c	Aggregated	5	DSL	517.83259	0.0954593	0.1086731	0.833229494	7.1482981	0.0222671	2356.9337	0.004434	0.0138088	0.0132114	0.3704772	0.0138088
SOUTH COAST	2025	LDA	Aggregated	5	GAS	719865.83	0.041315	0.0602867	0.998863317	0.049705	0.005702	576.20675	0.011485	0.0087325	0.0080292	0.0065106	0
SOUTH COAST	2025	LDA	Aggregated	5	DSL	7572.0712	0.1468369	0.167164	3.043218836	0.102991	0.0044332	468.94706	0.00682	0.0150433	0.0143925	0.0737119	0.0150433
SOUTH COAST	2025	LDT1	Aggregated	5	GAS	83153.597	0.1087688	0.1587152	1.84570184	0.1435799	0.0066594	672.95289	0.025701	0.0113458	0.0104321	0.0116068	0
SOUTH COAST	2025	LDT1	Aggregated	5	DSL	21.61003	0.6745385	0.7679173	3.643948927	0.6755583	0.009606	1016.1174	0.031331	0.4350876	0.4162659	0.1597195	0.4350876
SOUTH COAST	2025	LDT2	Aggregated	5	GAS	248475.98	0.0732723	0.1069188	1.381806608	0.1018897	0.0069694	704.27494	0.018816	0.0091508	0.0084138	0.0092515	0
SOUTH COAST	2025	LDT2	Aggregated	5	DSL	2096.776	0.2581362	0.2938709	2.403328973	0.1513147	0.0059232	626.55562	0.01199	0.0108116	0.0103439	0.0984858	0.0108116
SOUTH COAST	2025	T6 instate c	Aggregated	5	DSL	513.877	0.0902488	0.1027414	0.840824192	7.2105688	0.0220306	2331.8994	0.004192	0.0125616	0.0120182	0.3665421	0.0125616
SOUTH COAST	2026	LDA	Aggregated	5	GAS	718112.77	0.0366883	0.0535355	0.950427358	0.0458416	0.0055499	560.82858	0.010369	0.0083858	0.0077104	0.0062177	0
SOUTH COAST	2026	LDA	Aggregated	5	DSL	7761.4934	0.137457	0.1564857	3.000891738	0.0931671	0.0043236	457.35359	0.006385	0.0120555	0.011534	0.0718896	0.0120555
SOUTH COAST	2026	LDT1	Aggregated	5	GAS	84093.411	0.0954301	0.1392514	1.681728688	0.1276488	0.0064961	656.44567	0.022784	0.0106604	0.0098018	0.0106829	0
SOUTH COAST	2026	LDT1	Aggregated	5	DSL	19.63734	0.6135771	0.6985168	3.546443567	0.6100648	0.0093765	991.84897	0.028499	0.3720013	0.3559087	0.1559048	0.3720013
SOUTH COAST	2026	LDT2	Aggregated	5	GAS	249304.65	0.0662088	0.0966117	1.30564874	0.0921561	0.0067457	681.67186	0.017184	0.0088093	0.0080998	0.0086447	0
SOUTH COAST	2026	LDT2	Aggregated	5	DSL	2177.4535	0.2589294	0.2947739	2.447840667	0.1510853	0.005777	611.08714	0.012027	0.0104381	0.0099865	0.0960544	0.0104381
SOUTH COAST	2026	T6 instate c	Aggregated	5	DSL	512.39198	0.0855193	0.0973572	0.848840877	7.2869609	0.0218538	2313.1788	0.003972	0.0114689	0.0109728	0.3635995	0.0114689

Table H1.20

EMFAC2017 Output Offsite Transit

Fleet Mix Exhaust

EMFAC2017 (v1.0.2) Emission Rates

Region Type: Air District

Region: SOUTH COAST AQMD

Calendar Year: 2024, 2025, 2026

Season: Annual

Vehicle Classification: EMFAC2011 Categories

Units: miles/day for VMT, trips/day for Trips, g/mile for RUNEX, PMBW and PMTW, g/trip for STREX, HTSK and RUNLS, g/vehicle/day for IDLEX, RESTL and DIURN

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	Population	VMT	Trips	ROG_RUNE X	ROG_IDLEX	ROG_STRE X	ROG_HOTS OAK	ROG_RUNL OSS	ROG_REST LOSS	ROG_DIURN N	TOG_RUNE X	TOG_IDLEX	TOG_STRE X	TOG_HOTS OAK	TOG_RUNL OSS	TOG_RESTL OSS	TOG_DIURN N
SOUTH COA	2024	LDA	Aggregated	Aggregated	GAS	6543321.5	247047080	30912773	0.00822219	0	0.1888817	0.0900536	0.1997274	0.2074037	0.2191751	0.0119974	0	0.2068017	0.0900536	0.1997274	0.2074037	0.2191751
SOUTH COA	2024	LDA	Aggregated	Aggregated	DSL	63999.088	2508733.2	304606.89	0.0145786	0	0	0	0	0	0.0165967	0	0	0	0	0	0	0
SOUTH COA	2024	LDA	Aggregated	Aggregated	ELEC	172307.13	7265020	857849.63	0	0	0	0.004888	0	0.0079037	0.023477	0	0	0	0.004888	0	0.0079037	0.023477
SOUTH COA	2024	LDT1	Aggregated	Aggregated	GAS	758038.32	27517267	3506784.4	0.0241292	0	0.2935381	0.1753748	0.6117487	0.4403211	0.5238993	0.0352054	0	0.3213871	0.1753748	0.6117487	0.4403211	0.5238993
SOUTH COA	2024	LDT1	Aggregated	Aggregated	DSL	328.77854	7657.7325	1149.5715	0.1708218	0	0	0	0	0	0.1944693	0	0	0	0	0	0	0
SOUTH COA	2024	LDT1	Aggregated	Aggregated	ELEC	8873.8766	385871.85	44565.445	0	0	0	0.004888	0	0.0078613	0.0233652	0	0	0	0.004888	0	0.0078613	0.0233652
SOUTH COA	2024	LDT2	Aggregated	Aggregated	GAS	2256847	83361536	10593017	0.0149087	0	0.2669594	0.1136523	0.3879008	0.3356143	0.332401	0.0217534	0	0.2922868	0.1136523	0.3879008	0.3356143	0.332401
SOUTH COA	2024	LDT2	Aggregated	Aggregated	DSL	16402.997	669969.53	80362.135	0.020122	0	0	0	0	0	0.0229076	0	0	0	0	0	0	0
SOUTH COA	2024	LDT2	Aggregated	Aggregated	ELEC	34685.637	1081895.4	174560.97	0	0	0	0.004888	0	0.0078852	0.0234323	0	0	0	0.004888	0	0.0078852	0.0234323
SOUTH COA	2024	T6 instate cd	Aggregated	Aggregated	DSL	4467.8956	291328.11	20199.182	0.0115988	0.0497707	0	0	0	0	0.0132043	0.0566602	0	0	0	0	0	0
SOUTH COA	2025	LDA	Aggregated	Aggregated	GAS	6623932.9	247134863	31282323	0.0072078	0	0.1730799	0.0857858	0.1949939	0.1971446	0.2069079	0.0105176	0	0.1895006	0.0857858	0.1949939	0.1971446	0.2069079
SOUTH COA	2025	LDA	Aggregated	Aggregated	DSL	66922.32	2593390.4	318755.57	0.0131775	0	0	0	0	0	0	0.0150017	0	0	0	0	0	0
SOUTH COA	2025	LDA	Aggregated	Aggregated	ELEC	200007.11	8588255.8	994212.63	0	0	0	0.004888	0	0.0079137	0.0235063	0	0	0	0.004888	0	0.0079137	0.0235063
SOUTH COA	2025	LDT1	Aggregated	Aggregated	GAS	778181.88	27926963	3602142.6	0.0209762	0	0.2647065	0.1625491	0.5727636	0.4114373	0.4829739	0.0306084	0	0.2898203	0.1625491	0.5727636	0.4114373	0.4829739
SOUTH COA	2025	LDT1	Aggregated	Aggregated	DSL	306.69855	7182.2408	1077.0936	0.1589987	0	0	0	0	0	0	0.1810095	0	0	0	0	0	0
SOUTH COA	2025	LDT1	Aggregated	Aggregated	ELEC	10974.675	485559.29	55032.388	0	0	0	0.004888	0	0.0078683	0.0233853	0	0	0	0.004888	0	0.0078683	0.0233853
SOUTH COA	2025	LDT2	Aggregated	Aggregated	GAS	2295149.4	83832765	10772144	0.0133343	0	0.2461323	0.1083691	0.376717	0.3261566	0.3205227	0.0194574	0	0.2694839	0.1083691	0.376717	0.3261566	0.3205227
SOUTH COA	2025	LDT2	Aggregated	Aggregated	DSL	17587.778	702822.89	85874.295	0.0198868	0	0	0	0	0	0	0.0226398	0	0	0	0	0	0
SOUTH COA	2025	LDT2	Aggregated	Aggregated	ELEC	41917.383	1280277.3	210324.6	0	0	0	0.004888	0	0.0078902	0.0234468	0	0	0	0.004888	0	0.0078902	0.0234468
SOUTH COA	2025	T6 instate cd	Aggregated	Aggregated	DSL	4547.4396	289102.73	20558.798	0.0110903	0.0496598	0	0	0	0	0.0126254	0.0565339	0	0	0	0	0	0
SOUTH COA	2026	LDA	Aggregated	Aggregated	GAS	6704944.2	246806990	31652207	0.006388	0	0.1593916	0.0819021	0.1906985	0.187688	0.1957856	0.0093213	0	0.1745138	0.0819021	0.1906985	0.187688	0.1957856
SOUTH COA	2026	LDA	Aggregated	Aggregated	DSL	69486.663	2662198.2	331542.63	0.0118584	0	0	0	0	0	0	0.0135	0	0	0	0	0	0
SOUTH COA	2026	LDA	Aggregated	Aggregated	ELEC	226692.73	9539586.4	1124278.2	0	0	0	0.004888	0	0.0079235	0.0235345	0	0	0	0.004888	0	0.0079235	0.0235345
SOUTH COA	2026	LDT1	Aggregated	Aggregated	GAS	797971.55	28250579	3694973.3	0.0183022	0	0.2394362	0.1509449	0.5377018	0.3845134	0.4455651	0.0267065	0	0.2621525	0.1509449	0.5377018	0.3845134	0.4455651
SOUTH COA	2026	LDT1	Aggregated	Aggregated	DSL	270.69602	6522.8307	971.57155	0.1391271	0	0	0	0	0	0	0.1583869	0	0	0	0	0	0
SOUTH COA	2026	LDT1	Aggregated	Aggregated	ELEC	13055.319	564811.17	65291.34	0	0	0	0.004888	0	0.0078739	0.0234014	0	0	0	0.004888	0	0.0078739	0.0234014
SOUTH COA	2026	LDT2	Aggregated	Aggregated	GAS	2335277.2	84175951	10957538	0.012009	0	0.2278263	0.1034755	0.3655973	0.3166753	0.3090774	0.0175236	0	0.2494411	0.1034755	0.3655973	0.3166753	0.3090774
SOUTH COA	2026	LDT2	Aggregated	Aggregated	DSL	18735.824	731082.45	91136.642	0.0198152	0	0	0	0	0	0	0.0225583	0	0	0	0	0	0
SOUTH COA	2026	LDT2	Aggregated	Aggregated	ELEC	48997.68	1464375.6	244977.96	0	0	0	0.004888	0	0.0078949	0.0234608	0	0	0	0.004888	0	0.0078949	0.0234608
SOUTH COA	2026	T6 instate cd	Aggregated	Aggregated	DSL	4614.6301	288267.27	20862.563	0.0106317	0.0495653	0	0	0	0	0	0.0121033	0.0564263	0	0	0	0	0

Table H1.20  
EMFAC2017 Output Offsite Transit

Fleet Mix Exhaust

EMFAC2017 (v1.0.2) Emission Rates

Region Type: Air District

Region: SOUTH COAST AQMD

Calendar Year: 2024, 2025, 2026

Season: Annual

Vehicle Classification: EMFAC2011 Categories

Units: miles/day for VMT, trips/day for Trips, g/mile for RUNEX, PMBW and NEX

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	CO_RUNEX	CO_IDLEX	CO_STREX	NOx_RUNE X	NOx_IDLEX	NOx_STRE X	CO2_RUNE X	CO2_IDLEX	CO2_STREX	CH4_RUNE X	CH4_IDLEX	CH4_STREX	PM10_RUN EX	PM10_IDLE X	PM10_STR EX	PM10_PM TW	PM10_PM BW	PM2_5_RU NEX
SOUTH COA	2024	LDA	Aggregated	Aggregated	GAS	0.6170464	0	2.0207049	0.0309611	0	0.1642574	258.07942	0	51.791051	0.0022311	0	0.0436026	0.0015408	0	0.0017461	0.008	0.03675	0.0014167
SOUTH COA	2024	LDA	Aggregated	Aggregated	DSL	0.2478206	0	0	0.0491271	0	0	199.32668	0	0	0.0006771	0	0	0.0059574	0	0	0.008	0.03675	0.0056997
SOUTH COA	2024	LDA	Aggregated	Aggregated	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.008	0.03675	0
SOUTH COA	2024	LDT1	Aggregated	Aggregated	GAS	1.1388644	0	2.1397201	0.0881606	0	0.2238707	301.4961	0	60.692708	0.0055697	0	0.0603888	0.002162	0	0.0023056	0.008	0.03675	0.0019879
SOUTH COA	2024	LDT1	Aggregated	Aggregated	DSL	1.0129839	0	0	0.9123372	0	0	439.67457	0	0	0.0079343	0	0	0.1275098	0	0	0.008	0.03675	0.1219938
SOUTH COA	2024	LDT1	Aggregated	Aggregated	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.008	0.03675	0
SOUTH COA	2024	LDT2	Aggregated	Aggregated	GAS	0.8502923	0	2.5178682	0.0632094	0	0.2371036	317.80192	0	65.105601	0.0037395	0	0.0589011	0.0016344	0	0.0017692	0.008	0.03675	0.0015027
SOUTH COA	2024	LDT2	Aggregated	Aggregated	DSL	0.1813322	0	0	0.0405709	0	0	271.56232	0	0	0.0009346	0	0	0.0050299	0	0	0.008	0.03675	0.0048123
SOUTH COA	2024	LDT2	Aggregated	Aggregated	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.008	0.03675	0
SOUTH COA	2024	T6 instate cd	Aggregated	Aggregated	DSL	0.0838267	2.065668	0	1.4591341	2.9858499	2.608719	919.13301	611.50258	0	0.0005387	0.0023117	0	0.0100878	0.0010908	0	0.012	0.13034	0.0096514
SOUTH COA	2025	LDA	Aggregated	Aggregated	GAS	0.5828174	0	1.9420882	0.0281874	0	0.1548852	250.52752	0	50.2837	0.0019906	0	0.0404113	0.0014892	0	0.0016933	0.008	0.03675	0.0013692
SOUTH COA	2025	LDA	Aggregated	Aggregated	DSL	0.23993	0	0	0.0413241	0	0	193.81353	0	0	0.0006121	0	0	0.0050812	0	0	0.008	0.03675	0.0048614
SOUTH COA	2025	LDA	Aggregated	Aggregated	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.008	0.03675	0
SOUTH COA	2025	LDT1	Aggregated	Aggregated	GAS	1.0361128	0	2.0545514	0.0777812	0	0.2079147	293.35819	0	59.006598	0.0048877	0	0.0552078	0.0020231	0	0.0021721	0.008	0.03675	0.0018602
SOUTH COA	2025	LDT1	Aggregated	Aggregated	DSL	0.9514419	0	0	0.8441278	0	0	430.90778	0	0	0.0073852	0	0	0.1178524	0	0	0.008	0.03675	0.1127542
SOUTH COA	2025	LDT1	Aggregated	Aggregated	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.008	0.03675	0
SOUTH COA	2025	LDT2	Aggregated	Aggregated	GAS	0.7987576	0	2.4329096	0.0565713	0	0.2188839	306.65172	0	62.854964	0.0033811	0	0.0548503	0.0015807	0	0.0017244	0.008	0.03675	0.0014534
SOUTH COA	2025	LDT2	Aggregated	Aggregated	DSL	0.1833707	0	0	0.0385982	0	0	263.81093	0	0	0.0009237	0	0	0.0048189	0	0	0.008	0.03675	0.0046105
SOUTH COA	2025	LDT2	Aggregated	Aggregated	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.008	0.03675	0
SOUTH COA	2025	T6 instate cd	Aggregated	Aggregated	DSL	0.0832898	2.0686502	0	1.446922	2.9691191	2.614563	908.64595	606.79401	0	0.0005151	0.0023066	0	0.0099871	0.0010229	0	0.012	0.13034	0.0095551
SOUTH COA	2026	LDA	Aggregated	Aggregated	GAS	0.5551503	0	1.8711474	0.026021	0	0.1470536	243.80237	0	48.911179	0.0017939	0	0.0376081	0.0014287	0	0.001636	0.008	0.03675	0.0013136
SOUTH COA	2026	LDA	Aggregated	Aggregated	DSL	0.2328975	0	0	0.0343627	0	0	189.00964	0	0	0.0005508	0	0	0.0042255	0	0	0.008	0.03675	0.0040427
SOUTH COA	2026	LDA	Aggregated	Aggregated	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.008	0.03675	0
SOUTH COA	2026	LDT1	Aggregated	Aggregated	GAS	0.9485731	0	1.9744754	0.0691259	0	0.1943035	286.11364	0	57.468364	0.004308	0	0.0506358	0.001893	0	0.0020461	0.008	0.03675	0.0017405
SOUTH COA	2026	LDT1	Aggregated	Aggregated	DSL	0.8707018	0	0	0.7424044	0	0	420.343	0	0	0.0064622	0	0	0.1007983	0	0	0.008	0.03675	0.0964378
SOUTH COA	2026	LDT1	Aggregated	Aggregated	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.008	0.03675	0
SOUTH COA	2026	LDT2	Aggregated	Aggregated	GAS	0.7560499	0	2.3573407	0.0511453	0	0.2035334	296.78376	0	60.814875	0.0030782	0	0.0512609	0.0015198	0	0.001672	0.008	0.03675	0.0013974
SOUTH COA	2026	LDT2	Aggregated	Aggregated	DSL	0.1858674	0	0	0.0375382	0	0	257.27608	0	0	0.0009204	0	0	0.0047493	0	0	0.008	0.03675	0.0045438
SOUTH COA	2026	LDT2	Aggregated	Aggregated	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.008	0.03675	0
SOUTH COA	2026	T6 instate cd	Aggregated	Aggregated	DSL	0.0828843	2.0712518	0	1.4390438	2.9545035	2.6200331	900.66095	602.4448	0	0.0004938	0.0023022	0	0.00992	0.0009645	0	0.012	0.13034	0.0094909

Table H1.20  
EMFAC2017 Output Offsite Transit

Fleet Mix Exhaust

EMFAC2017 (v1.0.2) Emission Rates

Region Type: Air District

Region: SOUTH COAST AQMD

Calendar Year: 2024, 2025, 2026

Season: Annual

Vehicle Classification: EMFAC2011 Categories

Units: miles/day for VMT, trips/day for Trips, g/mile for RUNEX, PMBW an

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	PM2_5_IDL EX	PM2_5_ST REX	PM2_5_P MTW	PM2_5_P MBW	SOx_RUNE X	SOx_IDLEX	SOx_STREX	N2O_RUNE X	N2O_IDLEX	N2O_STREX
SOUTH COA	2024	LDA	Aggregated	Aggregated	GAS	0	0.0016055	0.002	0.01575	0.0025539	0	0.0005125	0.0039333	0	0.0237369
SOUTH COA	2024	LDA	Aggregated	Aggregated	DSL	0	0	0.002	0.01575	0.0018844	0	0	0.0313314	0	0
SOUTH COA	2024	LDA	Aggregated	Aggregated	ELEC	0	0	0.002	0.01575	0	0	0	0	0	0
SOUTH COA	2024	LDT1	Aggregated	Aggregated	GAS	0	0.0021199	0.002	0.01575	0.0029835	0	0.0006006	0.0070454	0	0.0264144
SOUTH COA	2024	LDT1	Aggregated	Aggregated	DSL	0	0	0.002	0.01575	0.0041565	0	0	0.0691107	0	0
SOUTH COA	2024	LDT1	Aggregated	Aggregated	ELEC	0	0	0.002	0.01575	0	0	0	0	0	0
SOUTH COA	2024	LDT2	Aggregated	Aggregated	GAS	0	0.0016267	0.002	0.01575	0.0031449	0	0.0006443	0.0056392	0	0.0288227
SOUTH COA	2024	LDT2	Aggregated	Aggregated	DSL	0	0	0.002	0.01575	0.0025672	0	0	0.0426858	0	0
SOUTH COA	2024	LDT2	Aggregated	Aggregated	ELEC	0	0	0.002	0.01575	0	0	0	0	0	0
SOUTH COA	2024	T6 instate cd	Aggregated	Aggregated	DSL	0.0010436	0	0.003	0.05586	0.0086835	0.0057772	0	0.1444749	0.0961197	0
SOUTH COA	2025	LDA	Aggregated	Aggregated	GAS	0	0.0015569	0.002	0.01575	0.0024792	0	0.0004976	0.0037231	0	0.0227572
SOUTH COA	2025	LDA	Aggregated	Aggregated	DSL	0	0	0.002	0.01575	0.0018322	0	0	0.0304648	0	0
SOUTH COA	2025	LDA	Aggregated	Aggregated	ELEC	0	0	0.002	0.01575	0	0	0	0	0	0
SOUTH COA	2025	LDT1	Aggregated	Aggregated	GAS	0	0.0019972	0.002	0.01575	0.002903	0	0.0005839	0.0064378	0	0.0252484
SOUTH COA	2025	LDT1	Aggregated	Aggregated	DSL	0	0	0.002	0.01575	0.0040736	0	0	0.0677327	0	0
SOUTH COA	2025	LDT1	Aggregated	Aggregated	ELEC	0	0	0.002	0.01575	0	0	0	0	0	0
SOUTH COA	2025	LDT2	Aggregated	Aggregated	GAS	0	0.0015855	0.002	0.01575	0.0030346	0	0.000622	0.0052221	0	0.0273272
SOUTH COA	2025	LDT2	Aggregated	Aggregated	DSL	0	0	0.002	0.01575	0.002494	0	0	0.0414674	0	0
SOUTH COA	2025	LDT2	Aggregated	Aggregated	ELEC	0	0	0.002	0.01575	0	0	0	0	0	0
SOUTH COA	2025	T6 instate cd	Aggregated	Aggregated	DSL	0.0009786	0	0.003	0.05586	0.0085844	0.0057327	0	0.1428265	0.0953796	0
SOUTH COA	2026	LDA	Aggregated	Aggregated	GAS	0	0.0015042	0.002	0.01575	0.0024126	0	0.000484	0.0035575	0	0.0219275
SOUTH COA	2026	LDA	Aggregated	Aggregated	DSL	0	0	0.002	0.01575	0.0017868	0	0	0.0297097	0	0
SOUTH COA	2026	LDA	Aggregated	Aggregated	ELEC	0	0	0.002	0.01575	0	0	0	0	0	0
SOUTH COA	2026	LDT1	Aggregated	Aggregated	GAS	0	0.0018813	0.002	0.01575	0.0028313	0	0.0005687	0.0059312	0	0.0242542
SOUTH COA	2026	LDT1	Aggregated	Aggregated	DSL	0	0	0.002	0.01575	0.0039738	0	0	0.0660721	0	0
SOUTH COA	2026	LDT1	Aggregated	Aggregated	ELEC	0	0	0.002	0.01575	0	0	0	0	0	0
SOUTH COA	2026	LDT2	Aggregated	Aggregated	GAS	0	0.0015373	0.002	0.01575	0.0029369	0	0.0006018	0.0048815	0	0.0260461
SOUTH COA	2026	LDT2	Aggregated	Aggregated	DSL	0	0	0.002	0.01575	0.0024322	0	0	0.0404402	0	0
SOUTH COA	2026	LDT2	Aggregated	Aggregated	ELEC	0	0	0.002	0.01575	0	0	0	0	0	0
SOUTH COA	2026	T6 instate cd	Aggregated	Aggregated	DSL	0.0009228	0	0.003	0.05586	0.008509	0.0056916	0	0.1415714	0.0946959	0



<b>Vehicle Idling Exhaust Onsite</b>	Fleet Mix
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Source: EMFAC2011 Idling Emission Rates - Idling rates for combined model year: HD\_Idle\_ER worksheet

**Table H1.22****Construction Equipment Load Factors**

<b>Equipment</b>	<b>CalEEMod HP</b>	<b>CalEEMod LF</b>
Aerial Lifts	63	0.31
Air Compressors	78	0.48
Bore/Drill Rigs	221	0.5
Cement and Mortar Mixers	9	0.56
Concrete/Industrial Saws	81	0.73
Cranes	231	0.29
Crawler Tractors	212	0.43
Crushing/Proc. Equipment	85	0.78
Dumpers/Tenders	16	0.38
Excavators	158	0.38
Forklifts	89	0.2
Generator Sets	84	0.74
Graders	187	0.41
Off-Highway Tractors	124	0.44
Off-Highway Trucks	402	0.38
Other Construction Equipment	172	0.42
Other General Industrial Equipment	88	0.34
Other Material Handling Equipment	168	0.4
Pavers	130	0.42
Paving Equipment	132	0.36
Plate Compactors	8	0.43
Pressure Washers	13	0.3
Pumps	84	0.74
Rollers	80	0.38
Rough Terrain Forklifts	100	0.4
Rubber Tired Dozers	247	0.4
Rubber Tired Loaders	203	0.36
Scrapers	367	0.48
Signal Boards	6	0.82
Skid Steer Loaders	65	0.37
Surfacing Equipment	263	0.3
Sweepers/Scrubbers	64	0.46
Tractors/Loaders/Backhoes	97	0.37
Trenchers	78	0.5
Welders	46	0.45

**Source:**

CalEEMod, Appendix D.

**Table H1.23****GHG Emission Factors**

	CO2 (lb CO2/MW hr)	CH4 (lb CO2/GW hr)	N2O (lb CO2/GW hr)
Electricity generation	527.9	33	4

**Source:**

2019 Climate Registry Default Emission Factors, Table 3.1, Default Factors for Calculating Emissions from Grid Electricity by eGrid Subregion. CAMX subregion.

**Table H1.24****Global Warming Potentials (GWP)**

CO2	CH4	N2O
1	25	298

**Source:**

IPCC 2007. Intergovernmental Panel on Climate Change. 4th Assessment Report, Climate Change 2007: The Physical Science Basis, Chapter 2, Table 2.14. June, 4th Assessment Report was chosen to maintain consistency with the U.S. EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2015, April 2017.

**Table H1.25****SOx Emission Factor - Offroad Construction Equipment**

Offroad Construction Equipment less	0.005552064 g/hp-hr
Offroad Construction Equipment grea	0.004994136 g/hp-hr
SOx (gms/hp-hr) = (S content in X/1,000,000) x (MW SO2/ MW S) x BSF =	
Where:	
X = S content in parts per million (ppm)	15 ppm
S MW = Molecular Weight	32
SO2 MW = Molecular Weight	64
BSFC for offroad construction equipment less than 100 hp (per CARB OFFROAD 2017 Diesel Emission Factors excel spreadsheet)	0.408 (lb/hp-hr)
BSFC for offroad construction equipment greater than 100 hp (per CARB OFFROAD 2017 Diesel Emission Factors excel spreadsheet)	0.367 (lb/hp-hr)
BSFC for offroad construction equipment less than 100 hp	185.0688 (g/hp-hr)
BSFC for offroad construction equipment greater than 100 hp	166.4712 (g/hp-hr)

Table H1.26

## Alternative 2 Emissions by Task

						Unmitigated Emissions										
						Peak Day										
						PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
1	Electrical Substation Construction at Pier J (mitigation only)															
1	Off-Road Equipment															
1	Caterpillar 320 excavator	Offroad Construction Equipment		onsite	20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Small asphalt roller	Offroad Construction Equipment		onsite	26	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Water truck	Offroad Construction Equipment		onsite	20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Forklift	Offroad Construction Equipment		onsite	22	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Mobile crane (35 ton)	Offroad Construction Equipment		onsite	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	On-Road Vehicles															
1	Haul trucks	Onroad Construction Vehicles		onsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Supply trucks	Onroad Construction Vehicles		onsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Haul trucks	Onroad Construction Vehicles		offsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Supply trucks	Onroad Construction Vehicles		offsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Workers	Onroad Construction Vehicles		offsite	60	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Fugitive Dust															
1	Soil handling	Fugitive Emissions		onsite	20	n/a	n/a									
1	Asphalting	Fugitive Emissions		onsite												
2	Pier J Breakwater Construction															
2	Marine Activities															
2	Pier J Breakwater Tugboat propulsion engine	Marine Equipment		onsite	54	5.81	5.17	5.81	108.18	0.06	58.10	6.00	3.44	0.00	0.00	3.4864
2	Pier J Breakwater Tugboat auxiliary engine	Marine Equipment		onsite	54	1.06	0.94	1.06	18.86	0.01	13.23	1.05	0.78	0.00	0.00	0.7941
2	Pier J Breakwater Crew boat propulsion engine	Marine Equipment		onsite	54	0.41	0.36	0.41	8.02	0.00	4.06	0.44	0.24	0.00	0.00	0.2437
2	Pier J Breakwater Crew boat auxiliary engine	Marine Equipment		onsite	54	0.03	0.03	0.03	0.60	0.00	0.42	0.03	0.02	0.00	0.00	0.0253
2	Pier J Breakwater Survey boat propulsion engine	Marine Equipment		onsite	54	0.36	0.32	0.36	7.16	0.00	3.62	0.40	0.21	0.00	0.00	0.2174
2	Off-Road Equipment															
2	Piling crane	Offroad Construction Equipment		onsite	54	0.21	0.19	0.21	5.00	0.01	2.67	0.47	0.38	0.00	0.00	0.3800
2	Long arm excavator	Offroad Construction Equipment		onsite	54	0.08	0.07	0.08	2.19	0.01	2.78	0.32	0.63	0.00	0.00	0.6340
2	On-Road Vehicles															
2	Delivery Trucks	Onroad Construction Vehicles		onsite	5	0.15	0.04	0.00	0.08	0.00	0.01	0.00	0.01	0.00	0.00	0.0123
2	Delivery Trucks	Onroad Construction Vehicles		offsite	5	0.49	0.19	0.02	3.22	0.02	0.18	0.03	0.92	0.00	0.00	0.9622
2	Workers	Onroad Construction Vehicles		offsite	54	0.16	0.05	0.00	0.06	0.00	0.96	0.01	0.17	0.00	0.00	0.1700

Table H1.26

## Alternative 2 Emissions by Task

			Unmitigated Emissions										
			Total										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
1	Electrical Substation Construction at Pier J (mitigation only)												
1	Off-Road Equipment												
1	Caterpillar 320 excavator	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Small asphalt roller	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Water truck	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Forklift	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Mobile crane (35 ton)	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	On-Road Vehicles												
1	Haul trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Supply trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Haul trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Supply trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Workers	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Fugitive Dust												
1	Soil handling	Fugitive Emissions	n/a	n/a									
1	Asphalting	Fugitive Emissions											
2 Pier J Breakwater Construction													
2	Marine Activities												
2	Pier J Breakwater Tugboat propulsion engine	Marine Equipment	313.73	279.22	313.73	5841.59	3.46	3137.27	323.75	185.57	0.00	0.01	188.27
2	Pier J Breakwater Tugboat auxiliary engine	Marine Equipment	57.17	50.88	57.17	1018.30	0.79	714.59	56.44	42.27	0.00	0.00	42.88
2	Pier J Breakwater Crew boat propulsion engine	Marine Equipment	21.93	19.52	21.93	433.28	0.24	219.27	24.01	12.97	0.00	0.00	13.16
2	Pier J Breakwater Crew boat auxiliary engine	Marine Equipment	1.82	1.62	1.82	32.38	0.03	22.73	1.79	1.34	0.00	0.00	1.36
2	Pier J Breakwater Survey boat propulsion engine	Marine Equipment	19.57	17.41	19.57	386.62	0.22	195.66	21.43	11.57	0.00	0.00	11.74
2	Off-Road Equipment												
2	Piling crane	Offroad Construction Equipment	11.27	10.36	11.27	270.12	0.42	144.43	25.20	20.52	0.00	0.00	20.52
2	Long arm excavator	Offroad Construction Equipment	4.06	3.74	4.06	118.13	0.70	149.87	17.33	34.23	0.00	0.00	34.23
2	On-Road Vehicles												
2	Delivery Trucks	Onroad Construction Vehicles	0.74	0.18	0.00	0.39	0.00	0.05	0.01	0.06	0.00	0.00	0.06
2	Delivery Trucks	Onroad Construction Vehicles	2.43	0.94	0.11	16.08	0.10	0.92	0.13	4.60	0.00	0.00	4.81
2	Workers	Onroad Construction Vehicles	8.58	2.72	0.00	3.14	0.20	51.79	0.81	9.13	0.00	0.00	9.18

Table H1.26

## Alternative 2 Emissions by Task

			Mitigated										
			Peak Day										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	Source Type 1	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
1	Electrical Substation Construction at Pier J (mitigation only)												
1	Off-Road Equipment												
1	Caterpillar 320 excavator	Offroad Construction Equipment	0.02	0.02	0.02	0.33	0.01	1.23	0.16	0.26	0.00	0.00	0.2648
1	Small asphalt roller	Offroad Construction Equipment	0.00	0.00	0.00	0.74	0.00	0.91	0.04	0.06	0.00	0.00	0.0581
1	Water truck	Offroad Construction Equipment	0.03	0.03	0.03	0.60	0.01	2.59	0.30	0.00	0.00	0.00	0.0000
1	Forklift	Offroad Construction Equipment	0.00	0.00	0.00	0.15	0.00	0.16	0.01	0.00	0.00	0.00	0.0000
1	Mobile crane (35 ton)	Offroad Construction Equipment	0.02	0.02	0.02	0.43	0.01	2.41	0.21	0.00	0.00	0.00	0.0000
1	On-Road Vehicles												
1	Haul trucks	Onroad Construction Vehicles	0.09	0.02	0.00	0.05	0.00	0.01	0.00	0.01	0.00	0.00	0.0074
1	Supply trucks	Onroad Construction Vehicles	0.21	0.05	0.00	0.11	0.00	0.01	0.00	0.02	0.00	0.00	0.0173
1	Haul trucks	Onroad Construction Vehicles	0.02	0.01	0.00	0.11	0.00	0.01	0.00	0.03	0.00	0.00	0.0318
1	Supply trucks	Onroad Construction Vehicles	0.07	0.03	0.00	0.45	0.00	0.03	0.00	0.13	0.00	0.00	0.1347
1	Workers	Onroad Construction Vehicles	0.15	0.05	0.00	0.06	0.00	0.91	0.01	0.16	0.00	0.00	0.1619
1	Fugitive Dust												
1	Soil handling	Fugitive Emissions	2.01	0.30									
1	Asphalting	Fugitive Emissions											
2	Pier J Breakwater Construction												
2	Marine Activities												
2	Pier J Breakwater Tugboat propulsion engine	Marine Equipment	3.95	3.52	3.95	77.27	0.06	58.10	4.28	3.44	0.00	0.00	3.4860
2	Pier J Breakwater Tugboat auxiliary engine	Marine Equipment	0.37	0.33	0.37	13.58	0.01	14.56	0.75	0.78	0.00	0.00	0.7940
2	Pier J Breakwater Crew boat propulsion engine	Marine Equipment	0.28	0.25	0.28	5.40	0.00	4.06	0.30	0.24	0.00	0.00	0.2436
2	Pier J Breakwater Crew boat auxiliary engine	Marine Equipment	0.01	0.01	0.01	0.43	0.00	0.46	0.02	0.02	0.00	0.00	0.0253
2	Pier J Breakwater Survey boat propulsion engine	Marine Equipment	0.25	0.22	0.25	4.82	0.00	3.62	0.27	0.21	0.00	0.00	0.2174
2	Off-Road Equipment												
2	Piling crane	Offroad Construction Equipment	0.02	0.02	0.02	0.48	0.01	2.67	0.24	0.38	0.00	0.00	0.3800
2	Long arm excavator	Offroad Construction Equipment	0.04	0.04	0.04	0.79	0.01	2.78	0.32	0.63	0.00	0.00	0.6340
2	On-Road Vehicles												
2	Delivery Trucks	Onroad Construction Vehicles	0.15	0.04	0.00	0.08	0.00	0.01	0.00	0.01	0.00	0.00	0.0123
2	Delivery Trucks	Onroad Construction Vehicles	0.49	0.19	0.02	3.22	0.02	0.18	0.03	0.92	0.00	0.00	0.9622
2	Workers	Onroad Construction Vehicles	0.16	0.05	0.00	0.06	0.00	0.96	0.01	0.17	0.00	0.00	0.1700

Table H1.26

## Alternative 2 Emissions by Task

			Mitigated Emissions										
			Total										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
1	Electrical Substation Construction at Pier J (mitigation only)												
1	Off-Road Equipment												
1	Caterpillar 320 excavator	Offroad Construction Equipment	0.33	0.33	0.33	6.59	0.11	24.52	3.12	5.30	0.00	0.00	5.30
1	Small asphalt roller	Offroad Construction Equipment	0.13	0.13	0.13	19.12	0.03	23.58	1.06	1.51	0.00	0.00	1.51
1	Water truck	Offroad Construction Equipment	0.60	0.60	0.60	12.06	0.20	51.75	5.93	0.00	0.00	0.00	0.00
1	Forklift	Offroad Construction Equipment	0.02	0.02	0.02	3.23	0.01	3.59	0.18	0.00	0.00	0.00	0.00
1	Mobile crane (35 ton)	Offroad Construction Equipment	0.04	0.04	0.04	0.87	0.01	4.83	0.43	0.00	0.00	0.00	0.00
1	On-Road Vehicles												
1	Haul trucks	Onroad Construction Vehicles	0.44	0.11	0.00	0.24	0.00	0.03	0.00	0.04	0.00	0.00	0.04
1	Supply trucks	Onroad Construction Vehicles	1.03	0.26	0.00	0.55	0.00	0.06	0.01	0.08	0.00	0.00	0.09
1	Haul trucks	Onroad Construction Vehicles	0.08	0.03	0.00	0.53	0.00	0.03	0.00	0.15	0.00	0.00	0.16
1	Supply trucks	Onroad Construction Vehicles	0.34	0.13	0.02	2.25	0.01	0.13	0.02	0.64	0.00	0.00	0.67
1	Workers	Onroad Construction Vehicles	9.08	2.88	0.00	3.33	0.21	54.81	0.86	9.66	0.00	0.00	9.71
1	Fugitive Dust												
1	Soil handling	Fugitive Emissions	40.12	6.07									
1	Asphalting	Fugitive Emissions											
2	Pier J Breakwater Construction												
2	Marine Activities												
2	Pier J Breakwater Tugboat propulsion engine	Marine Equipment	213.33	189.87	213.33	4172.56	3.46	3137.27	231.25	185.57	0.00	0.01	188.25
2	Pier J Breakwater Tugboat auxiliary engine	Marine Equipment	20.01	17.81	20.01	733.17	0.79	786.05	40.63	42.27	0.00	0.00	42.88
2	Pier J Breakwater Crew boat propulsion engine	Marine Equipment	14.91	13.27	14.91	291.63	0.24	219.27	16.16	12.97	0.00	0.00	13.16
2	Pier J Breakwater Crew boat auxiliary engine	Marine Equipment	0.64	0.57	0.64	23.32	0.03	25.00	1.29	1.34	0.00	0.00	1.36
2	Pier J Breakwater Survey boat propulsion engine	Marine Equipment	13.30	11.84	13.30	260.22	0.22	195.66	14.42	11.57	0.00	0.00	11.74
2	Off-Road Equipment												
2	Piling crane	Offroad Construction Equipment	1.29	1.29	1.29	25.89	0.42	144.43	12.72	20.52	0.00	0.00	20.52
2	Long arm excavator	Offroad Construction Equipment	2.14	2.14	2.14	42.75	0.70	149.87	17.33	34.23	0.00	0.00	34.23
2	On-Road Vehicles												
2	Delivery Trucks	Onroad Construction Vehicles	0.74	0.18	0.00	0.39	0.00	0.05	0.01	0.06	0.00	0.00	0.06
2	Delivery Trucks	Onroad Construction Vehicles	2.43	0.94	0.11	16.08	0.10	0.92	0.13	4.60	0.00	0.00	4.81
2	Workers	Onroad Construction Vehicles	8.58	2.72	0.00	3.14	0.20	51.79	0.81	9.13	0.00	0.00	9.18

Table H1.26

## Alternative 2 Emissions by Task

						Unmitigated Emissions										
						Peak Day										
						PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
<b>3 Approach Channel (hopper dredge 1,144,000 CY)</b>																
3	<b>Marine Hopper Dredge</b>															
3	Hopper propulsion engine	Marine Equipment	dredging	onsite	66	26.63	23.70	26.63	495.89	0.29	266.32	27.48	15.75	0.00	0.00	15.9819
3	Hopper propulsion engine	Marine Equipment	transit	offsite	66	50.31	44.77	50.31	936.68	0.56	503.05	51.91	29.76	0.00	0.00	30.1880
3	Hopper auxiliary engine	Marine Equipment	disposal	near shore	66	0.22	0.20	0.22	5.06	0.00	3.70	0.28	0.22	0.00	0.00	0.2219
3	Hopper Crew boat propulsion engine	Marine Equipment	support	onsite	66	0.41	0.36	0.41	8.02	0.00	4.06	0.44	0.24	0.00	0.00	0.2437
3	Hopper Crew boat auxiliary engine	Marine Equipment	support	onsite	66	0.03	0.03	0.03	0.60	0.00	0.42	0.03	0.02	0.00	0.00	0.0253
3	Hopper Survey boat propulsion engine	Marine Equipment	dredging	onsite	66	1.45	1.29	1.45	28.64	0.02	14.49	1.59	0.86	0.00	0.00	0.8697
<b>4 Main Channel Widening (clam shell dredge 1,065,000 CY)</b>																
4	<b>Marine Clamshell Dredge</b>															
4	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	178	4.37	4.37	4.37	132.70	0.15	75.66	7.35	5.79	0.00	0.00	5.7854
4	Clamshell Dredge generator	Marine Equipment	dredging	onsite	178	3.27	3.27	3.27	99.52	0.11	56.75	5.52	3.20	0.00	0.00	3.1964
4	Clamshell Barge dump scow	Marine Equipment	disposal	near shore	178	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.00	0.00	0.0382
4	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	178	0.61	0.54	0.61	11.39	0.01	6.12	0.63	0.36	0.00	0.00	0.3670
4	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	178	0.09	0.08	0.09	1.57	0.00	1.10	0.09	0.07	0.00	0.00	0.0662
4	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	178	11.01	9.80	11.01	204.97	0.12	110.08	11.36	6.51	0.00	0.00	6.6058
4	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	178	1.59	1.41	1.59	28.29	0.02	19.85	1.57	1.17	0.00	0.00	1.1911
4	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	178	0.41	0.36	0.41	8.02	0.00	4.06	0.44	0.24	0.00	0.00	0.2437
4	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	178	0.03	0.03	0.03	0.60	0.00	0.42	0.03	0.02	0.00	0.00	0.0253
4	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	178	0.36	0.32	0.36	7.16	0.00	3.62	0.40	0.21	0.00	0.00	0.2174
<b>5 West Basin (clam shell dredge 501,000 CY)</b>																
5	<b>Marine Clamshell Dredge</b>															
5	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	84	4.37	4.37	4.37	132.70	0.15	75.66	7.35	5.79	0.00	0.00	5.7854
5	Clamshell Dredge generator	Marine Equipment	dredging	onsite	84	3.27	3.27	3.27	99.52	0.11	56.75	5.52	3.20	0.00	0.00	3.1964
5	Clamshell Barge dump scow	Marine Equipment	disposal	near shore	84	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.00	0.00	0.0382
5	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	84	0.61	0.54	0.61	11.39	0.01	6.12	0.63	0.36	0.00	0.00	0.3670
5	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	84	0.09	0.08	0.09	1.57	0.00	1.10	0.09	0.07	0.00	0.00	0.0662
5	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	84	11.01	9.80	11.01	204.97	0.12	110.08	11.36	6.51	0.00	0.00	6.6058
5	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	84	1.59	1.41	1.59	28.29	0.02	19.85	1.57	1.17	0.00	0.00	1.1911
5	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	84	0.41	0.36	0.41	8.02	0.00	4.06	0.44	0.24	0.00	0.00	0.2437
5	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	84	0.03	0.03	0.03	0.60	0.00	0.42	0.03	0.02	0.00	0.00	0.0253
5	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	84	0.36	0.32	0.36	7.16	0.00	3.62	0.40	0.21	0.00	0.00	0.2174



Table H1.26

## Alternative 2 Emissions by Task

			Unmitigated Emissions										
			Total										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
3 Approach Channel (hopper dredge 1,144,000 CY)													
3	Marine Hopper Dredge												
3	Hopper propulsion engine	Marine Equipment	1757.72	1564.37	1757.72	32728.77	19.41	17577.21	1813.86	1039.68	0.02	0.05	1054.80
3	Hopper propulsion engine	Marine Equipment	3320.14	2954.92	3320.14	61821.01	36.65	33201.40	3426.19	1963.84	0.03	0.09	1992.41
3	Hopper auxiliary engine	Marine Equipment	14.65	13.04	14.65	333.97	0.27	244.13	18.51	14.44	0.00	0.00	14.65
3	Hopper Crew boat propulsion engine	Marine Equipment	26.80	23.85	26.80	529.56	0.30	268.00	29.35	15.85	0.00	0.00	16.08
3	Hopper Crew boat auxiliary engine	Marine Equipment	2.22	1.98	2.22	39.58	0.03	27.78	2.19	1.64	0.00	0.00	1.67
3	Hopper Survey boat propulsion engine	Marine Equipment	95.65	85.13	95.65	1890.14	1.06	956.55	104.75	56.58	0.00	0.00	57.40
4 Main Channel Widening (clam shell dredge 1,065,000 CY)													
4	Marine Clamshell Dredge												
4	Clamshell Dredge hoist	Marine Equipment	776.98	776.98	776.98	23620.32	25.87	13467.72	1309.06	1029.80	0.00	0.00	1029.80
4	Clamshell Dredge generator	Marine Equipment	582.74	582.74	582.74	17715.24	19.40	10100.79	981.80	568.97	0.00	0.00	568.97
4	Clamshell Barge dump scow	Marine Equipment	8.24	8.24	8.24	156.57	0.27	142.84	8.68	6.80	0.00	0.00	6.80
4	Clamshell Tugboat propulsion engine	Marine Equipment	108.86	96.88	108.86	2026.91	1.20	1088.56	112.33	64.39	0.00	0.00	65.32
4	Clamshell Tugboat auxiliary engine	Marine Equipment	15.70	13.98	15.70	279.72	0.22	196.29	15.50	11.61	0.00	0.00	11.78
4	Clamshell Tugboat propulsion engine	Marine Equipment	1959.42	1743.88	1959.42	36484.31	21.63	19594.15	2022.00	1158.98	0.02	0.06	1175.84
4	Clamshell Tugboat auxiliary engine	Marine Equipment	282.66	251.57	282.66	5034.91	3.90	3533.27	279.04	208.99	0.00	0.01	212.01
4	Clamshell Crew boat propulsion engine	Marine Equipment	72.28	64.33	72.28	1428.22	0.80	722.78	79.15	42.75	0.00	0.00	43.38
4	Clamshell Crew boat auxiliary engine	Marine Equipment	5.99	5.33	5.99	106.75	0.08	74.91	5.92	4.43	0.00	0.00	4.50
4	Clamshell Survey boat propulsion engine	Marine Equipment	64.49	57.40	64.49	1274.41	0.71	644.94	70.63	38.15	0.00	0.00	38.70
5 West Basin (clam shell dredge 501,000 CY)													
5	Marine Clamshell Dredge												
5	Clamshell Dredge hoist	Marine Equipment	366.67	366.67	366.67	11146.67	12.21	6355.56	617.76	485.97	0.00	0.00	485.97
5	Clamshell Dredge generator	Marine Equipment	275.00	275.00	275.00	8360.00	9.16	4766.67	463.32	268.50	0.00	0.00	268.50
5	Clamshell Barge dump scow	Marine Equipment	3.89	3.89	3.89	73.89	0.13	67.41	4.10	3.21	0.00	0.00	3.21
5	Clamshell Tugboat propulsion engine	Marine Equipment	51.37	45.72	51.37	956.52	0.57	513.70	53.01	30.39	0.00	0.00	30.83
5	Clamshell Tugboat auxiliary engine	Marine Equipment	7.41	6.60	7.41	132.00	0.10	92.63	7.32	5.48	0.00	0.00	5.56
5	Clamshell Tugboat propulsion engine	Marine Equipment	924.67	822.95	924.67	17217.32	10.21	9246.68	954.20	546.94	0.01	0.03	554.89
5	Clamshell Tugboat auxiliary engine	Marine Equipment	133.39	118.72	133.39	2376.02	1.84	1667.38	131.68	98.62	0.00	0.00	100.05
5	Clamshell Crew boat propulsion engine	Marine Equipment	34.11	30.36	34.11	673.99	0.38	341.09	37.35	20.18	0.00	0.00	20.47
5	Clamshell Crew boat auxiliary engine	Marine Equipment	2.83	2.52	2.83	50.38	0.04	35.35	2.79	2.09	0.00	0.00	2.12
5	Clamshell Survey boat propulsion engine	Marine Equipment	30.44	27.09	30.44	601.41	0.34	304.36	33.33	18.00	0.00	0.00	18.26

Table H1.26

## Alternative 2 Emissions by Task

			Mitigated Peak Day										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	Source Type 1	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
3 Approach Channel (hopper dredge 1,144,000 CY)													
3	Marine Hopper Dredge												
3	Hopper propulsion engine	Marine Equipment	26.63	23.70	26.63	495.89	0.29	266.32	27.48	15.75	0.00	0.00	15.9819
3	Hopper propulsion engine	Marine Equipment	50.31	44.77	50.31	936.68	0.56	503.05	51.91	29.76	0.00	0.00	30.1880
3	Hopper auxiliary engine	Marine Equipment	0.22	0.20	0.22	5.06	0.00	3.70	0.28	0.22	0.00	0.00	0.2219
3	Hopper Crew boat propulsion engine	Marine Equipment	0.28	0.25	0.28	5.40	0.00	4.06	0.30	0.24	0.00	0.00	0.2436
3	Hopper Crew boat auxiliary engine	Marine Equipment	0.01	0.01	0.01	0.43	0.00	0.46	0.02	0.02	0.00	0.00	0.0253
3	Hopper Survey boat propulsion engine	Marine Equipment	0.99	0.88	0.99	19.28	0.02	14.49	1.07	0.86	0.00	0.00	0.8696
4 Main Channel Widening (clam shell dredge 1,065,000 CY)													
4	Marine Clamshell Dredge												
4	Clamshell Dredge hoist	Marine Equipment	0.44	0.44	0.44	13.27	0.01	7.57	0.74	0.58	0.00	0.00	0.5785
4	Clamshell Dredge generator	Marine Equipment	0.33	0.33	0.33	9.95	0.01	5.67	0.55	0.32	0.00	0.00	0.3196
4	Clamshell Barge dump scow	Marine Equipment	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.00	0.00	0.0382
4	Clamshell Tugboat propulsion engine	Marine Equipment	0.42	0.37	0.42	8.13	0.01	6.12	0.45	0.36	0.00	0.00	0.3670
4	Clamshell Tugboat auxiliary engine	Marine Equipment	0.03	0.03	0.03	1.13	0.00	1.21	0.06	0.07	0.00	0.00	0.0662
4	Clamshell Tugboat propulsion engine	Marine Equipment	7.49	6.66	7.49	146.41	0.12	110.08	8.11	6.51	0.00	0.00	6.6051
4	Clamshell Tugboat auxiliary engine	Marine Equipment	0.56	0.49	0.56	20.37	0.02	21.83	1.13	1.17	0.00	0.00	1.1910
4	Clamshell Crew boat propulsion engine	Marine Equipment	0.28	0.25	0.28	5.40	0.00	4.06	0.30	0.24	0.00	0.00	0.2436
4	Clamshell Crew boat auxiliary engine	Marine Equipment	0.01	0.01	0.01	0.43	0.00	0.46	0.02	0.02	0.00	0.00	0.0253
4	Clamshell Survey boat propulsion engine	Marine Equipment	0.25	0.22	0.25	4.82	0.00	3.62	0.27	0.21	0.00	0.00	0.2174
5 West Basin (clam shell dredge 501,000 CY)													
5	Marine Clamshell Dredge												
5	Clamshell Dredge hoist	Marine Equipment	0.44	0.44	0.44	13.27	0.01	7.57	0.74	0.58	0.00	0.00	0.5785
5	Clamshell Dredge generator	Marine Equipment	0.33	0.33	0.33	9.95	0.01	5.67	0.55	0.32	0.00	0.00	0.3196
5	Clamshell Barge dump scow	Marine Equipment	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.00	0.00	0.0382
5	Clamshell Tugboat propulsion engine	Marine Equipment	0.42	0.37	0.42	8.13	0.01	6.12	0.45	0.36	0.00	0.00	0.3670
5	Clamshell Tugboat auxiliary engine	Marine Equipment	0.03	0.03	0.03	1.13	0.00	1.21	0.06	0.07	0.00	0.00	0.0662
5	Clamshell Tugboat propulsion engine	Marine Equipment	7.49	6.66	7.49	146.41	0.12	110.08	8.11	6.51	0.00	0.00	6.6051
5	Clamshell Tugboat auxiliary engine	Marine Equipment	0.56	0.49	0.56	20.37	0.02	21.83	1.13	1.17	0.00	0.00	1.1910
5	Clamshell Crew boat propulsion engine	Marine Equipment	0.28	0.25	0.28	5.40	0.00	4.06	0.30	0.24	0.00	0.00	0.2436
5	Clamshell Crew boat auxiliary engine	Marine Equipment	0.01	0.01	0.01	0.43	0.00	0.46	0.02	0.02	0.00	0.00	0.0253
5	Clamshell Survey boat propulsion engine	Marine Equipment	0.25	0.22	0.25	4.82	0.00	3.62	0.27	0.21	0.00	0.00	0.2174

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.26

## Alternative 2 Emissions by Task

			Mitigated Emissions										
			Total										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
<b>3 Approach Channel (hopper dredge 1,144,000 CY)</b>													
3	<b>Marine Hopper Dredge</b>												
3	Hopper propulsion engine	Marine Equipment	1757.72	1564.37	1757.72	32728.77	19.41	17577.21	1813.86	1039.68	0.02	0.05	1054.80
3	Hopper propulsion engine	Marine Equipment	3320.14	2954.92	3320.14	61821.01	36.65	33201.40	3426.19	1963.84	0.03	0.09	1992.41
3	Hopper auxiliary engine	Marine Equipment	14.65	13.04	14.65	333.97	0.27	244.13	18.51	14.44	0.00	0.00	14.65
3	Hopper Crew boat propulsion engine	Marine Equipment	18.22	16.22	18.22	356.44	0.30	268.00	19.75	15.85	0.00	0.00	16.08
3	Hopper Crew boat auxiliary engine	Marine Equipment	0.78	0.69	0.78	28.50	0.03	30.55	1.58	1.64	0.00	0.00	1.67
3	Hopper Survey boat propulsion engine	Marine Equipment	65.05	57.89	65.05	1272.21	1.06	956.55	70.51	56.58	0.00	0.00	57.40
<b>4 Main Channel Widening (clam shell dredge 1,065,000 CY)</b>													
4	<b>Marine Clamshell Dredge</b>												
4	Clamshell Dredge hoist	Marine Equipment	77.70	77.70	77.70	2362.03	2.59	1346.77	130.91	102.98	0.00	0.00	102.98
4	Clamshell Dredge generator	Marine Equipment	58.27	58.27	58.27	1771.52	1.94	1010.08	98.18	56.90	0.00	0.00	56.90
4	Clamshell Barge dump scow	Marine Equipment	8.24	8.24	8.24	156.57	0.27	142.84	8.68	6.80	0.00	0.00	6.80
4	Clamshell Tugboat propulsion engine	Marine Equipment	74.02	65.88	74.02	1447.79	1.20	1088.56	80.24	64.39	0.00	0.00	65.32
4	Clamshell Tugboat auxiliary engine	Marine Equipment	5.50	4.89	5.50	201.40	0.22	215.92	11.16	11.61	0.00	0.00	11.78
4	Clamshell Tugboat propulsion engine	Marine Equipment	1332.40	1185.84	1332.40	26060.22	21.63	19594.15	1444.28	1158.98	0.01	0.06	1175.72
4	Clamshell Tugboat auxiliary engine	Marine Equipment	98.93	88.05	98.93	3625.13	3.90	3886.59	200.91	208.99	0.00	0.01	212.00
4	Clamshell Crew boat propulsion engine	Marine Equipment	49.15	43.74	49.15	961.30	0.80	722.78	53.28	42.75	0.00	0.00	43.37
4	Clamshell Crew boat auxiliary engine	Marine Equipment	2.10	1.87	2.10	76.86	0.08	82.40	4.26	4.43	0.00	0.00	4.49
4	Clamshell Survey boat propulsion engine	Marine Equipment	43.86	39.03	43.86	857.78	0.71	644.94	47.54	38.15	0.00	0.00	38.70
<b>5 West Basin (clam shell dredge 501,000 CY)</b>													
5	<b>Marine Clamshell Dredge</b>												
5	Clamshell Dredge hoist	Marine Equipment	36.67	36.67	36.67	1114.67	1.22	635.56	61.78	48.60	0.00	0.00	48.60
5	Clamshell Dredge generator	Marine Equipment	27.50	27.50	27.50	836.00	0.92	476.67	46.33	26.85	0.00	0.00	26.85
5	Clamshell Barge dump scow	Marine Equipment	3.89	3.89	3.89	73.89	0.13	67.41	4.10	3.21	0.00	0.00	3.21
5	Clamshell Tugboat propulsion engine	Marine Equipment	34.93	31.09	34.93	683.23	0.57	513.70	37.87	30.39	0.00	0.00	30.82
5	Clamshell Tugboat auxiliary engine	Marine Equipment	2.59	2.31	2.59	95.04	0.10	101.90	5.27	5.48	0.00	0.00	5.56
5	Clamshell Tugboat propulsion engine	Marine Equipment	628.77	559.61	628.77	12298.08	10.21	9246.68	681.57	546.94	0.01	0.03	554.83
5	Clamshell Tugboat auxiliary engine	Marine Equipment	46.69	41.55	46.69	1710.74	1.84	1834.12	94.81	98.62	0.00	0.00	100.04
5	Clamshell Crew boat propulsion engine	Marine Equipment	23.19	20.64	23.19	453.65	0.38	341.09	25.14	20.18	0.00	0.00	20.47
5	Clamshell Crew boat auxiliary engine	Marine Equipment	0.99	0.88	0.99	36.27	0.04	38.89	2.01	2.09	0.00	0.00	2.12
5	Clamshell Survey boat propulsion engine	Marine Equipment	20.70	18.42	20.70	404.79	0.34	304.36	22.43	18.00	0.00	0.00	18.26

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.26

## Alternative 2 Emissions by Task

						Unmitigated Emissions										
						Peak Day										
						PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
<b>6 Pier J Basin (clam shell dredge 202,000 CY)</b>																
6	<b>Marine Clamshell Dredge</b>															
6	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	34	4.37	4.37	4.37	132.70	0.15	75.66	7.35	5.79	0.00	0.00	5.7854
6	Clamshell Dredge generator	Marine Equipment	dredging	onsite	34	3.27	3.27	3.27	99.52	0.11	56.75	5.52	3.20	0.00	0.00	3.1964
6	Clamshell Barge dump scow	Marine Equipment	disposal	offsite	34	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.00	0.00	0.0382
6	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	34	0.61	0.54	0.61	11.39	0.01	6.12	0.63	0.36	0.00	0.00	0.3670
6	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	34	0.09	0.08	0.09	1.57	0.00	1.10	0.09	0.07	0.00	0.00	0.0662
6	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	34	11.01	9.80	11.01	204.97	0.12	110.08	11.36	6.51	0.00	0.00	6.6058
6	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	34	1.59	1.41	1.59	28.29	0.02	19.85	1.57	1.17	0.00	0.00	1.1911
6	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	34	0.41	0.36	0.41	8.02	0.00	4.06	0.44	0.24	0.00	0.00	0.2437
6	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	34	0.03	0.03	0.03	0.60	0.00	0.42	0.03	0.02	0.00	0.00	0.0253
6	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	34	0.36	0.32	0.36	7.16	0.00	3.62	0.40	0.21	0.00	0.00	0.2174
<b>7 Pier J Approach (clam shell dredge 270,000 CY)</b>																
7	<b>Marine Clamshell Dredge</b>															
7	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	45	4.37	4.37	4.37	132.70	0.15	75.66	7.35	5.79	0.00	0.00	5.7854
7	Clamshell Dredge generator	Marine Equipment	dredging	onsite	45	3.27	3.27	3.27	99.52	0.11	56.75	5.52	3.20	0.00	0.00	3.1964
7	Clamshell Barge dump scow	Marine Equipment	disposal	offsite	45	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.00	0.00	0.0382
7	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	45	0.61	0.54	0.61	11.39	0.01	6.12	0.63	0.36	0.00	0.00	0.3670
7	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	45	0.09	0.08	0.09	1.57	0.00	1.10	0.09	0.07	0.00	0.00	0.0662
7	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	45	11.01	9.80	11.01	204.97	0.12	110.08	11.36	6.51	0.00	0.00	6.6058
7	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	45	1.59	1.41	1.59	28.29	0.02	19.85	1.57	1.17	0.00	0.00	1.1911
7	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	45	0.41	0.36	0.41	8.02	0.00	4.06	0.44	0.24	0.00	0.00	0.2437
7	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	45	0.03	0.03	0.03	0.60	0.00	0.42	0.03	0.02	0.00	0.00	0.0253
7	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	45	0.36	0.32	0.36	7.16	0.00	3.62	0.40	0.21	0.00	0.00	0.2174
<b>8 Pier J Approach (clam shell dredge 1,699,000 CY)</b>																
8	<b>Marine Clamshell Dredge</b>															
8	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	283	4.37	4.37	4.37	132.70	0.15	75.66	7.35	5.79	0.00	0.00	5.7854
8	Clamshell Dredge generator	Marine Equipment	dredging	onsite	283	3.27	3.27	3.27	99.52	0.11	56.75	5.52	3.20	0.00	0.00	3.1964
8	Clamshell Barge dump scow	Marine Equipment	disposal	offsite	283	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.00	0.00	0.0382
8	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	283	0.61	0.54	0.61	11.39	0.01	6.12	0.63	0.36	0.00	0.00	0.3670
8	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	283	0.09	0.08	0.09	1.57	0.00	1.10	0.09	0.07	0.00	0.00	0.0662
8	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	283	11.01	9.80	11.01	204.97	0.12	110.08	11.36	6.51	0.00	0.00	6.6058
8	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	283	1.59	1.41	1.59	28.29	0.02	19.85	1.57	1.17	0.00	0.00	1.1911
8	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	283	0.41	0.36	0.41	8.02	0.00	4.06	0.44	0.24	0.00	0.00	0.2437
8	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	283	0.03	0.03	0.03	0.60	0.00	0.42	0.03	0.02	0.00	0.00	0.0253
8	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	283	0.36	0.32	0.36	7.16	0.00	3.62	0.40	0.21	0.00	0.00	0.2174

Table H1.26

## Alternative 2 Emissions by Task

			Unmitigated Emissions										
			Total										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
6 Pier J Basin (clam shell dredge 202,000 CY)													
6	Marine Clamshell Dredge												
6	Clamshell Dredge hoist	Marine Equipment	148.41	148.41	148.41	4511.75	4.94	2572.49	250.05	196.70	0.00	0.00	196.70
6	Clamshell Dredge generator	Marine Equipment	111.31	111.31	111.31	3383.81	3.71	1929.37	187.53	108.68	0.00	0.00	108.68
6	Clamshell Barge dump scow	Marine Equipment	1.57	1.57	1.57	29.91	0.05	27.28	1.66	1.30	0.00	0.00	1.30
6	Clamshell Tugboat propulsion engine	Marine Equipment	20.79	18.51	20.79	387.16	0.23	207.93	21.46	12.30	0.00	0.00	12.48
6	Clamshell Tugboat auxiliary engine	Marine Equipment	3.00	2.67	3.00	53.43	0.04	37.49	2.96	2.22	0.00	0.00	2.25
6	Clamshell Tugboat propulsion engine	Marine Equipment	374.27	333.10	374.27	6968.91	4.13	3742.70	386.22	221.38	0.00	0.01	224.60
6	Clamshell Tugboat auxiliary engine	Marine Equipment	53.99	48.05	53.99	961.72	0.75	674.89	53.30	39.92	0.00	0.00	40.50
6	Clamshell Crew boat propulsion engine	Marine Equipment	13.81	12.29	13.81	272.81	0.15	138.06	15.12	8.17	0.00	0.00	8.29
6	Clamshell Crew boat auxiliary engine	Marine Equipment	1.14	1.02	1.14	20.39	0.02	14.31	1.13	0.85	0.00	0.00	0.86
6	Clamshell Survey boat propulsion engine	Marine Equipment	12.32	10.96	12.32	243.43	0.14	123.19	13.49	7.29	0.00	0.00	7.39
7 Pier J Approach (clam shell dredge 270,000 CY)													
7	Marine Clamshell Dredge												
7	Clamshell Dredge hoist	Marine Equipment	196.43	196.43	196.43	5971.43	6.54	3404.76	330.94	260.34	0.00	0.00	260.34
7	Clamshell Dredge generator	Marine Equipment	147.32	147.32	147.32	4478.57	4.90	2553.57	248.21	143.84	0.00	0.00	143.84
7	Clamshell Barge dump scow	Marine Equipment	2.08	2.08	2.08	39.58	0.07	36.11	2.19	1.72	0.00	0.00	1.72
7	Clamshell Tugboat propulsion engine	Marine Equipment	27.52	24.49	27.52	512.42	0.30	275.20	28.40	16.28	0.00	0.00	16.51
7	Clamshell Tugboat auxiliary engine	Marine Equipment	3.97	3.53	3.97	70.71	0.05	49.62	3.92	2.94	0.00	0.00	2.98
7	Clamshell Tugboat propulsion engine	Marine Equipment	495.36	440.87	495.36	9223.56	5.47	4953.58	511.18	293.00	0.00	0.01	297.26
7	Clamshell Tugboat auxiliary engine	Marine Equipment	71.46	63.60	71.46	1272.87	0.99	893.24	70.54	52.83	0.00	0.00	53.60
7	Clamshell Crew boat propulsion engine	Marine Equipment	18.27	16.26	18.27	361.07	0.20	182.73	20.01	10.81	0.00	0.00	10.97
7	Clamshell Crew boat auxiliary engine	Marine Equipment	1.52	1.35	1.52	26.99	0.02	18.94	1.50	1.12	0.00	0.00	1.14
7	Clamshell Survey boat propulsion engine	Marine Equipment	16.30	14.51	16.30	322.18	0.18	163.05	17.86	9.64	0.00	0.00	9.78
8 Pier J Approach (clam shell dredge 1,699,000 CY)													
8	Marine Clamshell Dredge												
8	Clamshell Dredge hoist	Marine Equipment	1235.32	1235.32	1235.32	37553.65	41.13	21412.17	2081.26	1637.26	0.00	0.00	1637.26
8	Clamshell Dredge generator	Marine Equipment	926.49	926.49	926.49	28165.24	30.85	16059.13	1560.95	904.59	0.00	0.00	904.59
8	Clamshell Barge dump scow	Marine Equipment	13.10	13.10	13.10	248.94	0.44	227.10	13.80	10.82	0.00	0.00	10.82
8	Clamshell Tugboat propulsion engine	Marine Equipment	173.07	154.03	173.07	3222.55	1.91	1730.69	178.60	102.37	0.00	0.00	103.86
8	Clamshell Tugboat auxiliary engine	Marine Equipment	24.97	22.22	24.97	444.72	0.34	312.08	24.65	18.46	0.00	0.00	18.73
8	Clamshell Tugboat propulsion engine	Marine Equipment	3115.25	2772.57	3115.25	58005.95	34.39	31152.50	3214.75	1842.65	0.03	0.09	1869.45
8	Clamshell Tugboat auxiliary engine	Marine Equipment	449.40	399.97	449.40	8004.94	6.20	5617.50	443.64	332.27	0.00	0.02	337.08
8	Clamshell Crew boat propulsion engine	Marine Equipment	114.91	102.27	114.91	2270.71	1.27	1149.14	125.85	67.97	0.00	0.00	68.96
8	Clamshell Crew boat auxiliary engine	Marine Equipment	9.53	8.48	9.53	169.72	0.13	119.10	9.41	7.04	0.00	0.00	7.15
8	Clamshell Survey boat propulsion engine	Marine Equipment	102.54	91.26	102.54	2026.17	1.13	1025.39	112.29	60.65	0.00	0.00	61.53

Table H1.26

## Alternative 2 Emissions by Task

			Mitigated										
			Peak Day										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	Source Type 1	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
<b>6 Pier J Basin (clam shell dredge 202,000 CY)</b>													
6	<b>Marine Clamshell Dredge</b>												
6	Clamshell Dredge hoist	Marine Equipment	0.44	0.44	0.44	13.27	0.01	7.57	0.74	0.58	0.00	0.00	0.5785
6	Clamshell Dredge generator	Marine Equipment	0.33	0.33	0.33	9.95	0.01	5.67	0.55	0.32	0.00	0.00	0.3196
6	Clamshell Barge dump scow	Marine Equipment	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.00	0.00	0.0382
6	Clamshell Tugboat propulsion engine	Marine Equipment	0.42	0.37	0.42	8.13	0.01	6.12	0.45	0.36	0.00	0.00	0.3670
6	Clamshell Tugboat auxiliary engine	Marine Equipment	0.03	0.03	0.03	1.13	0.00	1.21	0.06	0.07	0.00	0.00	0.0662
6	Clamshell Tugboat propulsion engine	Marine Equipment	7.49	6.66	7.49	146.41	0.12	110.08	8.11	6.51	0.00	0.00	6.6051
6	Clamshell Tugboat auxiliary engine	Marine Equipment	0.56	0.49	0.56	20.37	0.02	21.83	1.13	1.17	0.00	0.00	1.1910
6	Clamshell Crew boat propulsion engine	Marine Equipment	0.28	0.25	0.28	5.40	0.00	4.06	0.30	0.24	0.00	0.00	0.2436
6	Clamshell Crew boat auxiliary engine	Marine Equipment	0.01	0.01	0.01	0.43	0.00	0.46	0.02	0.02	0.00	0.00	0.0253
6	Clamshell Survey boat propulsion engine	Marine Equipment	0.25	0.22	0.25	4.82	0.00	3.62	0.27	0.21	0.00	0.00	0.2174
<b>7 Pier J Approach (clam shell dredge 270,000 CY)</b>													
7	<b>Marine Clamshell Dredge</b>												
7	Clamshell Dredge hoist	Marine Equipment	0.44	0.44	0.44	13.27	0.01	7.57	0.74	0.58	0.00	0.00	0.5785
7	Clamshell Dredge generator	Marine Equipment	0.33	0.33	0.33	9.95	0.01	5.67	0.55	0.32	0.00	0.00	0.3196
7	Clamshell Barge dump scow	Marine Equipment	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.00	0.00	0.0382
7	Clamshell Tugboat propulsion engine	Marine Equipment	0.42	0.37	0.42	8.13	0.01	6.12	0.45	0.36	0.00	0.00	0.3670
7	Clamshell Tugboat auxiliary engine	Marine Equipment	0.03	0.03	0.03	1.13	0.00	1.21	0.06	0.07	0.00	0.00	0.0662
7	Clamshell Tugboat propulsion engine	Marine Equipment	7.49	6.66	7.49	146.41	0.12	110.08	8.11	6.51	0.00	0.00	6.6051
7	Clamshell Tugboat auxiliary engine	Marine Equipment	0.56	0.49	0.56	20.37	0.02	21.83	1.13	1.17	0.00	0.00	1.1910
7	Clamshell Crew boat propulsion engine	Marine Equipment	0.28	0.25	0.28	5.40	0.00	4.06	0.30	0.24	0.00	0.00	0.2436
7	Clamshell Crew boat auxiliary engine	Marine Equipment	0.01	0.01	0.01	0.43	0.00	0.46	0.02	0.02	0.00	0.00	0.0253
7	Clamshell Survey boat propulsion engine	Marine Equipment	0.25	0.22	0.25	4.82	0.00	3.62	0.27	0.21	0.00	0.00	0.2174
<b>8 Pier J Approach (clam shell dredge 1,699,000 CY)</b>													
8	<b>Marine Clamshell Dredge</b>												
8	Clamshell Dredge hoist	Marine Equipment	0.44	0.44	0.44	13.27	0.01	7.57	0.74	0.58	0.00	0.00	0.5785
8	Clamshell Dredge generator	Marine Equipment	0.33	0.33	0.33	9.95	0.01	5.67	0.55	0.32	0.00	0.00	0.3196
8	Clamshell Barge dump scow	Marine Equipment	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.00	0.00	0.0382
8	Clamshell Tugboat propulsion engine	Marine Equipment	0.42	0.37	0.42	8.13	0.01	6.12	0.45	0.36	0.00	0.00	0.3670
8	Clamshell Tugboat auxiliary engine	Marine Equipment	0.03	0.03	0.03	1.13	0.00	1.21	0.06	0.07	0.00	0.00	0.0662
8	Clamshell Tugboat propulsion engine	Marine Equipment	7.49	6.66	7.49	146.41	0.12	110.08	8.11	6.51	0.00	0.00	6.6051
8	Clamshell Tugboat auxiliary engine	Marine Equipment	0.56	0.49	0.56	20.37	0.02	21.83	1.13	1.17	0.00	0.00	1.1910
8	Clamshell Crew boat propulsion engine	Marine Equipment	0.28	0.25	0.28	5.40	0.00	4.06	0.30	0.24	0.00	0.00	0.2436
8	Clamshell Crew boat auxiliary engine	Marine Equipment	0.01	0.01	0.01	0.43	0.00	0.46	0.02	0.02	0.00	0.00	0.0253
8	Clamshell Survey boat propulsion engine	Marine Equipment	0.25	0.22	0.25	4.82	0.00	3.62	0.27	0.21	0.00	0.00	0.2174

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.26

## Alternative 2 Emissions by Task

			Mitigated Emissions										
			Total										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
<b>6 Pier J Basin (clam shell dredge 202,000 CY)</b>													
6	<b>Marine Clamshell Dredge</b>												
6	Clamshell Dredge hoist	Marine Equipment	14.84	14.84	14.84	451.17	0.49	257.25	25.00	19.67	0.00	0.00	19.67
6	Clamshell Dredge generator	Marine Equipment	11.13	11.13	11.13	338.38	0.37	192.94	18.75	10.87	0.00	0.00	10.87
6	Clamshell Barge dump scow	Marine Equipment	1.57	1.57	1.57	29.91	0.05	27.28	1.66	1.30	0.00	0.00	1.30
6	Clamshell Tugboat propulsion engine	Marine Equipment	14.14	12.58	14.14	276.54	0.23	207.93	15.33	12.30	0.00	0.00	12.48
6	Clamshell Tugboat auxiliary engine	Marine Equipment	1.05	0.93	1.05	38.47	0.04	41.24	2.13	2.22	0.00	0.00	2.25
6	Clamshell Tugboat propulsion engine	Marine Equipment	254.50	226.51	254.50	4977.80	4.13	3742.70	275.87	221.38	0.00	0.01	224.57
6	Clamshell Tugboat auxiliary engine	Marine Equipment	18.90	16.82	18.90	692.44	0.75	742.38	38.38	39.92	0.00	0.00	40.49
6	Clamshell Crew boat propulsion engine	Marine Equipment	9.39	8.36	9.39	183.62	0.15	138.06	10.18	8.17	0.00	0.00	8.28
6	Clamshell Crew boat auxiliary engine	Marine Equipment	0.40	0.36	0.40	14.68	0.02	15.74	0.81	0.85	0.00	0.00	0.86
6	Clamshell Survey boat propulsion engine	Marine Equipment	8.38	7.46	8.38	163.84	0.14	123.19	9.08	7.29	0.00	0.00	7.39
<b>7 Pier J Approach (clam shell dredge 270,000 CY)</b>													
7	<b>Marine Clamshell Dredge</b>												
7	Clamshell Dredge hoist	Marine Equipment	19.64	19.64	19.64	597.14	0.65	340.48	33.09	26.03	0.00	0.00	26.03
7	Clamshell Dredge generator	Marine Equipment	14.73	14.73	14.73	447.86	0.49	255.36	24.82	14.38	0.00	0.00	14.38
7	Clamshell Barge dump scow	Marine Equipment	2.08	2.08	2.08	39.58	0.07	36.11	2.19	1.72	0.00	0.00	1.72
7	Clamshell Tugboat propulsion engine	Marine Equipment	18.71	16.66	18.71	366.01	0.30	275.20	20.28	16.28	0.00	0.00	16.51
7	Clamshell Tugboat auxiliary engine	Marine Equipment	1.39	1.24	1.39	50.91	0.05	54.59	2.82	2.94	0.00	0.00	2.98
7	Clamshell Tugboat propulsion engine	Marine Equipment	336.84	299.79	336.84	6588.26	5.47	4953.58	365.13	293.00	0.00	0.01	297.23
7	Clamshell Tugboat auxiliary engine	Marine Equipment	25.01	22.26	25.01	916.47	0.99	982.57	50.79	52.83	0.00	0.00	53.59
7	Clamshell Crew boat propulsion engine	Marine Equipment	12.43	11.06	12.43	243.03	0.20	182.73	13.47	10.81	0.00	0.00	10.96
7	Clamshell Crew boat auxiliary engine	Marine Equipment	0.53	0.47	0.53	19.43	0.02	20.83	1.08	1.12	0.00	0.00	1.14
7	Clamshell Survey boat propulsion engine	Marine Equipment	11.09	9.87	11.09	216.85	0.18	163.05	12.02	9.64	0.00	0.00	9.78
<b>8 Pier J Approach (clam shell dredge 1,699,000 CY)</b>													
8	<b>Marine Clamshell Dredge</b>												
8	Clamshell Dredge hoist	Marine Equipment	123.53	123.53	123.53	3755.37	4.11	2141.22	208.13	163.73	0.00	0.00	163.73
8	Clamshell Dredge generator	Marine Equipment	92.65	92.65	92.65	2816.52	3.08	1605.91	156.09	90.46	0.00	0.00	90.46
8	Clamshell Barge dump scow	Marine Equipment	13.10	13.10	13.10	248.94	0.44	227.10	13.80	10.82	0.00	0.00	10.82
8	Clamshell Tugboat propulsion engine	Marine Equipment	117.69	104.74	117.69	2301.82	1.91	1730.69	127.57	102.37	0.00	0.00	103.85
8	Clamshell Tugboat auxiliary engine	Marine Equipment	8.74	7.78	8.74	320.20	0.34	343.29	17.75	18.46	0.00	0.00	18.72
8	Clamshell Tugboat propulsion engine	Marine Equipment	2118.37	1885.35	2118.37	41432.82	34.39	31152.50	2296.25	1842.65	0.02	0.09	1869.26
8	Clamshell Tugboat auxiliary engine	Marine Equipment	157.29	139.99	157.29	5763.55	6.20	6179.25	319.42	332.27	0.00	0.02	337.05
8	Clamshell Crew boat propulsion engine	Marine Equipment	78.14	69.55	78.14	1528.36	1.27	1149.14	84.70	67.97	0.00	0.00	68.95
8	Clamshell Crew boat auxiliary engine	Marine Equipment	3.33	2.97	3.33	122.20	0.13	131.01	6.77	7.04	0.00	0.00	7.15
8	Clamshell Survey boat propulsion engine	Marine Equipment	69.73	62.06	69.73	1363.77	1.13	1025.39	75.58	60.65	0.00	0.00	61.53

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.27  
Alternative 3 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
<b>1 Electrical Substation Construction at Pier J (mitigation only)</b>																	
1		<b>Off-Road Equipment</b>															
1		Caterpillar 320 excavator	Offroad Construction Equipment		onsite	20.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Small asphalt roller	Offroad Construction Equipment		onsite	26.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Water truck	Offroad Construction Equipment		onsite	20.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Forklift	Offroad Construction Equipment		onsite	22.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Mobile crane (35 ton)	Offroad Construction Equipment		onsite	2.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		<b>On-Road Vehicles</b>															
1		Haul trucks	Onroad Construction Vehicles		onsite	5.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Supply trucks	Onroad Construction Vehicles		onsite	5.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Haul trucks	Onroad Construction Vehicles		offsite	5.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Supply trucks	Onroad Construction Vehicles		offsite	5.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Workers	Onroad Construction Vehicles		offsite	60.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Fugitive Dust															
1		Soil handling	Fugitive Emissions		onsite	20.00	n/a	n/a									
1		Asphalting	Fugitive Emissions		onsite												
<b>2 Pier J Breakwater Construction</b>																	
2		<b>Marine Activities</b>															
2		Pier J Breakwater Tugboat propulsion	Marine Equipment	Pier J Breakwater Construction	onsite	54.00	5.81	5.17	5.81	108.18	0.06	58.10	6.00	3.44	0.0001	0.00	3.49
2		Pier J Breakwater Tugboat auxiliary	Marine Equipment	Pier J Breakwater Construction	onsite	54.00	1.06	0.94	1.06	18.86	0.01	13.23	1.05	0.78	0.0000	0.00	0.79
2		Pier J Breakwater Crew boat propulsion engine	Marine Equipment	Pier J Breakwater Construction	onsite	54.00	0.41	0.36	0.41	8.02	0.00	4.06	0.44	0.24	0.0000	0.00	0.24
2		Pier J Breakwater Crew boat auxiliary engine	Marine Equipment	Pier J Breakwater Construction	onsite	54.00	0.03	0.03	0.03	0.60	0.00	0.42	0.03	0.02	0.0000	0.00	0.03
2		Pier J Breakwater Survey boat propulsion engine	Marine Equipment	Pier J Breakwater Construction	onsite	54.00	0.36	0.32	0.36	7.16	0.00	3.62	0.40	0.21	0.0000	0.00	0.22
2		<b>Off-Road Equipment</b>															
2		Piling crane	Offroad Construction Equipment		onsite	54.00	0.21	0.19	0.21	5.00	0.01	2.67	0.47	0.38	0.0000	0.00	0.38
2		Long arm excavator	Offroad Construction Equipment		onsite	54.00	0.08	0.07	0.08	2.19	0.01	2.78	0.32	0.63	0.0000	0.00	0.63
2		<b>On-Road Vehicles</b>															
2		Delivery Trucks	Onroad Construction Vehicles		onsite	5.00	0.15	0.04	0.00	0.08	0.00	0.01	0.00	0.01	0.0000	0.00	0.01
2		Delivery Trucks	Onroad Construction Vehicles		offsite	5.00	0.49	0.19	0.02	3.22	0.02	0.18	0.03	0.92	0.0000	0.00	0.96
2		Workers	Onroad Construction Vehicles		offsite	54.00	0.16	0.05	0.00	0.06	0.00	0.96	0.01	0.17	0.0000	0.00	0.17



Table H1.27  
Alternative 3 Emissions by Task

				Unmitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
1 Electrical Substation Construction at Pier J (mitigation only)														
1		Off-Road Equipment												
		Caterpillar 320 excavator	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Small asphalt roller	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Water truck	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Forklift	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Mobile crane (35 ton)	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		On-Road Vehicles												
1		Haul trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Supply trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Haul trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Supply trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Workers	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Fugitive Dust												
1		Soil handling	Fugitive Emissions	n/a	n/a									
1		Asphalting	Fugitive Emissions											
2 Pier J Breakwater Construction														
2		Marine Activities												
2		Pier J Breakwater Tugboat propulsion	Marine Equipment	313.73	279.22	313.73	5841.59	3.46	3137.27	323.75	185.57	0.00	0.01	188.27
2		Pier J Breakwater Tugboat auxiliary	Marine Equipment	57.17	50.88	57.17	1018.30	0.79	714.59	56.44	42.27	0.00	0.00	42.88
2		Pier J Breakwater Crew boat propulsion engine	Marine Equipment	21.93	19.52	21.93	433.28	0.24	219.27	24.01	12.97	0.00	0.00	13.16
2		Pier J Breakwater Crew boat auxiliary engine	Marine Equipment	1.82	1.62	1.82	32.38	0.03	22.73	1.79	1.34	0.00	0.00	1.36
2		Pier J Breakwater Survey boat propulsion engine	Marine Equipment	19.57	17.41	19.57	386.62	0.22	195.66	21.43	11.57	0.00	0.00	11.74
2		Off-Road Equipment												
2		Piling crane	Offroad Construction Equipment	11.27	10.36	11.27	270.12	0.42	144.43	25.20	20.52	0.00	0.00	20.52
2		Long arm excavator	Offroad Construction Equipment	4.06	3.74	4.06	118.13	0.70	149.87	17.33	34.23	0.00	0.00	34.23
2		On-Road Vehicles												
2		Delivery Trucks	Onroad Construction Vehicles	0.74	0.18	0.00	0.39	0.00	0.05	0.01	0.06	0.00	0.00	0.06
2		Delivery Trucks	Onroad Construction Vehicles	2.43	0.94	0.11	16.08	0.10	0.92	0.13	4.60	0.00	0.00	4.81
2		Workers	Onroad Construction Vehicles	8.58	2.72	0.00	3.14	0.20	51.79	0.81	9.13	0.00	0.00	9.18

Table H1.27  
Alternative 3 Emissions by Task

				Mitigated										
				Peak Day										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
1 Electrical Substation Construction at Pier J (mitigation only)														
1		Off-Road Equipment												
		Caterpillar 320 excavator	Offroad Construction Equipment	0.02	0.02	0.02	0.33	0.01	1.23	0.1561	0.26	0.00	0.00	0.26
1		Small asphalt roller	Offroad Construction Equipment	0.00	0.00	0.00	0.74	0.00	0.91	0.0408	0.06	0.00	0.00	0.06
1		Water truck	Offroad Construction Equipment	0.03	0.03	0.03	0.60	0.01	2.59	0.2964	0.00	0.00	0.00	0.00
1		Forklift	Offroad Construction Equipment	0.00	0.00	0.00	0.15	0.00	0.16	0.0081	0.00	0.00	0.00	0.00
1		Mobile crane (35 ton)	Offroad Construction Equipment	0.02	0.02	0.02	0.43	0.01	2.41	0.2126	0.00	0.00	0.00	0.00
1		On-Road Vehicles												
1		Haul trucks	Onroad Construction Vehicles	0.09	0.02	0.00	0.05	0.00	0.01	0.0006	0.01	0.00	0.00	0.01
1		Supply trucks	Onroad Construction Vehicles	0.21	0.05	0.00	0.11	0.00	0.01	0.0015	0.02	0.00	0.00	0.02
1		Haul trucks	Onroad Construction Vehicles	0.02	0.01	0.00	0.11	0.00	0.01	0.0008	0.03	0.00	0.00	0.03
1		Supply trucks	Onroad Construction Vehicles	0.07	0.03	0.00	0.45	0.00	0.03	0.0036	0.13	0.00	0.00	0.13
1		Workers	Onroad Construction Vehicles	0.15	0.05	0.00	0.06	0.00	0.91	0.0143	0.16	0.00	0.00	0.16
1		Fugitive Dust												
1		Soil handling	Fugitive Emissions	2.01	0.30									
1		Asphalting	Fugitive Emissions											
2 Pier J Breakwater Construction														
2		Marine Activities												
2		Pier J Breakwater Tugboat propulsion	Marine Equipment	3.95	3.52	3.95	77.27	0.06	58.10	4.2824	3.44	0.00	0.00	3.49
2		Pier J Breakwater Tugboat auxiliary	Marine Equipment	0.37	0.33	0.37	13.58	0.01	14.56	0.7525	0.78	0.00	0.00	0.79
2		Pier J Breakwater Crew boat propulsion engine	Marine Equipment	0.28	0.25	0.28	5.40	0.00	4.06	0.2993	0.24	0.00	0.00	0.24
2		Pier J Breakwater Crew boat auxiliary engine	Marine Equipment	0.01	0.01	0.01	0.43	0.00	0.46	0.0239	0.02	0.00	0.00	0.03
2		Pier J Breakwater Survey boat propulsion engine	Marine Equipment	0.25	0.22	0.25	4.82	0.00	3.62	0.2671	0.21	0.00	0.00	0.22
2		Off-Road Equipment												
2		Piling crane	Offroad Construction Equipment	0.02	0.02	0.02	0.48	0.01	2.67	0.2356	0.38	0.00	0.00	0.38
2		Long arm excavator	Offroad Construction Equipment	0.04	0.04	0.04	0.79	0.01	2.78	0.3209	0.63	0.00	0.00	0.63
2		On-Road Vehicles												
2		Delivery Trucks	Onroad Construction Vehicles	0.15	0.04	0.00	0.08	0.00	0.01	0.0011	0.01	0.00	0.00	0.01
2		Delivery Trucks	Onroad Construction Vehicles	0.49	0.19	0.02	3.22	0.02	0.18	0.0256	0.92	0.00	0.00	0.96
2		Workers	Onroad Construction Vehicles	0.16	0.05	0.00	0.06	0.00	0.96	0.0150	0.17	0.00	0.00	0.17

Table H1.27  
Alternative 3 Emissions by Task

				Mitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
1 Electrical Substation Construction at Pier J (mitigation only)														
1		Off-Road Equipment												
		Caterpillar 320 excavator	Offroad Construction Equipment	0.33	0.33	0.33	6.59	0.11	24.52	3.12	5.30	0.00	0.00	5.30
1		Small asphalt roller	Offroad Construction Equipment	0.13	0.13	0.13	19.12	0.03	23.58	1.06	1.511223352	0	0	1.511223352
1		Water truck	Offroad Construction Equipment	0.60	0.60	0.60	12.06	0.20	51.75	5.93	0	0	0	0
1		Forklift	Offroad Construction Equipment	0.02	0.02	0.02	3.23	0.01	3.59	0.18	0	0	0	0
1		Mobile crane (35 ton)	Offroad Construction Equipment	0.04	0.04	0.04	0.87	0.01	4.83	0.43	0	0	0	0
1		On-Road Vehicles												
1		Haul trucks	Onroad Construction Vehicles	0.44	0.11	0.00	0.24	0.00	0.03	0.00	0.035354006	6.65075E-08	5.55716E-06	0.037011702
1		Supply trucks	Onroad Construction Vehicles	1.03	0.26	0.00	0.55	0.00	0.06	0.01	0.082492681	1.55184E-07	1.29667E-05	0.086360637
1		Haul trucks	Onroad Construction Vehicles	0.08	0.03	0.00	0.53	0.00	0.03	0.00	0.151656946	8.88911E-08	2.38384E-05	0.158763
1		Supply trucks	Onroad Construction Vehicles	0.34	0.13	0.02	2.25	0.01	0.13	0.02	0.643393105	3.77114E-07	0.000101132	0.673539999
1		Workers	Onroad Construction Vehicles	9.08	2.88	0.00	3.33	0.21	54.81	0.86	9.659044664	9.91447E-05	0.0001697	9.712093981
1		Fugitive Dust												
1		Soil handling	Fugitive Emissions	40.12	6.07									
1		Asphalting	Fugitive Emissions											
2 Pier J Breakwater Construction														
2		Marine Activities												
2		Pier J Breakwater Tugboat propulsion	Marine Equipment	213.33	189.87	213.33	4172.56	3.46	3137.27	231.25	185.57	0.00	0.01	188.25
2		Pier J Breakwater Tugboat auxiliary	Marine Equipment	20.01	17.81	20.01	733.17	0.79	786.05	40.63	42.27	0.00	0.00	42.88
2		Pier J Breakwater Crew boat propulsion engine	Marine Equipment	14.91	13.27	14.91	291.63	0.24	219.27	16.16	12.97	0.00	0.00	13.16
2		Pier J Breakwater Crew boat auxiliary engine	Marine Equipment	0.64	0.57	0.64	23.32	0.03	25.00	1.29	1.34	0.00	0.00	1.36
2		Pier J Breakwater Survey boat propulsion engine	Marine Equipment	13.30	11.84	13.30	260.22	0.22	195.66	14.42	11.57	0.00	0.00	11.74
2		Off-Road Equipment												
2		Piling crane	Offroad Construction Equipment	1.29	1.29	1.29	25.89	0.42	144.43	12.72	20.52	0.00	0.00	20.52
2		Long arm excavator	Offroad Construction Equipment	2.14	2.14	2.14	42.75	0.70	149.87	17.33	34.23	0.00	0.00	34.23
2		On-Road Vehicles												
2		Delivery Trucks	Onroad Construction Vehicles	0.74	0.18	0.00	0.39	0.00	0.05	0.01	0.058923344	1.10846E-07	9.26193E-06	0.06168617
2		Delivery Trucks	Onroad Construction Vehicles	2.43	0.94	0.11	16.08	0.10	0.92	0.13	4.595665034	2.69367E-06	0.000722375	4.81099999
2		Workers	Onroad Construction Vehicles	8.58	2.72	0.00	3.14	0.20	51.79	0.81	9.127797208	9.36918E-05	0.000160367	9.177928812

Table H1.27  
Alternative 3 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
<b>3 Approach Channel (hopper dredge 2,600,000 CY)</b>																	
3		Marine Hopper Dredge															
3		Hopper propulsion engine	Marine Equipment	dredging	onsite	150.00	26.63	23.70	26.63	495.89	0.29	266.32	27.48	15.75	0.0002	0.00	15.98
3		Hopper propulsion engine	Marine Equipment	transit	offsite	150.00	50.31	44.77	50.31	936.68	0.56	503.05	51.91	29.76	0.0004	0.00	30.19
3		Hopper auxiliary engine	Marine Equipment	disposal	near shore	150.00	0.22	0.20	0.22	5.06	0.00	3.70	0.28	0.22	0.0000	0.00	0.22
3		Crew boat propulsion engine	Marine Equipment	support	onsite	150.00	0.41	0.36	0.41	8.02	0.00	4.06	0.44	0.24	0.0000	0.00	0.24
3		Crew boat auxiliary engine	Marine Equipment	support	onsite	150.00	0.03	0.03	0.03	0.60	0.00	0.42	0.03	0.02	0.0000	0.00	0.03
3		Survey boat propulsion engine	Marine Equipment	dredging	onsite	150.00	1.45	1.29	1.45	28.64	0.02	14.49	1.59	0.86	0.0000	0.00	0.87
<b>4 Main Channel Widening (clam shell dredge 1,065,000 CY)</b>																	
4		Marine Clamshell Dredge															
4		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	177.00	4.37	4.37	4.37	132.70	0.15	75.66	7.35	5.79	0.0000	0.00	5.79
4		Clamshell Dredge generator	Marine Equipment	dredging	onsite	177.00	3.27	3.27	3.27	99.52	0.11	56.75	5.52	3.20	0.0000	0.00	3.20
4		Clamshell Barge dump scow	Marine Equipment	disposal	near shore	177.00	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.0000	0.00	0.04
4		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	177.00	0.61	0.54	0.61	11.39	0.01	6.12	0.63	0.36	0.0000	0.00	0.37
4		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	177.00	0.09	0.08	0.09	1.57	0.00	1.10	0.09	0.07	0.0000	0.00	0.07
4		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	177.00	11.01	9.80	11.01	204.97	0.12	110.08	11.36	6.51	0.0001	0.00	6.61
4		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	177.00	1.59	1.41	1.59	28.29	0.02	19.85	1.57	1.17	0.00	0.00	1.19
4		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	177.0000	0.4060579	0.3613915	0.4060579	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
4		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	177.0000	0.0336683	0.0300	0.0336683	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
4		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	177.00	0.36	0.32	0.36	7.16	0.00	3.62	0.40	0.21	0.0000	0.00	0.22

Table H1.27  
Alternative 3 Emissions by Task

				Unmitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
<b>3 Approach Channel (hopper dredge 2,600,000 CY)</b>														
3		<b>Marine Hopper Dredge</b>												
3		Hopper propulsion engine	Marine Equipment	3994.82	3555.39	3994.82	74383.56	44.10	39948.21	4122.42	2362.91	0.04	0.11	2397.28
3		Hopper propulsion engine	Marine Equipment	7545.77	6715.74	7545.77	140502.28	83.31	75457.73	7786.78	4463.28	0.07	0.21	4528.20
3		Hopper auxiliary engine	Marine Equipment	33.29	29.63	33.29	759.02	0.61	554.84	42.07	32.82	0.00	0.00	33.29
3		Crew boat propulsion engine	Marine Equipment	60.91	54.21	60.91	1203.56	0.67	609.09	66.70	36.03	0.00	0.00	36.55
3		Crew boat auxiliary engine	Marine Equipment	5.05	4.49	5.05	89.96	0.07	63.13	4.99	3.73	0.00	0.00	3.79
3		Survey boat propulsion engine	Marine Equipment	217.40	193.48	217.40	4295.77	2.40	2173.97	238.08	128.59	0.00	0.01	130.46
<b>4 Main Channel Widening (clam shell dredge 1,065,000 CY)</b>														
4		<b>Marine Clamshell Dredge</b>												
4		Clamshell Dredge hoist	Marine Equipment	772.62	772.62	772.62	23487.62	25.72	13392.06	1301.71	1024.01	0.00	0.00	1024.01
4		Clamshell Dredge generator	Marine Equipment	579.46	579.46	579.46	17615.71	19.29	10044.05	976.28	565.77	0.00	0.00	565.77
4		Clamshell Barge dump scow	Marine Equipment	8.19	8.19	8.19	155.69	0.27	142.04	8.63	6.77	0.00	0.00	6.77
4		Clamshell Tugboat propulsion engine	Marine Equipment	108.24	96.34	108.24	2015.52	1.20	1082.45	111.70	64.03	0.00	0.00	64.96
4		Clamshell Tugboat auxiliary engine	Marine Equipment	15.62	13.90	15.62	278.15	0.22	195.19	15.42	11.55	0.00	0.00	11.71
4		Clamshell Tugboat propulsion engine	Marine Equipment	1948.41	1734.08	1948.41	36279.34	21.51	19484.07	2010.64	1152.47	0.02	0.05	1169.23
4		Clamshell Tugboat auxiliary engine	Marine Equipment	281.07	250.16	281.07	5006.62	3.88	3513.42	277.47	207.82	0.00	0.01	210.82
4		Clamshell Crew boat propulsion engine	Marine Equipment	71.87225	63.966303	71.87225	1420.19566	0.7934696	718.7225	78.708739	42.512033	0.000678106	0.002021278	43.131327
4		Clamshell Crew boat auxiliary engine	Marine Equipment	5.9592862	5.3037647	5.9592862	106.149785	0.0822381	74.49	5.8829328	4.4061055	0.00	0.000209493	4.4698014
4		Clamshell Survey boat propulsion engine	Marine Equipment	64.13	57.08	64.13	1267.25	0.71	641.32	70.23	37.93	0.00	0.00	38.49

Table H1.27  
Alternative 3 Emissions by Task

				Mitigated										
				Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	PM10  (lb/day)	PM2.5  (lb/day)	DPM  (lb/day)	NOX  (lb/day)	SOX  (lb/day)	CO  (lb/day)	VOC  (lb/day)	CO2  (tonnes/day)	CH4  (tonnes/day)	N2O  (tonnes/day)	CO2e  (tonnes/day)
3 Approach Channel (hopper dredge 2,600,000 CY)														
3		Marine Hopper Dredge												
3		Hopper propulsion engine	Marine Equipment	26.63	23.70	26.63	495.89	0.29	266.32	27.4828	15.75	0.00	0.00	15.98
3		Hopper propulsion engine	Marine Equipment	50.31	44.77	50.31	936.68	0.56	503.05	51.9119	29.76	0.00	0.00	30.19
3		Hopper auxiliary engine	Marine Equipment	0.22	0.20	0.22	5.06	0.00	3.70	0.2804	0.22	0.00	0.00	0.22
3		Crew boat propulsion engine	Marine Equipment	0.28	0.25	0.28	5.40	0.00	4.06	0.2993	0.24	0.00	0.00	0.24
3		Crew boat auxiliary engine	Marine Equipment	0.01	0.01	0.01	0.43	0.00	0.46	0.0239	0.02	0.00	0.00	0.03
3		Survey boat propulsion engine	Marine Equipment	0.99	0.88	0.99	19.28	0.02	14.49	1.0683	0.86	0.00	0.00	0.87
4 Main Channel Widening (clam shell dredge 1,065,000 CY)														
4		Marine Clamshell Dredge												
4		Clamshell Dredge hoist	Marine Equipment	0.44	0.44	0.44	13.27	0.01	7.57	0.7354	0.58	0.00	0.00	0.58
4		Clamshell Dredge generator	Marine Equipment	0.33	0.33	0.33	9.95	0.01	5.67	0.5516	0.32	0.00	0.00	0.32
4		Clamshell Barge dump scow	Marine Equipment	0.05	0.05	0.05	0.88	0.00	0.80	0.0488	0.04	0.00	0.00	0.04
4		Clamshell Tugboat propulsion engine	Marine Equipment	0.42	0.37	0.42	8.13	0.01	6.12	0.4508	0.36	0.00	0.00	0.37
4		Clamshell Tugboat auxiliary engine	Marine Equipment	0.03	0.03	0.03	1.13	0.00	1.21	0.0627	0.07	0.00	0.00	0.07
4		Clamshell Tugboat propulsion engine	Marine Equipment	7.49	6.66	7.49	146.41	0.12	110.08	8.1140	6.51	0.00	0.00	6.61
4		Clamshell Tugboat auxiliary engine	Marine Equipment	0.56	0.49	0.56	20.37	0.02	21.83	1.13	1.17	0.00	0.00	1.19
4		Clamshell Crew boat propulsion engine	Marine Equipment	0.2761194	0.2457462	0.2761194	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
4		Clamshell Crew boat auxiliary engine	Marine Equipment	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
4		Clamshell Survey boat propulsion engine	Marine Equipment	0.25	0.22	0.25	4.82	0.00	3.62	0.2671	0.21	0.00	0.00	0.22
Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.														

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.27  
Alternative 3 Emissions by Task

				Mitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
<b>3 Approach Channel (hopper dredge 2,600,000 CY)</b>														
3		Marine Hopper Dredge												
3		Hopper propulsion engine	Marine Equipment	3994.82	3555.39	3994.82	74383.56	44.10	39948.21	4122.42	2362.91	0.04	0.11	2397.28
3		Hopper propulsion engine	Marine Equipment	7545.77	6715.74	7545.77	140502.28	83.31	75457.73	7786.78	4463.282182	0.067086143	0.212211269	4528.198294
3		Hopper auxiliary engine	Marine Equipment	33.29	29.63	33.29	759.02	0.61	554.84	42.07	32.81825134	0.00036241	0.001560377	33.29230393
3		Crew boat propulsion engine	Marine Equipment	41.42	36.86	41.42	810.09	0.67	609.09	44.90	36.02714702	0.000386795	0.001712947	36.54727515
3		Crew boat auxiliary engine	Marine Equipment	1.77	1.57	1.77	64.77	0.07	69.44	3.59	3.733987708	3.09257E-05	0.000177536	3.787666645
3		Survey boat propulsion engine	Marine Equipment	147.83	131.57	147.83	2891.38	2.40	2173.97	160.24	128.5892017	0.001380559	0.006113904	130.445659
<b>4 Main Channel Widening (clam shell dredge 1,065,000 CY)</b>														
4		Marine Clamshell Dredge												
4		Clamshell Dredge hoist	Marine Equipment	77.26	77.26	77.26	2348.76	2.57	1339.21	130.17	102.4011648	0	0	102.4011648
4		Clamshell Dredge generator	Marine Equipment	57.95	57.95	57.95	1761.57	1.93	1004.40	97.63	56.57711647	0	0	56.57711647
4		Clamshell Barge dump scow	Marine Equipment	8.19	8.19	8.19	155.69	0.27	142.04	8.63	6.766310242	0	0	6.766310242
4		Clamshell Tugboat propulsion engine	Marine Equipment	73.61	65.51	73.61	1439.66	1.20	1082.45	79.79	64.02622048	0.000687398	0.003044191	64.95057449
4		Clamshell Tugboat auxiliary engine	Marine Equipment	5.47	4.86	5.47	200.26	0.22	214.71	11.10	11.54537331	9.56212E-05	0.000548936	11.7113469
4		Clamshell Tugboat propulsion engine	Marine Equipment	1324.92	1179.18	1324.92	25913.82	21.51	19484.07	1436.17	1152.471969	0.012373165	0.054795446	1169.110341
4		Clamshell Tugboat auxiliary engine	Marine Equipment	98.38	87.55	98.38	3604.77	3.88	3864.76	199.78	207.8167195	0.001721181	0.009880856	210.8042442
4		Clamshell Crew boat propulsion engine	Marine Equipment	48.87313	43.497086	48.87313	955.900927	0.7934696	718.7225	52.977036	42.51203349	0.000456418	0.002021278	43.12578467
4		Clamshell Crew boat auxiliary engine	Marine Equipment	2.0857502	1.8563176	2.0857502	76.4278451	0.0822381	81.94	4.2357116	4.406105495	3.64923E-05	0.000209493	4.469446641
4		Clamshell Survey boat propulsion engine	Marine Equipment	43.61	38.81	43.61	852.96	0.71	641.32	47.27	37.93	0.00	0.00	38.48

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.27  
Alternative 3 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
<b>5 West Basin (clam shell dredge 717,000 CY)</b>																	
5		Marine Clamshell Dredge															
5		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	120.00	4.37	4.37	4.37	132.70	0.15	75.66	7.35	5.79	0.0000	0.00	5.79
5		Clamshell Dredge generator	Marine Equipment	dredging	onsite	120.00	3.27	3.27	3.27	99.52	0.11	56.75	5.52	3.20	0.0000	0.00	3.20
5		Clamshell Barge dump scow	Marine Equipment	disposal	near shore	120.00	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.0000	0.00	0.04
5		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	120.00	0.61	0.54	0.61	11.39	0.01	6.12	0.63	0.36	0.0000	0.00	0.37
5		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	120.00	0.09	0.08	0.09	1.57	0.00	1.10	0.09	0.07	0.0000	0.00	0.07
5		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	120.00	11.01	9.80	11.01	204.97	0.12	110.08	11.36	6.51	0.0001	0.00	6.61
5		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	120.00	1.59	1.41	1.59	28.29	0.02	19.85	1.57	1.17	0.00	0.00	1.19
5		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	120	0.4060579	0.3613915	0.4060579	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
5		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	120.0000	0.0336683	0.0300	0.0336683	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
5		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	120.00	0.36	0.32	0.36	7.16	0.00	3.62	0.40	0.21	0.0000	0.00	0.22
<b>6 Pier J Basin (clam shell dredge 258,000 CY)</b>																	
6		Marine Clamshell Dredge															
6		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	43.00	4.37	4.37	4.37	132.70	0.15	75.66	7.35	5.79	0.0000	0.00	5.79
6		Clamshell Dredge generator	Marine Equipment	dredging	onsite	43.00	3.27	3.27	3.27	99.52	0.11	56.75	5.52	3.20	0.0000	0.00	3.20
6		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	43.00	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.0000	0.00	0.04
6		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	43.00	0.61	0.54	0.61	11.39	0.01	6.12	0.63	0.36	0.0000	0.00	0.37
6		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	43.00	0.09	0.08	0.09	1.57	0.00	1.10	0.09	0.07	0.0000	0.00	0.07
6		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	43.00	11.01	9.80	11.01	204.97	0.12	110.08	11.36	6.51	0.0001	0.00	6.61
6		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	43.00	1.59	1.41	1.59	28.29	0.02	19.85	1.57	1.17	0.0000	0.00	1.19
6		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	43	0.4060579	0.3613915	0.4060579	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
6		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	43.0000	0.0336683	0.0300	0.0336683	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
6		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	43.00	0.36	0.32	0.36	7.16	0.00	3.62	0.40	0.21	0.0000	0.00	0.22



Table H1.27  
Alternative 3 Emissions by Task

				Unmitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
5 West Basin (clam shell dredge 717,000 CY)														
5		Marine Clamshell Dredge												
5		Clamshell Dredge hoist	Marine Equipment	523.81	523.81	523.81	15923.81	17.44	9079.37	882.51	694.25	0.00	0.00	694.25
5		Clamshell Dredge generator	Marine Equipment	392.86	392.86	392.86	11942.86	13.08	6809.52	661.89	383.57	0.00	0.00	383.57
5		Clamshell Barge dump scow	Marine Equipment	5.56	5.56	5.56	105.56	0.18	96.30	5.85	4.59	0.00	0.00	4.59
5		Clamshell Tugboat propulsion engine	Marine Equipment	73.39	65.31	73.39	1366.45	0.81	733.86	75.73	43.41	0.00	0.00	44.04
5		Clamshell Tugboat auxiliary engine	Marine Equipment	10.59	9.42	10.59	188.57	0.15	132.33	10.45	7.83	0.00	0.00	7.94
5		Clamshell Tugboat propulsion engine	Marine Equipment	1320.95	1175.65	1320.95	24596.16	14.58	13209.54	1363.15	781.34	0.01	0.04	792.70
5		Clamshell Tugboat auxiliary engine	Marine Equipment	190.56	169.60	190.56	3394.32	2.63	2381.98	188.12	140.89	0.00	0.01	142.93
5		Clamshell Crew boat propulsion engine	Marine Equipment	48.726949	43.366985	48.726949	962.844517	0.5379455	487.26949	53.361857	28.821718	0.000459733	0.001370358	29.241578
5		Clamshell Crew boat auxiliary engine	Marine Equipment	4.040194	3.5957727	4.040194	71.9659558	0.0557547	50.50	3.988429	2.9871902	0.00	0.0001	3.0303738
5		Clamshell Survey boat propulsion engine	Marine Equipment	43.48	38.70	43.48	859.15	0.48	434.79	47.62	25.72	0.00	0.00	26.09
6 Pier J Basin (clam shell dredge 258,000 CY)														
6		Marine Clamshell Dredge												
6		Clamshell Dredge hoist	Marine Equipment	187.70	187.70	187.70	5706.03	6.25	3253.44	316.23	248.77	0.00	0.00	248.77
6		Clamshell Dredge generator	Marine Equipment	140.77	140.77	140.77	4279.52	4.69	2440.08	237.18	137.45	0.00	0.00	137.45
6		Clamshell Barge dump scow	Marine Equipment	1.99	1.99	1.99	37.82	0.07	34.51	2.10	1.64	0.00	0.00	1.64
6		Clamshell Tugboat propulsion engine	Marine Equipment	26.30	23.40	26.30	489.65	0.29	262.97	27.14	15.55	0.00	0.00	15.78
6		Clamshell Tugboat auxiliary engine	Marine Equipment	3.79	3.38	3.79	67.57	0.05	47.42	3.74	2.80	0.00	0.00	2.85
6		Clamshell Tugboat propulsion engine	Marine Equipment	473.34	421.27	473.34	8813.63	5.23	4733.42	488.46	279.98	0.00	0.01	284.05
6		Clamshell Tugboat auxiliary engine	Marine Equipment	68.28	60.77	68.28	1216.30	0.94	853.54	67.41	50.49	0.00	0.00	51.22
6		Clamshell Crew boat propulsion engine	Marine Equipment	17.46049	15.539836	17.46049	345.019285	0.1927638	174.6049	19.121332	10.327782	0.000164738	0.000491045	10.478232
6		Clamshell Crew boat auxiliary engine	Marine Equipment	1.4477362	1.2884852	1.4477362	25.7878008	0.0199788	18.10	1.4291871	1.0704098	0.00	0.0001	1.085884
6		Clamshell Survey boat propulsion engine	Marine Equipment	15.58	13.87	15.58	307.86	0.17	155.80	17.06	9.22	0.00	0.00	9.35

Table H1.27  
Alternative 3 Emissions by Task

				Mitigated										
				Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
<b>5 West Basin (clam shell dredge 717,000 CY)</b>														
5		Marine Clamshell Dredge												
5		Clamshell Dredge hoist	Marine Equipment	0.44	0.44	0.44	13.27	0.01	7.57	0.7354	0.58	0.00	0.00	0.58
5		Clamshell Dredge generator	Marine Equipment	0.33	0.33	0.33	9.95	0.01	5.67	0.5516	0.32	0.00	0.00	0.32
5		Clamshell Barge dump scow	Marine Equipment	0.05	0.05	0.05	0.88	0.00	0.80	0.0488	0.04	0.00	0.00	0.04
5		Clamshell Tugboat propulsion engine	Marine Equipment	0.42	0.37	0.42	8.13	0.01	6.12	0.4508	0.36	0.00	0.00	0.37
5		Clamshell Tugboat auxiliary engine	Marine Equipment	0.03	0.03	0.03	1.13	0.00	1.21	0.0627	0.07	0.00	0.00	0.07
5		Clamshell Tugboat propulsion engine	Marine Equipment	7.49	6.66	7.49	146.41	0.12	110.08	8.1140	6.51	0.00	0.00	6.61
5		Clamshell Tugboat auxiliary engine	Marine Equipment	0.56	0.49	0.56	20.37	0.02	21.83	1.13	1.17	0.00	0.00	1.19
5		Clamshell Crew boat propulsion engine	Marine Equipment	0.2761194	0.2457462	0.2761194	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
5		Clamshell Crew boat auxiliary engine	Marine Equipment	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
5		Clamshell Survey boat propulsion engine	Marine Equipment	0.25	0.22	0.25	4.82	0.00	3.62	0.2671	0.21	0.00	0.00	0.22
<b>6 Pier J Basin (clam shell dredge 258,000 CY)</b>														
6		Marine Clamshell Dredge												
6		Clamshell Dredge hoist	Marine Equipment	0.44	0.44	0.44	13.27	0.01	7.57	0.7354	0.58	0.00	0.00	0.58
6		Clamshell Dredge generator	Marine Equipment	0.33	0.33	0.33	9.95	0.01	5.67	0.5516	0.32	0.00	0.00	0.32
6		Clamshell Barge dump scow	Marine Equipment	0.05	0.05	0.05	0.88	0.00	0.80	0.0488	0.04	0.00	0.00	0.04
6		Clamshell Tugboat propulsion engine	Marine Equipment	0.42	0.37	0.42	8.13	0.01	6.12	0.4508	0.36	0.00	0.00	0.37
6		Clamshell Tugboat auxiliary engine	Marine Equipment	0.03	0.03	0.03	1.13	0.00	1.21	0.0627	0.07	0.00	0.00	0.07
6		Clamshell Tugboat propulsion engine	Marine Equipment	7.49	6.66	7.49	146.41	0.12	110.08	8.1140	6.51	0.00	0.00	6.61
6		Clamshell Tugboat auxiliary engine	Marine Equipment	0.56	0.49	0.56	20.37	0.02	21.83	1.1287	1.17	0.00	0.00	1.19
6		Clamshell Crew boat propulsion engine	Marine Equipment	0.2761194	0.2457462	0.2761194	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
6		Clamshell Crew boat auxiliary engine	Marine Equipment	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
6		Clamshell Survey boat propulsion engine	Marine Equipment	0.25	0.22	0.25	4.82	0.00	3.62	0.2671	0.21	0.00	0.00	0.22

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

**Table H1.27**  
**Alternative 3 Emissions by Task**

				Mitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
5 West Basin (clam shell dredge 717,000 CY)														
5		Marine Clamshell Dredge												
5		Clamshell Dredge hoist	Marine Equipment	52.38	52.38	52.38	1592.38	1.74	907.94	88.25	69.42451853	0	0	69.42451853
5		Clamshell Dredge generator	Marine Equipment	39.29	39.29	39.29	1194.29	1.31	680.95	66.19	38.3573671	0	0	38.3573671
5		Clamshell Barge dump scow	Marine Equipment	5.56	5.56	5.56	105.56	0.18	96.30	5.85	4.587328978	0	0	4.587328978
5		Clamshell Tugboat propulsion engine	Marine Equipment	49.90	44.41	49.90	976.04	0.81	733.86	54.09	43.4076071	0.000466033	0.002063859	44.03428779
5		Clamshell Tugboat auxiliary engine	Marine Equipment	3.71	3.30	3.71	135.77	0.15	145.57	7.52	7.827371733	6.48279E-05	0.00037216	7.939896204
5		Clamshell Tugboat propulsion engine	Marine Equipment	898.25	799.44	898.25	17568.69	14.58	13209.54	973.68	781.3369279	0.008388587	0.037149455	792.6171802
5		Clamshell Tugboat auxiliary engine	Marine Equipment	66.70	59.36	66.70	2443.91	2.63	2620.18	135.44	140.8926912	0.001166903	0.006698886	142.9181317
5		Clamshell Crew boat propulsion engine	Marine Equipment	33.134326	29.48955	33.134326	648.068425	0.5379455	487.26949	35.916634	28.82171762	0.000309436	0.001370358	29.23782012
5		Clamshell Crew boat auxiliary engine	Marine Equipment	1.4140679	1.2585204	1.4140679	51.82	0.0557547	55.552668	2.87	2.987190166	2.47405E-05	0.000142029	3.030133316
5		Clamshell Survey boat propulsion engine	Marine Equipment	29.57	26.31	29.57	578.28	0.48	434.79	32.05	25.72	0.00	0.00	26.09
6 Pier J Basin (clam shell dredge 258,000 CY)														
6		Marine Clamshell Dredge												
6		Clamshell Dredge hoist	Marine Equipment	18.77	18.77	18.77	570.60	0.62	325.34	31.62	24.87711914	0	0	24.87711914
6		Clamshell Dredge generator	Marine Equipment	14.08	14.08	14.08	427.95	0.47	244.01	23.72	13.74472321	0	0	13.74472321
6		Clamshell Barge dump scow	Marine Equipment	1.99	1.99	1.99	37.82	0.07	34.51	2.10	1.643792884	0	0	1.643792884
6		Clamshell Tugboat propulsion engine	Marine Equipment	17.88	15.91	17.88	349.75	0.29	262.97	19.38	15.55439255	0.000166995	0.000739549	15.77895312
6		Clamshell Tugboat auxiliary engine	Marine Equipment	1.33	1.18	1.33	48.65	0.05	52.16	2.70	2.804808204	2.323E-05	0.000133357	2.845129473
6		Clamshell Tugboat propulsion engine	Marine Equipment	321.87	286.47	321.87	6295.45	5.23	4733.42	348.90	279.9790658	0.00300591	0.013311888	284.0211562
6		Clamshell Tugboat auxiliary engine	Marine Equipment	23.90	21.27	23.90	875.73	0.94	938.90	48.53	50.48654767	0.00041814	0.002400434	51.21233051
6		Clamshell Crew boat propulsion engine	Marine Equipment	11.873133	10.567089	11.873133	232.224519	0.1927638	174.6049	12.870127	10.32778215	0.000110881	0.000491045	10.47688554
6		Clamshell Crew boat auxiliary engine	Marine Equipment	0.5067077	0.4509698	0.5067077	18.57	0.0199788	19.906373	1.03	1.07040981	8.86536E-06	5.08937E-05	1.085797771
6		Clamshell Survey boat propulsion engine	Marine Equipment	10.59	9.43	10.59	207.22	0.17	155.80	11.48	9.22	0.00	0.00	9.35
Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.														

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.27  
Alternative 3 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
							PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
<b>7 Pier J Basin (clam shell dredge 46,000 CY)</b>																	
7		Marine Clamshell Dredge															
7		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	8.00	4.37	4.37	4.37	132.70	0.15	75.66	7.35	5.79	0.0000	0.00	5.79
7		Clamshell Dredge generator	Marine Equipment	dredging	onsite	8.00	3.27	3.27	3.27	99.52	0.11	56.75	5.52	3.20	0.0000	0.00	3.20
7		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	8.00	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.0000	0.00	0.04
7		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	8.00	0.61	0.54	0.61	11.39	0.01	6.12	0.63	0.36	0.0000	0.00	0.37
7		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	8.00	0.09	0.08	0.09	1.57	0.00	1.10	0.09	0.07	0.0000	0.00	0.07
7		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	8.00	11.01	9.80	11.01	204.97	0.12	110.08	11.36	6.51	0.0001	0.00	6.61
7		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	8.00	1.59	1.41	1.59	28.29	0.02	19.85	1.57	1.17	0.0000	0.00	1.19
7		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	8	0.4060579	0.3613915	0.4060579	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
7		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	8.0000	0.0336683	0.0300	0.0336683	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
7		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	8.00	0.36	0.32	0.36	7.16	0.00	3.62	0.40	0.21	0.0000	0.00	0.22
<b>8 Pier J Approach (clam shell dredge 1,994,000 CY)</b>																	
8		Marine Clamshell Dredge															
8		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	332.00	4.37	4.37	4.37	132.70	0.15	75.66	7.35	5.79	0.0000	0.00	5.79
8		Clamshell Dredge generator	Marine Equipment	dredging	onsite	332.00	3.27	3.27	3.27	99.52	0.11	56.75	5.52	3.20	0.0000	0.00	3.20
8		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	332.00	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.0000	0.00	0.04
8		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	332.00	0.61	0.54	0.61	11.39	0.01	6.12	0.63	0.36	0.0000	0.00	0.37
8		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	332.00	0.09	0.08	0.09	1.57	0.00	1.10	0.09	0.07	0.0000	0.00	0.07
8		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	332.00	11.01	9.80	11.01	204.97	0.12	110.08	11.36	6.51	0.0001	0.00	6.61
8		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	332.00	1.59	1.41	1.59	28.29	0.02	19.85	1.57	1.17	0.0000	0.00	1.19
8		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	332	0.4060579	0.3613915	0.4060579	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
8		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	332	0.0336683	0.0299648	0.0336683	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
8		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	332	0.3623286	0.3224725	0.3623286	7.1596131	0.0040001	3.623286	0.3967933	0.2143153	3.41853E-06	1.01898E-05	0.2174374

Table H1.27  
Alternative 3 Emissions by Task

				Unmitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
7 Pier J Basin (clam shell dredge 46,000 CY)														
7		Marine Clamshell Dredge												
7		Clamshell Dredge hoist	Marine Equipment	34.92	34.92	34.92	1061.59	1.16	605.29	58.83	46.28	0.00	0.00	46.28
7		Clamshell Dredge generator	Marine Equipment	26.19	26.19	26.19	796.19	0.87	453.97	44.13	25.57	0.00	0.00	25.57
7		Clamshell Barge dump scow	Marine Equipment	0.37	0.37	0.37	7.04	0.01	6.42	0.39	0.31	0.00	0.00	0.31
7		Clamshell Tugboat propulsion engine	Marine Equipment	4.89	4.35	4.89	91.10	0.05	48.92	5.05	2.89	0.00	0.00	2.94
7		Clamshell Tugboat auxiliary engine	Marine Equipment	0.71	0.63	0.71	12.57	0.01	8.82	0.70	0.52	0.00	0.00	0.53
7		Clamshell Tugboat propulsion engine	Marine Equipment	88.06	78.38	88.06	1639.74	0.97	880.64	90.88	52.09	0.00	0.00	52.85
7		Clamshell Tugboat auxiliary engine	Marine Equipment	12.70	11.31	12.70	226.29	0.18	158.80	12.54	9.39	0.00	0.00	9.53
7		Clamshell Crew boat propulsion engine	Marine Equipment	3.2484633	2.8911323	3.2484633	64.1896345	0.035863	32.484633	3.5574571	1.9214478	3.06489E-05	9.13572E-05	1.9494385
7		Clamshell Crew boat auxiliary engine	Marine Equipment	0.2693463	0.24	0.2693463	4.79773039	0.003717	3.37	0.2658953	0.199146	0.00	0.0000	0.2020249
7		Clamshell Survey boat propulsion engine	Marine Equipment	2.90	2.58	2.90	57.28	0.03	28.99	3.17	1.71	0.00	0.00	1.74
8 Pier J Approach (clam shell dredge 1,994,000 CY)														
8		Marine Clamshell Dredge												
8		Clamshell Dredge hoist	Marine Equipment	1449.21	1449.21	1449.21	44055.87	48.25	25119.58	2441.62	1920.75	0.00	0.00	1920.75
8		Clamshell Dredge generator	Marine Equipment	1086.90	1086.90	1086.90	33041.90	36.19	18839.68	1831.22	1061.22	0.00	0.00	1061.22
8		Clamshell Barge dump scow	Marine Equipment	15.37	15.37	15.37	292.04	0.51	266.42	16.19	12.69	0.00	0.00	12.69
8		Clamshell Tugboat propulsion engine	Marine Equipment	203.04	180.70	203.04	3780.52	2.24	2030.36	209.52	120.09	0.00	0.01	121.84
8		Clamshell Tugboat auxiliary engine	Marine Equipment	29.29	26.07	29.29	521.72	0.40	366.12	28.91	21.66	0.00	0.00	21.97
8		Clamshell Tugboat propulsion engine	Marine Equipment	3654.64	3252.63	3654.64	68049.39	40.35	36546.40	3771.37	2161.70	0.03	0.10	2193.14
8		Clamshell Tugboat auxiliary engine	Marine Equipment	527.21	469.22	527.21	9390.95	7.28	6590.14	520.46	389.80	0.00	0.02	395.44
8		Clamshell Crew boat propulsion engine	Marine Equipment	134.81123	119.98199	134.81123	2663.86983	1.4883159	1348.1123	147.63447	79.740085	0.001271928	0.003791323	80.901698
8		Clamshell Crew boat auxiliary engine	Marine Equipment	11.17787	9.9483044	11.17787	199.105811	0.1542546	139.72338	11.034654	8.2645595	9.50678E-05	0.000392947	8.3840343
8		Clamshell Survey boat propulsion engine	Marine Equipment	120.29309	107.06085	120.29309	2376.99154	1.3280358	1202.9309	131.73537	71.152692	0.001134951	0.003383027	72.189207

Table H1.27  
Alternative 3 Emissions by Task

				Mitigated										
				Peak Day										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
<b>7 Pier J Basin (clam shell dredge 46,000 CY)</b>														
7		Marine Clamshell Dredge												
7		Clamshell Dredge hoist	Marine Equipment	0.44	0.44	0.44	13.27	0.01	7.57	0.7354	0.58	0.00	0.00	0.58
7		Clamshell Dredge generator	Marine Equipment	0.33	0.33	0.33	9.95	0.01	5.67	0.5516	0.32	0.00	0.00	0.32
7		Clamshell Barge dump scow	Marine Equipment	0.05	0.05	0.05	0.88	0.00	0.80	0.0488	0.04	0.00	0.00	0.04
7		Clamshell Tugboat propulsion engine	Marine Equipment	0.42	0.37	0.42	8.13	0.01	6.12	0.4508	0.36	0.00	0.00	0.37
7		Clamshell Tugboat auxiliary engine	Marine Equipment	0.03	0.03	0.03	1.13	0.00	1.21	0.0627	0.07	0.00	0.00	0.07
7		Clamshell Tugboat propulsion engine	Marine Equipment	7.49	6.66	7.49	146.41	0.12	110.08	8.1140	6.51	0.00	0.00	6.61
7		Clamshell Tugboat auxiliary engine	Marine Equipment	0.56	0.49	0.56	20.37	0.02	21.83	1.1287	1.17	0.00	0.00	1.19
7		Clamshell Crew boat propulsion engine	Marine Equipment	0.2761194	0.2457462	0.2761194	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
7		Clamshell Crew boat auxiliary engine	Marine Equipment	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
7		Clamshell Survey boat propulsion engine	Marine Equipment	0.25	0.22	0.25	4.82	0.00	3.62	0.2671	0.21	0.00	0.00	0.22
<b>8 Pier J Approach (clam shell dredge 1,994,000 CY)</b>														
8		Marine Clamshell Dredge												
8		Clamshell Dredge hoist	Marine Equipment	0.44	0.44	0.44	13.27	0.01	7.57	0.7354	0.58	0.00	0.00	0.58
8		Clamshell Dredge generator	Marine Equipment	0.33	0.33	0.33	9.95	0.01	5.67	0.5516	0.32	0.00	0.00	0.32
8		Clamshell Barge dump scow	Marine Equipment	0.05	0.05	0.05	0.88	0.00	0.80	0.0488	0.04	0.00	0.00	0.04
8		Clamshell Tugboat propulsion engine	Marine Equipment	0.42	0.37	0.42	8.13	0.01	6.12	0.4508	0.36	0.00	0.00	0.37
8		Clamshell Tugboat auxiliary engine	Marine Equipment	0.03	0.03	0.03	1.13	0.00	1.21	0.0627	0.07	0.00	0.00	0.07
8		Clamshell Tugboat propulsion engine	Marine Equipment	7.49	6.66	7.49	146.41	0.12	110.08	8.1140	6.51	0.00	0.00	6.61
8		Clamshell Tugboat auxiliary engine	Marine Equipment	0.56	0.49	0.5558	20.37	0.02	21.83	1.13	1.17	0.00	0.00	1.19
8		Clamshell Crew boat propulsion engine	Marine Equipment	0.2761194	0.2457462	0.2761194	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
8		Clamshell Crew boat auxiliary engine	Marine Equipment	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
8		Clamshell Survey boat propulsion engine	Marine Equipment	0.2463834	0.2192813	0.2463834	4.8189703	0.0040001	3.623286	0.2670724	0.2143153	2.30093E-06	1.01898E-05	0.2174094

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.27  
Alternative 3 Emissions by Task

				Mitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
<b>7 Pier J Basin (clam shell dredge 46,000 CY)</b>														
7		Marine Clamshell Dredge												
7		Clamshell Dredge hoist	Marine Equipment	3.49	3.49	3.49	106.16	0.12	60.53	5.88	4.628301236	0	0	4.628301236
7		Clamshell Dredge generator	Marine Equipment	2.62	2.62	2.62	79.62	0.09	45.40	4.41	2.557157807	0	0	2.557157807
7		Clamshell Barge dump scow	Marine Equipment	0.37	0.37	0.37	7.04	0.01	6.42	0.39	0.305821932	0	0	0.305821932
7		Clamshell Tugboat propulsion engine	Marine Equipment	3.33	2.96	3.33	65.07	0.05	48.92	3.61	2.893840474	3.10688E-05	0.000137591	2.935619186
7		Clamshell Tugboat auxiliary engine	Marine Equipment	0.25	0.22	0.25	9.05	0.01	9.70	0.50	0.521824782	4.32186E-06	2.48107E-05	0.529326414
7		Clamshell Tugboat propulsion engine	Marine Equipment	59.88	53.30	59.88	1171.25	0.97	880.64	64.91	52.08912852	0.000559239	0.00247663	52.84114534
7		Clamshell Tugboat auxiliary engine	Marine Equipment	4.45	3.96	4.45	162.93	0.18	174.68	9.03	9.392846079	7.77935E-05	0.000446592	9.527875445
7		Clamshell Crew boat propulsion engine	Marine Equipment	2.208955	1.96597	2.208955	43.2045617	0.035863	32.484633	2.3944423	1.921447841	2.0629E-05	9.13572E-05	1.949188008
7		Clamshell Crew boat auxiliary engine	Marine Equipment	0.0942712	0.0839014	0.0942712	3.45	0.003717	3.7035112	0.19	0.199146011	1.64937E-06	9.4686E-06	0.202008888
7		Clamshell Survey boat propulsion engine	Marine Equipment	1.97	1.75	1.97	38.55	0.03	28.99	2.14	1.71	0.00	0.00	1.74
<b>8 Pier J Approach (clam shell dredge 1,994,000 CY)</b>														
8		Marine Clamshell Dredge												
8		Clamshell Dredge hoist	Marine Equipment	144.92	144.92	144.92	4405.59	4.83	2511.96	244.16	192.0745013	0	0	192.0745013
8		Clamshell Dredge generator	Marine Equipment	108.69	108.69	108.69	3304.19	3.62	1883.97	183.12	106.122049	0	0	106.122049
8		Clamshell Barge dump scow	Marine Equipment	15.37	15.37	15.37	292.04	0.51	266.42	16.19	12.69161017	0	0	12.69161017
8		Clamshell Tugboat propulsion engine	Marine Equipment	138.06	122.88	138.06	2700.37	2.24	2030.36	149.66	120.0943797	0.001289357	0.005710009	121.8281962
8		Clamshell Tugboat auxiliary engine	Marine Equipment	10.25	9.12	10.25	375.64	0.40	402.73	20.82	21.65572846	0.000179357	0.001029644	21.96704616
8		Clamshell Tugboat propulsion engine	Marine Equipment	2485.15	2211.79	2485.15	48606.71	40.35	36546.40	2693.83	2161.698834	0.023208423	0.102780159	2192.907532
8		Clamshell Tugboat auxiliary engine	Marine Equipment	184.52	164.23	184.52	6761.48	7.28	7249.15	374.73	389.8031123	0.003228431	0.018533584	395.4068309
8		Clamshell Crew boat propulsion engine	Marine Equipment	91.671634	81.587754	91.671634	1792.98931	1.4883159	1348.1123	99.369355	79.74008541	0.000856105	0.003791323	80.89130232
8		Clamshell Crew boat auxiliary engine	Marine Equipment	3.9122545	3.4819065	3.9122545	143.356184	0.1542546	153.69571	7.9449506	8.26455946	6.84488E-05	0.000392947	8.38336884
8		Clamshell Survey boat propulsion engine	Marine Equipment	81.799304	72.801381	81.799304	1599.89815	1.3280358	1202.9309	88.66804	71.1526916	0.000763909	0.003383027	72.1799313

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.27  
Alternative 3 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
<b>9 Pier J Approach (clam shell dredge 679,000 CY)</b>																	
9		Marine Clamshell Dredge															
9		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	113	4.3650794	4.3650794	4.3650794	132.69841	0.145332	75.661376	7.3542857	5.7853765	0	0	5.7853765
9		Clamshell Dredge generator	Marine Equipment	dredging	onsite	113	3.2738095	3.2738095	3.2738095	99.52381	0.108999	56.746032	5.5157143	3.1964473	0	0	3.1964473
9		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	113	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
9		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	113	0.6115528	0.544282	0.6115528	11.387113	0.0067515	6.115528	0.6310858	0.3617301	5.43705E-06	1.71988E-05	0.3669912
9		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	113	0.0882214	0.0785171	0.0882214	1.5714441	0.0012175	1.1027678	0.0870911	0.0652281	7.50323E-07	3.10134E-06	0.0661711
9		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	113	11.00795	9.7970759	11.00795	204.96804	0.1215278	110.0795	11.359544	6.5111411	9.78668E-05	0.000309579	6.6058422
9		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	113	1.5879856	1.4133072	1.5879856	28.285994	0.0219142	19.84982	1.5676396	1.1741058	1.35058E-05	5.5824E-05	1.191079
9		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	113	0.4060579	0.3613915	0.4060579	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
9		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	113	0.0336683	0.0299648	0.0336683	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
9		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	113	0.3623286	0.3224725	0.3623286	7.1596131	0.0040001	3.623286	0.3967933	0.2143153	3.41853E-06	1.01898E-05	0.2174374



Table H1.27  
Alternative 3 Emissions by Task

				Unmitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
9 Pier J Approach (clam shell dredge 679,000 CY)														
9		Marine Clamshell Dredge												
9		Clamshell Dredge hoist	Marine Equipment	493.25397	493.25397	493.25397	14994.9206	16.422516	8549.7354	831.03429	653.74755	0	0	653.74755
9		Clamshell Dredge generator	Marine Equipment	369.94048	369.94048	369.94048	11246.1905	12.316887	6412.3016	623.27571	361.19854	0	0	361.19854
9		Clamshell Barge dump scow	Marine Equipment	5.2314815	5.2314815	5.2314815	99.3981481	0.1741782	90.679012	5.50875	4.3197348	0	0	4.3197348
9		Clamshell Tugboat propulsion engine	Marine Equipment	69.105467	61.503866	69.105467	1286.74379	0.7629244	691.05467	71.312696	40.875497	0.000614386	0.001943467	41.470009
9		Clamshell Tugboat auxiliary engine	Marine Equipment	9.9690209	8.8724286	9.9690209	177.573185	0.1375725	124.61276	9.8412928	7.370775	8.47865E-05	0.000350451	7.4773291
9		Clamshell Tugboat propulsion engine	Marine Equipment	1243.8984	1107.0696	1243.8984	23161.3883	13.732638	12438.984	1283.6285	735.75894	0.011058953	0.034982404	746.46017
9		Clamshell Tugboat auxiliary engine	Marine Equipment	179.44238	159.70371	179.44238	3196.31733	2.4763048	2243.0297	177.14327	132.67395	0.001526157	0.006308117	134.59192
9		Clamshell Crew boat propulsion engine	Marine Equipment	45.884544	40.837244	45.884544	906.678587	0.5065654	458.84544	50.249082	27.140451	0.000432915	0.00129042	27.535819
9		Clamshell Crew boat auxiliary engine	Marine Equipment	3.804516	3.3860193	3.804516	67.7679417	0.0525023	47.55645	3.7557707	2.8129374	3.23574E-05	0.000133744	2.853602
9		Clamshell Survey boat propulsion engine	Marine Equipment	40.943131	36.439387	40.943131	809.036278	0.4520122	409.43131	44.837642	24.217633	0.000386294	0.001151452	24.570423

Table H1.27  
Alternative 3 Emissions by Task

				Mitigated										
				Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	PM10  (lb/day)	PM2.5  (lb/day)	DPM  (lb/day)	NOX  (lb/day)	SOX  (lb/day)	CO  (lb/day)	VOC  (lb/day)	CO2  (tonnes/day)	CH4  (tonnes/day)	N2O  (tonnes/day)	CO2e  (tonnes/day)
9 Pier J Approach (clam shell dredge 679,000 CY)														
9		Marine Clamshell Dredge												
9		Clamshell Dredge hoist	Marine Equipment	0.4365079	0.4365079	0.4365079	13.269841	0.0145332	7.5661376	0.7354286	0.5785377	0	0	0.5785377
9		Clamshell Dredge generator	Marine Equipment	0.327381	0.327381	0.327381	9.952381	0.0108999	5.6746032	0.5515714	0.3196447	0	0	0.3196447
9		Clamshell Barge dump scow	Marine Equipment	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
9		Clamshell Tugboat propulsion engine	Marine Equipment	0.4158559	0.3701118	0.4158559	8.1336523	0.0067515	6.115528	0.4507756	0.3617301	3.8836E-06	1.71988E-05	0.3669524
9		Clamshell Tugboat auxiliary engine	Marine Equipment	0.0308775	0.027481	0.0308775	1.1314398	0.0012175	1.2130446	0.0627056	0.0652281	5.40233E-07	3.10134E-06	0.0661658
9		Clamshell Tugboat propulsion engine	Marine Equipment	7.4854063	6.6620116	7.4854063	146.40574	0.1215278	110.0795	8.1139603	6.5111411	6.99049E-05	0.000309579	6.6051432
9		Clamshell Tugboat auxiliary engine	Marine Equipment	0.555795	0.4946575	0.555795	20.365916	0.0219142	21.834802	1.1287005	1.1741058	9.72419E-06	5.5824E-05	1.1909844
9		Clamshell Crew boat propulsion engine	Marine Equipment	0.2761194	0.2457462	0.2761194	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
9		Clamshell Crew boat auxiliary engine	Marine Equipment	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
9		Clamshell Survey boat propulsion engine	Marine Equipment	0.2463834	0.2192813	0.2463834	4.8189703	0.0040001	3.623286	0.2670724	0.2143153	2.30093E-06	1.01898E-05	0.2174094

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.27  
Alternative 3 Emissions by Task

				Mitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
<b>9 Pier J Approach (clam shell dredge 679,000 CY)</b>														
9		Marine Clamshell Dredge												
9		Clamshell Dredge hoist	Marine Equipment	49.325397	49.325397	49.325397	1499.49206	1.6422516	854.97354	83.103429	65.37475495	0	0	65.37475495
9		Clamshell Dredge generator	Marine Equipment	36.994048	36.994048	36.994048	1124.61905	1.2316887	641.23016	62.327571	36.11985402	0	0	36.11985402
9		Clamshell Barge dump scow	Marine Equipment	5.2314815	5.2314815	5.2314815	99.3981481	0.1741782	90.679012	5.50875	4.319734787	0	0	4.319734787
9		Clamshell Tugboat propulsion engine	Marine Equipment	46.991718	41.822629	46.991718	919.10271	0.7629244	691.05467	50.93764	40.87549669	0.000438847	0.001943467	41.465621
9		Clamshell Tugboat auxiliary engine	Marine Equipment	3.4891573	3.10535	3.4891573	127.852693	0.1375725	137.07404	7.0857308	7.370775048	6.10463E-05	0.000350451	7.476735592
9		Clamshell Tugboat propulsion engine	Marine Equipment	845.85092	752.80731	845.85092	16543.8488	13.732638	12438.984	916.87751	735.7589404	0.007899252	0.034982404	746.381178
9		Clamshell Tugboat auxiliary engine	Marine Equipment	62.804832	55.8963	62.804832	2301.34848	2.4763048	2467.3327	127.54316	132.6739509	0.001098833	0.006308117	134.5812407
9		Clamshell Crew boat propulsion engine	Marine Equipment	31.20149	27.769326	31.20149	610.264434	0.5065654	458.84544	33.821497	27.14045076	0.000291385	0.00129042	27.53228061
9		Clamshell Crew boat auxiliary engine	Marine Equipment	1.3315806	1.1851067	1.3315806	48.7929181	0.0525023	52.312095	2.7041549	2.812937407	2.32973E-05	0.000133744	2.853375539
9		Clamshell Survey boat propulsion engine	Marine Equipment	27.841329	24.778783	27.841329	544.543649	0.4520122	409.43131	30.179182	24.21763298	0.000260005	0.001151452	24.56726578

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.28  
Alternative 4 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
							PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
1		Electrical Substation Construction at Pier J (mitigation only)															
1		Off-Road Equipment															
1		Caterpillar 320 excavator	Offroad Construction Equipment		onsite	20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Small asphalt roller	Offroad Construction Equipment		onsite	26	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Water truck	Offroad Construction Equipment		onsite	20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Forklift	Offroad Construction Equipment		onsite	22	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Mobile crane (35 ton)	Offroad Construction Equipment		onsite	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		On-Road Vehicles															
1		Haul trucks	Onroad Construction Vehicles		onsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Supply trucks	Onroad Construction Vehicles		onsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Haul trucks	Onroad Construction Vehicles		offsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Supply trucks	Onroad Construction Vehicles		offsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Workers	Onroad Construction Vehicles		offsite	60	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Fugitive Dust															
1		Soil handling	Fugitive Emissions		onsite	20	n/a	n/a									
1		Asphalting	Fugitive Emissions		onsite												
2		Pier J Breakwater Construction															
2		Marine Activities															
2		Pier J Breakwater Construction Tugboat propulsion engine	Marine Equipment		onsite	54	5.810	5.171	5.810	108.178	0.064	58.098	5.995	3.436	0.000	0.000	3.486
2		Pier J Breakwater Construction Tugboat auxiliary engine	Marine Equipment		onsite	54	1.059	0.942	1.059	18.857	0.015	13.233	1.045	0.783	0.000	0.000	0.794
2		Pier J Breakwater Construction Crew boat propulsion engine	Marine Equipment		onsite	54	0.406	0.361	0.406	8.024	0.004	4.061	0.445	0.240	0.000	0.000	0.244
2		Pier J Breakwater Construction Crew boat auxiliary engine	Marine Equipment		onsite	54	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
2		Pier J Breakwater Construction Survey boat propulsion engine	Marine Equipment		onsite	54	0.362	0.322	0.362	7.160	0.004	3.623	0.397	0.214	0.000	0.000	0.217
2		Off-Road Equipment															
2		Piling crane	Offroad Construction Equipment		onsite	54	0.209	0.192	0.209	5.002	0.008	2.675	0.467	0.380	0.000	0.000	0.380
2		Long arm excavator	Offroad Construction Equipment		onsite	54	0.075	0.069	0.075	2.188	0.013	2.775	0.321	0.634	0.000	0.000	0.634
2		On-Road Vehicles															
2		Delivery Trucks	Onroad Construction Vehicles		onsite	5	0.147	0.037	0.000	0.079	0.000	0.009	0.001	0.012	0.000	0.000	0.012
2		Delivery Trucks	Onroad Construction Vehicles		offsite	5	0.486	0.189	0.022	3.217	0.019	0.185	0.026	0.919	0.000	0.000	0.962
2		Workers	Onroad Construction Vehicles		offsite	54	0.159	0.050	0.000	0.058	0.004	0.959	0.015	0.169	0.000	0.000	0.170

Table H1.28  
Alternative 4 Emissions by Task

				Unmitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
1		Electrical Substation Construction at Pier J (mitigation only)												
1		Off-Road Equipment												
1		Caterpillar 320 excavator	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Small asphalt roller	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Water truck	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Forklift	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Mobile crane (35 ton)	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		On-Road Vehicles												
1		Haul trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Supply trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Haul trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Supply trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Workers	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Fugitive Dust												
1		Soil handling	Fugitive Emissions	n/a	n/a									
1		Asphalting	Fugitive Emissions											
2		Pier J Breakwater Construction												
2		Marine Activities												
2		Pier J Breakwater Construction Tugboat propulsion engine	Marine Equipment	313.727	279.217	313.727	5841.589	3.464	3137.266	323.747	185.568	0.003	0.009	188.267
2		Pier J Breakwater Construction Tugboat auxiliary engine	Marine Equipment	57.167	50.879	57.167	1018.296	0.789	714.594	56.435	42.268	0.000	0.002	42.879
2		Pier J Breakwater Construction Crew boat propulsion engine	Marine Equipment	21.927	19.515	21.927	433.280	0.242	219.271	24.013	12.970	0.000	0.001	13.159
2		Pier J Breakwater Construction Crew boat auxiliary engine	Marine Equipment	1.818	1.618	1.818	32.385	0.025	22.726	1.795	1.344	0.000	0.000	1.364
2		Pier J Breakwater Construction Survey boat propulsion engine	Marine Equipment	19.566	17.414	19.566	386.619	0.216	195.657	21.427	11.573	0.000	0.001	11.742
2		Off-Road Equipment												
2		Piling crane	Offroad Construction Equipment	11.266	10.365	11.266	270.124	0.418	144.427	25.201	20.519	0.000	0.000	20.519
2		Long arm excavator	Offroad Construction Equipment	4.061	3.736	4.061	118.133	0.697	149.866	17.327	34.235	0.000	0.000	34.235
2		On-Road Vehicles												
2		Delivery Trucks	Onroad Construction Vehicles	0.736	0.185	0.001	0.394	0.001	0.046	0.005	0.059	0.000	0.000	0.062
2		Delivery Trucks	Onroad Construction Vehicles	2.431	0.943	0.111	16.084	0.096	0.924	0.128	4.596	0.000	0.001	4.811
2		Workers	Onroad Construction Vehicles	8.583	2.719	0.000	3.143	0.199	51.794	0.809	9.128	0.000	0.000	9.178

Table H1.28  
Alternative 4 Emissions by Task

				Mitigated										
				Peak Day										
		Construction Element/Equipment	Source Type 1	PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID				(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
1		Electrical Substation Construction at Pier J (mitigation only)												
1		Off-Road Equipment												
		Caterpillar 320 excavator	Offroad Construction Equipment	0.016	0.016	0.016	0.330	0.005	1.226	0.156	0.265	0.000	0.000	0.265
1		Small asphalt roller	Offroad Construction Equipment	0.005	0.005	0.005	0.735	0.001	0.907	0.041	0.058	0.000	0.000	0.058
1		Water truck	Offroad Construction Equipment	0.030	0.030	0.030	0.603	0.010	2.587	0.296	0.482	0.000	0.000	0.482
1		Forklift	Offroad Construction Equipment	0.001	0.001	0.001	0.147	0.000	0.163	0.008	0.012	0.000	0.000	0.012
1		Mobile crane (35 ton)	Offroad Construction Equipment	0.022	0.022	0.022	0.433	0.007	2.414	0.213	0.343	0.000	0.000	0.343
1		On-Road Vehicles												
1		Haul trucks	Onroad Construction Vehicles	0.088	0.022	0.000	0.047	0.000	0.006	0.001	0.007	0.000	0.000	0.007
1		Supply trucks	Onroad Construction Vehicles	0.206	0.052	0.000	0.110	0.000	0.013	0.001	0.016	0.000	0.000	0.017
1		Haul trucks	Onroad Construction Vehicles	0.016	0.006	0.001	0.113	0.002	0.006	0.004	0.030	0.000	0.000	0.032
1		Supply trucks	Onroad Construction Vehicles	0.068	0.026	0.003	0.514	0.019	0.026	0.038	0.129	0.000	0.000	0.135
1		Workers	Onroad Construction Vehicles	0.151	0.048	0.000	0.055	0.004	0.913	0.014	0.161	0.000	0.000	0.162
1		Fugitive Dust												
1		Soil handling	Fugitive Emissions	2.006	0.304									
1		Asphalting	Fugitive Emissions											
2		Pier J Breakwater Construction												
2		Marine Activities												
2		Pier J Breakwater Construction Tugboat propulsion engine	Marine Equipment	3.951	3.516	3.951	77.270	0.064	58.098	4.282	3.436	0.000	0.000	3.486
2		Pier J Breakwater Construction Tugboat auxiliary engine	Marine Equipment	0.371	0.330	0.371	13.577	0.015	14.557	0.752	0.783	0.000	0.000	0.794
2		Pier J Breakwater Construction Crew boat propulsion engine	Marine Equipment	0.276	0.246	0.276	5.401	0.004	4.061	0.299	0.240	0.000	0.000	0.244
2		Pier J Breakwater Construction Crew boat auxiliary engine	Marine Equipment	0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.025
2		Pier J Breakwater Construction Survey boat propulsion engine	Marine Equipment	0.246	0.219	0.246	4.819	0.004	3.623	0.267	0.214	0.000	0.000	0.217
2		Off-Road Equipment												
2		Piling crane	Offroad Construction Equipment	0.024	0.024	0.024	0.479	0.008	2.675	0.236	0.380	0.000	0.000	0.380
2		Long arm excavator	Offroad Construction Equipment	0.040	0.040	0.040	0.792	0.013	2.775	0.321	0.634	0.000	0.000	0.634
2		On-Road Vehicles												
2		Delivery Trucks	Onroad Construction Vehicles	0.147	0.037	0.000	0.079	0.000	0.009	0.001	0.012	0.000	0.000	0.012
2		Delivery Trucks	Onroad Construction Vehicles	0.486	0.189	0.022	3.541	0.101	0.185	0.199	0.919	0.000	0.000	0.962
2		Workers	Onroad Construction Vehicles	0.159	0.050	0.000	0.058	0.004	0.959	0.015	0.169	0.000	0.000	0.170

Table H1.28  
Alternative 4 Emissions by Task

				Mitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
1		Electrical Substation Construction at Pier J (mitigation only)												
1		Off-Road Equipment												
1		Caterpillar 320 excavator	Offroad Construction Equipment	0.330	0.330	0.330	6.595	0.108	24.518	3.122	5.296	0.000	0.000	5.296
1		Small asphalt roller	Offroad Construction Equipment	0.127	0.127	0.127	19.120	0.031	23.576	1.060	1.511	0.000	0.000	1.511
1		Water truck	Offroad Construction Equipment	0.603	0.603	0.603	12.063	0.196	51.747	5.928	9.642	0.000	0.000	9.642
1		Forklift	Offroad Construction Equipment	0.021	0.021	0.021	3.225	0.005	3.589	0.179	0.260	0.000	0.000	0.260
1		Mobile crane (35 ton)	Offroad Construction Equipment	0.043	0.043	0.043	0.865	0.014	4.827	0.425	0.686	0.000	0.000	0.686
1		On-Road Vehicles												
1		Haul trucks	Onroad Construction Vehicles	0.442	0.111	0.000	0.236	0.001	0.028	0.003	0.035	0.000	0.000	0.037
1		Supply trucks	Onroad Construction Vehicles	1.030	0.258	0.001	0.552	0.002	0.064	0.007	0.082	0.000	0.000	0.086
1		Haul trucks	Onroad Construction Vehicles	0.080	0.031	0.004	0.563	0.011	0.031	0.021	0.152	0.000	0.000	0.159
1		Supply trucks	Onroad Construction Vehicles	0.340	0.132	0.016	2.570	0.093	0.130	0.188	0.643	0.000	0.000	0.674
1		Workers	Onroad Construction Vehicles	9.083	2.877	0.000	3.326	0.211	54.809	0.856	9.659	0.000	0.000	9.712
1		Fugitive Dust												
1		Soil handling	Fugitive Emissions	40.118	6.075									
1		Asphalting	Fugitive Emissions											
2		Pier J Breakwater Construction												
2		Marine Activities												
2		Pier J Breakwater Construction Tugboat propulsion engine	Marine Equipment	213.334	189.867	213.334	4172.564	3.464	3137.266	231.248	185.568	0.002	0.009	188.247
2		Pier J Breakwater Construction Tugboat auxiliary engine	Marine Equipment	20.009	17.808	20.009	733.173	0.789	786.053	40.633	42.268	0.000	0.002	42.875
2		Pier J Breakwater Construction Crew boat propulsion engine	Marine Equipment	14.910	13.270	14.910	291.631	0.242	219.271	16.162	12.970	0.000	0.001	13.157
2		Pier J Breakwater Construction Crew boat auxiliary engine	Marine Equipment	0.636	0.566	0.636	23.317	0.025	24.999	1.292	1.344	0.000	0.000	1.364
2		Pier J Breakwater Construction Survey boat propulsion engine	Marine Equipment	13.305	11.841	13.305	260.224	0.216	195.657	14.422	11.573	0.000	0.001	11.740
2		Off-Road Equipment												
2		Piling crane	Offroad Construction Equipment	1.295	1.295	1.295	25.893	0.418	144.427	12.724	20.519	0.000	0.000	20.519
2		Long arm excavator	Offroad Construction Equipment	2.138	2.138	2.138	42.750	0.697	149.866	17.327	34.235	0.000	0.000	34.235
2		On-Road Vehicles												
2		Delivery Trucks	Onroad Construction Vehicles	0.736	0.185	0.001	0.394	0.001	0.046	0.005	0.059	0.000	0.000	0.062
2		Delivery Trucks	Onroad Construction Vehicles	2.431	0.943	0.111	17.707	0.503	0.926	0.996	4.596	0.000	0.001	4.811
2		Workers	Onroad Construction Vehicles	8.583	2.719	0.000	3.143	0.199	51.794	0.809	9.128	0.000	0.000	9.178

Table H1.28  
Alternative 4 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
3		Pier J Wharf Upgrade															
3		Marine Activities															
3		Pier J Wharf Tugboat propulsion engine	Marine Equipment		onsite	175	6.116	5.443	6.116	113.871	0.068	61.155	6.311	3.617	0.000	0.000	3.670
3		Pier J Wharf Tugboat auxiliary engine	Marine Equipment		onsite	175	0.529	0.471	0.529	9.429	0.007	6.617	0.523	0.391	0.000	0.000	0.397
3		Pier J Wharf Crew boat propulsion engine	Marine Equipment		onsite	175	0.500	0.445	0.500	9.306	0.006	4.998	0.516	0.296	0.000	0.000	0.300
3		Pier J Wharf Crew boat auxiliary engine	Marine Equipment		onsite	175	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
3		Pier J Wharf Survey boat propulsion engine	Marine Equipment		onsite	175	0.250	0.222	0.250	4.653	0.003	2.499	0.258	0.148	0.000	0.000	0.150
3		Off-Road Equipment															
3		Const Barge - piling crane	Offroad Construction Equipment		onsite	170	0.209	0.192	0.209	5.002	0.008	2.675	0.467	0.380	0.000	0.000	0.380
3		Cong Barge - long arm excavator	Offroad Construction Equipment		onsite	170	0.075	0.069	0.075	2.188	0.013	2.775	0.321	0.634	0.000	0.000	0.634
3		Const barge - deck equipment	Offroad Construction Equipment		onsite	170	0.192	0.177	0.192	2.758	0.004	2.819	0.327	0.181	0.000	0.000	0.181
3		Sheet pile barge - deck equipment	Offroad Construction Equipment		onsite	170	0.192	0.177	0.192	2.758	0.004	2.819	0.327	0.181	0.000	0.000	0.181
3		On-Road Vehicles															
3		Workers	Onroad Construction Vehicles		offsite	175	0.144	0.046	0.000	0.053	0.003	0.868	0.014	0.153	0.000	0.000	0.154
4		Pier T Wharf Upgrade															
4		Marine Activities															
4		Pier T Wharf Tugboat propulsion engine	Marine Equipment		onsite	320	6.116	5.443	6.116	113.871	0.068	61.155	6.311	3.617	0.000	0.000	3.670
4		Pier T Wharf Tugboat auxiliary engine	Marine Equipment		onsite	320	0.529	0.471	0.529	9.429	0.007	6.617	0.523	0.391	0.000	0.000	0.397
4		Pier T Wharf Crew boat propulsion engine	Marine Equipment		onsite	320	0.500	0.445	0.500	9.306	0.006	4.998	0.516	0.296	0.000	0.000	0.300
4		Pier T Wharf Crew boat auxiliary engine	Marine Equipment		onsite	320	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
4		Pier T Wharf Survey boat propulsion engine	Marine Equipment		onsite	320	0.250	0.222	0.250	4.653	0.003	2.499	0.258	0.148	0.000	0.000	0.150
4		Off-Road Equipment															
4		Const Barge - piling crane	Offroad Construction Equipment		onsite	310	0.209	0.192	0.209	5.002	0.008	2.675	0.467	0.380	0.000	0.000	0.380
4		Cong Barge - long arm excavator	Offroad Construction Equipment		onsite	310	0.075	0.069	0.075	2.188	0.013	2.775	0.321	0.634	0.000	0.000	0.634
4		Const barge - deck equipment	Offroad Construction Equipment		onsite	310	0.192	0.177	0.192	2.758	0.004	2.819	0.327	0.181	0.000	0.000	0.181
4		Sheet pile barge - deck equipment	Offroad Construction Equipment		onsite	310	0.192	0.177	0.192	2.758	0.004	2.819	0.327	0.181	0.000	0.000	0.181
4		On-Road Vehicles															
4		Workers	Onroad Construction Vehicles		offsite	320	0.144	0.046	0.000	0.053	0.003	0.868	0.014	0.153	0.000	0.000	0.154



Table H1.28  
Alternative 4 Emissions by Task

				Unmitigated Emissions											
				Total											
		Construction Element/Equipment	Source Type 1	PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e	
Task ID				(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	
3		Pier J Wharf Upgrade													
3		Marine Activities													
3		Pier J Wharf Tugboat propulsion engine	Marine Equipment	1070.217	952.493	1070.217	19927.448	11.815	10702.174	1104.400	633.028	0.010	0.030	642.235	
3		Pier J Wharf Tugboat auxiliary engine	Marine Equipment	92.632	82.443	92.632	1650.016	1.278	1157.906	91.446	68.490	0.001	0.003	69.480	
3		Pier J Wharf Crew boat propulsion engine	Marine Equipment	87.459	77.838	87.459	1628.480	0.966	874.586	90.252	51.731	0.001	0.002	52.484	
3		Pier J Wharf Crew boat auxiliary engine	Marine Equipment	5.892	5.244	5.892	104.950	0.081	73.649	5.816	4.356	0.000	0.000	4.419	
3		Pier J Wharf Survey boat propulsion engine	Marine Equipment	43.729	38.919	43.729	814.240	0.483	437.293	45.126	25.866	0.000	0.001	26.242	
3		Off-Road Equipment													
3		Const Barge - piling crane	Offroad Construction Equipment	35.467	32.630	35.467	850.389	1.315	454.676	79.338	64.597	0.000	0.000	64.597	
3		Cong Barge - long arm excavator	Offroad Construction Equipment	12.784	11.761	12.784	371.901	2.195	471.801	54.548	107.776	0.000	0.000	107.776	
3		Const barge - deck equipment	Offroad Construction Equipment	32.705	30.088	32.705	468.878	0.625	479.240	55.642	30.730	0.000	0.000	30.730	
3		Sheet pile barge - deck equipment	Offroad Construction Equipment	32.705	30.088	32.705	468.878	0.625	479.240	55.642	30.730	0.000	0.000	30.730	
3		On-Road Vehicles													
3		Workers	Onroad Construction Vehicles	25.167	7.972	0.000	9.217	0.584	151.865	2.372	26.764	0.000	0.000	26.911	
4		Pier T Wharf Upgrade													
4		Marine Activities													
4		Pier T Wharf Tugboat propulsion engine	Marine Equipment	1956.969	1741.702	1956.969	36438.762	21.605	19569.690	2019.475	1157.536	0.017	0.055	1174.372	
4		Pier T Wharf Tugboat auxiliary engine	Marine Equipment	169.385	150.753	169.385	3017.173	2.338	2117.314	167.215	125.238	0.001	0.006	127.048	
4		Pier T Wharf Crew boat propulsion engine	Marine Equipment	159.924	142.333	159.924	2977.791	1.766	1599.243	165.032	94.594	0.001	0.004	95.970	
4		Pier T Wharf Crew boat auxiliary engine	Marine Equipment	10.774	9.589	10.774	191.909	0.149	134.673	10.636	7.966	0.000	0.000	8.081	
4		Pier T Wharf Survey boat propulsion engine	Marine Equipment	79.962	71.166	79.962	1488.896	0.883	799.622	82.516	47.297	0.001	0.002	47.985	
4		Off-Road Equipment													
4		Const Barge - piling crane	Offroad Construction Equipment	64.675	59.501	64.675	1550.709	2.397	829.115	144.674	117.794	0.000	0.000	117.794	
4		Cong Barge - long arm excavator	Offroad Construction Equipment	23.312	21.447	23.312	678.172	4.003	860.342	99.471	196.533	0.000	0.000	196.533	
4		Const barge - deck equipment	Offroad Construction Equipment	59.638	54.867	59.638	855.012	1.140	873.908	101.465	56.037	0.000	0.000	56.037	
4		Sheet pile barge - deck equipment	Offroad Construction Equipment	59.638	54.867	59.638	855.012	1.140	873.908	101.465	56.037	0.000	0.000	56.037	
4		On-Road Vehicles													
4		Workers	Onroad Construction Vehicles	46.019	14.578	0.000	16.854	1.067	277.697	4.337	48.939	0.001	0.001	49.208	

Table H1.28  
Alternative 4 Emissions by Task

				Mitigated										
				Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
3		Pier J Wharf Upgrade												
3		Marine Activities												
3		Pier J Wharf Tugboat propulsion engine	Marine Equipment	4.159	3.701	4.159	81.337	0.068	61.155	4.508	3.617	0.000	0.000	3.670
3		Pier J Wharf Tugboat auxiliary engine	Marine Equipment	0.185	0.165	0.185	6.789	0.007	7.278	0.376	0.391	0.000	0.000	0.397
3		Pier J Wharf Crew boat propulsion engine	Marine Equipment	0.340	0.302	0.340	6.647	0.006	4.998	0.368	0.296	0.000	0.000	0.300
3		Pier J Wharf Crew boat auxiliary engine	Marine Equipment	0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.025
3		Pier J Wharf Survey boat propulsion engine	Marine Equipment	0.170	0.151	0.170	3.323	0.003	2.499	0.184	0.148	0.000	0.000	0.150
3		Off-Road Equipment												
3		Const Barge - piling crane	Offroad Construction Equipment	0.024	0.024	0.024	0.479	0.008	2.675	0.236	0.380	0.000	0.000	0.380
3		Cong Barge - long arm excavator	Offroad Construction Equipment	0.040	0.040	0.040	0.792	0.013	2.775	0.321	0.634	0.000	0.000	0.634
3		Const barge - deck equipment	Offroad Construction Equipment	0.014	0.014	0.014	0.278	0.004	2.819	0.137	0.181	0.000	0.000	0.181
3		Sheet pile barge - deck equipment	Offroad Construction Equipment	0.014	0.014	0.014	0.278	0.004	2.819	0.137	0.181	0.000	0.000	0.181
3		On-Road Vehicles												
3		Workers	Onroad Construction Vehicles	0.144	0.046	0.000	0.053	0.003	0.868	0.014	0.153	0.000	0.000	0.154
4		Pier T Wharf Upgrade												
4		Marine Activities												
4		Pier T Wharf Tugboat propulsion engine	Marine Equipment	4.159	3.701	4.159	81.337	0.068	61.155	4.508	3.617	0.000	0.000	3.670
4		Pier T Wharf Tugboat auxiliary engine	Marine Equipment	0.185	0.165	0.185	6.789	0.007	7.278	0.376	0.391	0.000	0.000	0.397
4		Pier T Wharf Crew boat propulsion engine	Marine Equipment	0.340	0.302	0.340	6.647	0.006	4.998	0.368	0.296	0.000	0.000	0.300
4		Pier T Wharf Crew boat auxiliary engine	Marine Equipment	0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.025
4		Pier T Wharf Survey boat propulsion engine	Marine Equipment	0.170	0.151	0.170	3.323	0.003	2.499	0.184	0.148	0.000	0.000	0.150
4		Off-Road Equipment												
4		Const Barge - piling crane	Offroad Construction Equipment	0.024	0.024	0.024	0.479	0.008	2.675	0.236	0.380	0.000	0.000	0.380
4		Cong Barge - long arm excavator	Offroad Construction Equipment	0.040	0.040	0.040	0.792	0.013	2.775	0.321	0.634	0.000	0.000	0.634
4		Const barge - deck equipment	Offroad Construction Equipment	0.014	0.014	0.014	0.278	0.004	2.819	0.137	0.181	0.000	0.000	0.181
4		Sheet pile barge - deck equipment	Offroad Construction Equipment	0.014	0.014	0.014	0.278	0.004	2.819	0.137	0.181	0.000	0.000	0.181
4		On-Road Vehicles												
4		Workers	Onroad Construction Vehicles	0.144	0.046	0.000	0.053	0.003	0.868	0.014	0.153	0.000	0.000	0.154

Table H1.28  
Alternative 4 Emissions by Task

				Mitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
3		Pier J Wharf Upgrade												
3		Marine Activities												
3		Pier J Wharf Tugboat propulsion engine	Marine Equipment	727.748	647.696	727.748	14233.892	11.815	10702.174	788.857	633.028	0.007	0.030	642.167
3		Pier J Wharf Tugboat auxiliary engine	Marine Equipment	32.421	28.855	32.421	1188.012	1.278	1273.697	65.841	68.490	0.001	0.003	69.474
3		Pier J Wharf Crew boat propulsion engine	Marine Equipment	59.472	52.930	59.472	1163.200	0.966	874.586	64.466	51.731	0.001	0.002	52.478
3		Pier J Wharf Crew boat auxiliary engine	Marine Equipment	2.062	1.835	2.062	75.564	0.081	81.014	4.188	4.356	0.000	0.000	4.419
3		Pier J Wharf Survey boat propulsion engine	Marine Equipment	29.736	26.465	29.736	581.600	0.483	437.293	32.233	25.866	0.000	0.001	26.239
3		Off-Road Equipment												
3		Const Barge - piling crane	Offroad Construction Equipment	4.076	4.076	4.076	81.515	1.315	454.676	40.056	64.597	0.000	0.000	64.597
3		Cong Barge - long arm excavator	Offroad Construction Equipment	6.729	6.729	6.729	134.583	2.195	471.801	54.548	107.776	0.000	0.000	107.776
3		Const barge - deck equipment	Offroad Construction Equipment	2.361	2.361	2.361	47.222	0.625	479.240	23.205	30.730	0.000	0.000	30.730
3		Sheet pile barge - deck equipment	Offroad Construction Equipment	2.361	2.361	2.361	47.222	0.625	479.240	23.205	30.730	0.000	0.000	30.730
3		On-Road Vehicles												
3		Workers	Onroad Construction Vehicles	25.167	7.972	0.000	9.217	0.584	151.865	2.372	26.764	0.000	0.000	26.911
4		Pier T Wharf Upgrade												
4		Marine Activities												
4		Pier T Wharf Tugboat propulsion engine	Marine Equipment	1330.739	1184.358	1330.739	26027.687	21.605	19569.690	1442.482	1157.536	0.012	0.055	1174.248
4		Pier T Wharf Tugboat auxiliary engine	Marine Equipment	59.285	52.763	59.285	2172.364	2.338	2329.046	120.395	125.238	0.001	0.006	127.038
4		Pier T Wharf Crew boat propulsion engine	Marine Equipment	108.749	96.786	108.749	2126.994	1.766	1599.243	117.880	94.594	0.001	0.004	95.960
4		Pier T Wharf Crew boat auxiliary engine	Marine Equipment	3.771	3.356	3.771	138.175	0.149	148.140	7.658	7.966	0.000	0.000	8.080
4		Pier T Wharf Survey boat propulsion engine	Marine Equipment	54.374	48.393	54.374	1063.497	0.883	799.622	58.940	47.297	0.001	0.002	47.980
4		Off-Road Equipment												
4		Const Barge - piling crane	Offroad Construction Equipment	7.432	7.432	7.432	148.644	2.397	829.115	73.044	117.794	0.000	0.000	117.794
4		Cong Barge - long arm excavator	Offroad Construction Equipment	12.271	12.271	12.271	245.417	4.003	860.342	99.471	196.533	0.000	0.000	196.533
4		Const barge - deck equipment	Offroad Construction Equipment	4.306	4.306	4.306	86.111	1.140	873.908	42.315	56.037	0.000	0.000	56.037
4		Sheet pile barge - deck equipment	Offroad Construction Equipment	4.306	4.306	4.306	86.111	1.140	873.908	42.315	56.037	0.000	0.000	56.037
4		On-Road Vehicles												
4		Workers	Onroad Construction Vehicles	46.019	14.578	0.000	16.854	1.067	277.697	4.337	48.939	0.001	0.001	49.208

Table H1.28  
Alternative 4 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
5		Approach Channel (hopper dredge 5,447,000 CY)															
5		Marine Hopper Dredge															
5		Hopper propulsion engine	Marine Equipment	dredging	onsite	399	26.632	23.703	26.632	495.890	0.294	266.321	27.483	15.753	0.000	0.001	15.982
5		Hopper propulsion engine	Marine Equipment	transit	offsite	399	50.305	44.772	50.305	936.682	0.555	503.052	51.912	29.755	0.000	0.001	30.188
5		Hopper auxiliary engine	Marine Equipment	disposal	offsite	399	0.222	0.198	0.222	5.060	0.004	3.699	0.280	0.219	0.000	0.000	0.222
5		Crew boat propulsion engine	Marine Equipment	support	onsite	399	0.406	0.361	0.406	8.024	0.004	4.061	0.445	0.240	0.000	0.000	0.244
5		Crew boat auxiliary engine	Marine Equipment	support	onsite	399	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
5		Survey boat propulsion engine	Marine Equipment	dredging	onsite	399	1.449	1.290	1.449	28.638	0.016	14.493	1.587	0.857	0.000	0.000	0.870
6		Main Channel Widening (clam shell dredge 1,065,000 CY)															
6		Marine Clamshell Dredge															
6		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	178	4.365	4.365	4.365	132.698	0.145	75.661	7.354	5.785	0.000	0.000	5.785
6		Clamshell Dredge generator	Marine Equipment	dredging	onsite	178	3.274	3.274	3.274	99.524	0.109	56.746	5.516	3.196	0.000	0.000	3.196
6		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	178	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
6		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	178	0.612	0.544	0.612	11.387	0.007	6.116	0.631	0.362	0.000	0.000	0.367
6		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	178	0.088	0.079	0.088	1.571	0.001	1.103	0.087	0.065	0.000	0.000	0.066
6		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	178	11.008	9.797	11.008	204.968	0.122	110.080	11.360	6.511	0.000	0.000	6.606
6		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	178	1.588	1.413	1.588	28.286	0.022	19.850	1.568	1.174	0.000	0.000	1.191
6		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	178	0.406	0.361	0.406	8.024	0.004	4.061	0.445	0.240	0.000	0.000	0.244
6		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	178	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
6		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	178	0.362	0.322	0.362	7.160	0.004	3.623	0.397	0.214	0.000	0.000	0.217

Table H1.28  
Alternative 4 Emissions by Task

				Unmitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
5	Approach Channel (hopper dredge 5,447,000 CY)													
5		Marine Hopper Dredge												
5		Hopper propulsion engine	Marine Equipment	10626.223	9457.339	10626.223	197860.275	117.314	106262.232	10965.625	6285.351	0.094	0.299	6376.769
5		Hopper propulsion engine	Marine Equipment	20071.755	17863.862	20071.755	373736.076	221.592	200717.549	20712.847	11872.331	0.178	0.564	12045.007
5		Hopper auxiliary engine	Marine Equipment	88.552	78.811	88.552	2018.982	1.629	1475.864	111.894	87.297	0.001	0.004	88.558
5		Crew boat propulsion engine	Marine Equipment	162.017	144.195	162.017	3201.458	1.789	1620.171	177.428	95.832	0.002	0.005	97.228
5		Crew boat auxiliary engine	Marine Equipment	13.434	11.956	13.434	239.287	0.185	167.921	13.262	9.932	0.000	0.000	10.076
5		Survey boat propulsion engine	Marine Equipment	578.276	514.666	578.276	11426.742	6.384	5782.764	633.282	342.047	0.005	0.016	347.030
6	Main Channel Widening (clam shell dredge 1,065,000 CY)													
6		Marine Clamshell Dredge												
6		Clamshell Dredge hoist	Marine Equipment	776.984	776.984	776.984	23620.317	25.869	13467.725	1309.063	1029.797	0.000	0.000	1029.797
6		Clamshell Dredge generator	Marine Equipment	582.738	582.738	582.738	17715.238	19.402	10100.794	981.797	568.968	0.000	0.000	568.968
6		Clamshell Barge dump scow	Marine Equipment	8.241	8.241	8.241	156.574	0.274	142.840	8.678	5.631	0.000	0.000	5.631
6		Clamshell Tugboat propulsion engine	Marine Equipment	108.856	96.882	108.856	2026.906	1.202	1088.564	112.333	64.388	0.001	0.003	65.324
6		Clamshell Tugboat auxiliary engine	Marine Equipment	15.703	13.976	15.703	279.717	0.217	196.293	15.502	11.611	0.000	0.001	11.778
6		Clamshell Tugboat propulsion engine	Marine Equipment	1959.415	1743.880	1959.415	36484.311	21.632	19594.152	2021.999	1158.983	0.017	0.055	1175.840
6		Clamshell Tugboat auxiliary engine	Marine Equipment	282.661	251.569	282.661	5034.907	3.901	3533.268	279.040	208.991	0.002	0.010	212.012
6		Clamshell Crew boat propulsion engine	Marine Equipment	72.278	64.328	72.278	1428.219	0.798	722.783	79.153	42.752	0.001	0.002	43.375
6		Clamshell Crew boat auxiliary engine	Marine Equipment	5.993	5.334	5.993	106.750	0.083	74.912	5.916	4.431	0.000	0.000	4.495
6		Clamshell Survey boat propulsion engine	Marine Equipment	64.494	57.400	64.494	1274.411	0.712	644.945	70.629	38.148	0.001	0.002	38.704

**Table H1.28**  
**Alternative 4 Emissions by Task**

				Mitigated										
				Peak Day										
		Construction Element/Equipment	Source Type 1	PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID				(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
5	Approach Channel (hopper dredge 5,447,000 CY)													
5		Marine Hopper Dredge												
5		Hopper propulsion engine	Marine Equipment	26.632	23.703	26.632	495.890	0.294	266.321	27.483	15.753	0.000	0.001	15.982
5		Hopper propulsion engine	Marine Equipment	50.305	44.772	50.305	936.682	0.555	503.052	51.912	29.755	0.000	0.001	30.188
5		Hopper auxiliary engine	Marine Equipment	0.222	0.198	0.222	5.060	0.004	3.699	0.280	0.219	0.000	0.000	0.222
5		Crew boat propulsion engine	Marine Equipment	0.276	0.246	0.276	5.401	0.004	4.061	0.299	0.240	0.000	0.000	0.244
5		Crew boat auxiliary engine	Marine Equipment	0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.025
5		Survey boat propulsion engine	Marine Equipment	0.986	0.877	0.986	19.276	0.016	14.493	1.068	0.857	0.000	0.000	0.870
6	Main Channel Widening (clam shell dredge 1,065,000 CY)													
6		Marine Clamshell Dredge												
6		Clamshell Dredge hoist	Marine Equipment	0.437	0.437	0.437	13.270	0.015	7.566	0.735	0.579	0.000	0.000	0.579
6		Clamshell Dredge generator	Marine Equipment	0.327	0.327	0.327	9.952	0.011	5.675	0.552	0.320	0.000	0.000	0.320
6		Clamshell Barge dump scow	Marine Equipment	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
6		Clamshell Tugboat propulsion engine	Marine Equipment	0.416	0.370	0.416	8.134	0.007	6.116	0.451	0.362	0.000	0.000	0.367
6		Clamshell Tugboat auxiliary engine	Marine Equipment	0.031	0.027	0.031	1.131	0.001	1.213	0.063	0.065	0.000	0.000	0.066
6		Clamshell Tugboat propulsion engine	Marine Equipment	7.485	6.662	7.485	146.406	0.122	110.080	8.114	6.511	0.000	0.000	6.605
6		Clamshell Tugboat auxiliary engine	Marine Equipment	0.556	0.495	0.556	20.366	0.022	21.835	1.129	1.174	0.000	0.000	1.191
6		Clamshell Crew boat propulsion engine	Marine Equipment	0.276	0.246	0.276	5.401	0.004	4.061	0.299	0.240	0.000	0.000	0.244
6		Clamshell Crew boat auxiliary engine	Marine Equipment	0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.025
6		Clamshell Survey boat propulsion engine	Marine Equipment	0.246	0.219	0.246	4.819	0.004	3.623	0.267	0.214	0.000	0.000	0.217
				Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.										

**Table H1.28**  
**Alternative 4 Emissions by Task**

Alternative 4 Emissions by Task				Mitigated Emissions										
				Total										
Task ID		Construction Element/Equipment	Source Type 1	PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
				(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
5	Approach Channel (hopper dredge 5,447,000 CY)													
5		Marine Hopper Dredge												
5		Hopper propulsion engine	Marine Equipment	10626.223	9457.339	10626.223	197860.275	117.314	106262.232	10965.625	6285.351	0.094	0.299	6376.769
5		Hopper propulsion engine	Marine Equipment	20071.755	17863.862	20071.755	373736.076	221.592	200717.549	20712.847	11872.331	0.178	0.564	12045.007
5		Hopper auxiliary engine	Marine Equipment	88.552	78.811	88.552	2018.982	1.629	1475.864	111.894	87.297	0.001	0.004	88.558
5		Crew boat propulsion engine	Marine Equipment	110.172	98.053	110.172	2154.828	1.789	1620.171	119.423	95.832	0.001	0.005	97.216
5		Crew boat auxiliary engine	Marine Equipment	4.702	4.185	4.702	172.286	0.185	184.713	9.548	9.932	0.000	0.000	10.075
5		Survey boat propulsion engine	Marine Equipment	393.228	349.973	393.228	7691.077	6.384	5782.764	426.248	342.047	0.004	0.016	346.985
6	Main Channel Widening (clam shell dredge 1,065,000 CY)													
6		Marine Clamshell Dredge												
6		Clamshell Dredge hoist	Marine Equipment	77.698	77.698	77.698	2362.032	2.587	1346.772	130.906	102.980	0.000	0.000	102.980
6		Clamshell Dredge generator	Marine Equipment	58.274	58.274	58.274	1771.524	1.940	1010.079	98.180	56.897	0.000	0.000	56.897
6		Clamshell Barge dump scow	Marine Equipment	8.241	8.241	8.241	156.574	0.274	142.840	8.678	5.631	0.000	0.000	5.631
6		Clamshell Tugboat propulsion engine	Marine Equipment	74.022	65.880	74.022	1447.790	1.202	1088.564	80.238	64.388	0.001	0.003	65.318
6		Clamshell Tugboat auxiliary engine	Marine Equipment	5.496	4.892	5.496	201.396	0.217	215.922	11.162	11.611	0.000	0.001	11.778
6		Clamshell Tugboat propulsion engine	Marine Equipment	1332.402	1185.838	1332.402	26060.222	21.632	19594.152	1444.285	1158.983	0.012	0.055	1175.715
6		Clamshell Tugboat auxiliary engine	Marine Equipment	98.932	88.049	98.932	3625.133	3.901	3886.595	200.909	208.991	0.002	0.010	211.995
6		Clamshell Crew boat propulsion engine	Marine Equipment	49.149	43.743	49.149	961.301	0.798	722.783	53.276	42.752	0.000	0.002	43.369
6		Clamshell Crew boat auxiliary engine	Marine Equipment	2.098	1.867	2.098	76.860	0.083	82.403	4.260	4.431	0.000	0.000	4.495
6		Clamshell Survey boat propulsion engine	Marine Equipment	43.856	39.032	43.856	857.777	0.712	644.945	47.539	38.148	0.000	0.002	38.699
				Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.										

Table H1.28  
Alternative 4 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
7	West Basin	(clam shell dredge 975,000 CY)															
7		Marine Clamshell Dredge															
7		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	163	4.365	4.365	4.365	132.698	0.145	75.661	7.354	5.785	0.000	0.000	5.785
7		Clamshell Dredge generator	Marine Equipment	dredging	onsite	163	3.274	3.274	3.274	99.524	0.109	56.746	5.516	3.196	0.000	0.000	3.196
7		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	163	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
7		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	163	0.612	0.544	0.612	11.387	0.007	6.116	0.631	0.362	0.000	0.000	0.367
7		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	163	0.088	0.079	0.088	1.571	0.001	1.103	0.087	0.065	0.000	0.000	0.066
7		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	163	11.008	9.797	11.008	204.968	0.122	110.080	11.360	6.511	0.000	0.000	6.606
7		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	163	1.588	1.413	1.588	28.286	0.022	19.850	1.568	1.174	0.000	0.000	1.191
7		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	163	0.406	0.361	0.406	8.024	0.004	4.061	0.445	0.240	0.000	0.000	0.244
7		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	163	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
7		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	163	0.362	0.322	0.362	7.160	0.004	3.623	0.397	0.214	0.000	0.000	0.217
8	West Basin	(clam shell dredge 513,000 CY)															
8		Marine Clamshell Dredge															
8		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	86	4.365	4.365	4.365	132.698	0.145	75.661	7.354	5.785	0.000	0.000	5.785
8		Clamshell Dredge generator	Marine Equipment	dredging	onsite	86	3.274	3.274	3.274	99.524	0.109	56.746	5.516	3.196	0.000	0.000	3.196
8		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	86	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
8		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	86	0.612	0.544	0.612	11.387	0.007	6.116	0.631	0.362	0.000	0.000	0.367
8		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	86	0.088	0.079	0.088	1.571	0.001	1.103	0.087	0.065	0.000	0.000	0.066
8		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	86	11.008	9.797	11.008	204.968	0.122	110.080	11.360	6.511	0.000	0.000	6.606
8		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	86	1.588	1.413	1.588	28.286	0.022	19.850	1.568	1.174	0.000	0.000	1.191
8		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	86	0.406	0.361	0.406	8.024	0.004	4.061	0.445	0.240	0.000	0.000	0.244
8		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	86	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
8		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	86	0.362	0.322	0.362	7.160	0.004	3.623	0.397	0.214	0.000	0.000	0.217



Table H1.28  
Alternative 4 Emissions by Task

				Unmitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
7	West Basin	(clam shell dredge 975,000 CY)												
7		Marine Clamshell Dredge												
7		Clamshell Dredge hoist	Marine Equipment	711.508	711.508	711.508	21629.841	23.689	12332.804	1198.749	943.016	0.000	0.000	943.016
7		Clamshell Dredge generator	Marine Equipment	533.631	533.631	533.631	16222.381	17.767	9249.603	899.061	521.021	0.000	0.000	521.021
7		Clamshell Barge dump scow	Marine Equipment	7.546	7.546	7.546	143.380	0.251	130.802	7.946	5.156	0.000	0.000	5.156
7		Clamshell Tugboat propulsion engine	Marine Equipment	99.683	88.718	99.683	1856.099	1.101	996.831	102.867	58.962	0.001	0.003	59.820
7		Clamshell Tugboat auxiliary engine	Marine Equipment	14.380	12.798	14.380	256.145	0.198	179.751	14.196	10.632	0.000	0.001	10.786
7		Clamshell Tugboat propulsion engine	Marine Equipment	1794.296	1596.923	1794.296	33409.790	19.809	17942.959	1851.606	1061.316	0.016	0.050	1076.752
7		Clamshell Tugboat auxiliary engine	Marine Equipment	258.842	230.369	258.842	4610.617	3.572	3235.521	255.525	191.379	0.002	0.009	194.146
7		Clamshell Crew boat propulsion engine	Marine Equipment	66.187	58.907	66.187	1307.864	0.731	661.874	72.483	39.149	0.001	0.002	39.720
7		Clamshell Crew boat auxiliary engine	Marine Equipment	5.488	4.884	5.488	97.754	0.076	68.599	5.418	4.058	0.000	0.000	4.116
7		Clamshell Survey boat propulsion engine	Marine Equipment	59.060	52.563	59.060	1167.017	0.652	590.596	64.677	34.933	0.001	0.002	35.442
8	West Basin	(clam shell dredge 513,000 CY)												
8		Marine Clamshell Dredge												
8		Clamshell Dredge hoist	Marine Equipment	375.397	375.397	375.397	11412.063	12.499	6506.878	632.469	497.542	0.000	0.000	497.542
8		Clamshell Dredge generator	Marine Equipment	281.548	281.548	281.548	8559.048	9.374	4880.159	474.351	274.894	0.000	0.000	274.894
8		Clamshell Barge dump scow	Marine Equipment	3.981	3.981	3.981	75.648	0.133	69.012	4.193	2.720	0.000	0.000	2.720
8		Clamshell Tugboat propulsion engine	Marine Equipment	52.594	46.808	52.594	979.292	0.581	525.935	54.273	31.109	0.000	0.001	31.561
8		Clamshell Tugboat auxiliary engine	Marine Equipment	7.587	6.752	7.587	135.144	0.105	94.838	7.490	5.610	0.000	0.000	5.691
8		Clamshell Tugboat propulsion engine	Marine Equipment	946.684	842.549	946.684	17627.251	10.451	9466.837	976.921	559.958	0.008	0.027	568.102
8		Clamshell Tugboat auxiliary engine	Marine Equipment	136.567	121.544	136.567	2432.595	1.885	1707.085	134.817	100.973	0.001	0.005	102.433
8		Clamshell Crew boat propulsion engine	Marine Equipment	34.921	31.080	34.921	690.039	0.386	349.210	38.243	20.656	0.000	0.001	20.956
8		Clamshell Crew boat auxiliary engine	Marine Equipment	2.895	2.577	2.895	51.576	0.040	36.193	2.858	2.141	0.000	0.000	2.172
8		Clamshell Survey boat propulsion engine	Marine Equipment	31.160	27.733	31.160	615.727	0.344	311.603	34.124	18.431	0.000	0.001	18.700

**Table H1.28**  
**Alternative 4 Emissions by Task**

Alternative 4 Emissions by Task				Mitigated Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
7	West Basin	(clam shell dredge 975,000 CY)												
7		Marine Clamshell Dredge												
7		Clamshell Dredge hoist	Marine Equipment	0.437	0.437	0.437	13.270	0.015	7.566	0.735	0.579	0.000	0.000	0.579
7		Clamshell Dredge generator	Marine Equipment	0.327	0.327	0.327	9.952	0.011	5.675	0.552	0.320	0.000	0.000	0.320
7		Clamshell Barge dump scow	Marine Equipment	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
7		Clamshell Tugboat propulsion engine	Marine Equipment	0.416	0.370	0.416	8.134	0.007	6.116	0.451	0.362	0.000	0.000	0.367
7		Clamshell Tugboat auxiliary engine	Marine Equipment	0.031	0.027	0.031	1.131	0.001	1.213	0.063	0.065	0.000	0.000	0.066
7		Clamshell Tugboat propulsion engine	Marine Equipment	7.485	6.662	7.485	146.406	0.122	110.080	8.114	6.511	0.000	0.000	6.605
7		Clamshell Tugboat auxiliary engine	Marine Equipment	0.556	0.495	0.556	20.366	0.022	21.835	1.129	1.174	0.000	0.000	1.191
7		Clamshell Crew boat propulsion engine	Marine Equipment	0.276	0.246	0.276	5.401	0.004	4.061	0.299	0.240	0.000	0.000	0.244
7		Clamshell Crew boat auxiliary engine	Marine Equipment	0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.025
7		Clamshell Survey boat propulsion engine	Marine Equipment	0.246	0.219	0.246	4.819	0.004	3.623	0.267	0.214	0.000	0.000	0.217
8	West Basin	(clam shell dredge 513,000 CY)												
8		Marine Clamshell Dredge												
8		Clamshell Dredge hoist	Marine Equipment	0.437	0.437	0.437	13.270	0.015	7.566	0.735	0.579	0.000	0.000	0.579
8		Clamshell Dredge generator	Marine Equipment	0.327	0.327	0.327	9.952	0.011	5.675	0.552	0.320	0.000	0.000	0.320
8		Clamshell Barge dump scow	Marine Equipment	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
8		Clamshell Tugboat propulsion engine	Marine Equipment	0.416	0.370	0.416	8.134	0.007	6.116	0.451	0.362	0.000	0.000	0.367
8		Clamshell Tugboat auxiliary engine	Marine Equipment	0.031	0.027	0.031	1.131	0.001	1.213	0.063	0.065	0.000	0.000	0.066
8		Clamshell Tugboat propulsion engine	Marine Equipment	7.485	6.662	7.485	146.406	0.122	110.080	8.114	6.511	0.000	0.000	6.605
8		Clamshell Tugboat auxiliary engine	Marine Equipment	0.556	0.495	0.556	20.366	0.022	21.835	1.129	1.174	0.000	0.000	1.191
8		Clamshell Crew boat propulsion engine	Marine Equipment	0.276	0.246	0.276	5.401	0.004	4.061	0.299	0.240	0.000	0.000	0.244
8		Clamshell Crew boat auxiliary engine	Marine Equipment	0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.025
8		Clamshell Survey boat propulsion engine	Marine Equipment	0.246	0.219	0.246	4.819	0.004	3.623	0.267	0.214	0.000	0.000	0.217
Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.														

**Table H1.28**  
**Alternative 4 Emissions by Task**

				Mitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
7	West Basin	(clam shell dredge 975,000 CY)												
7		Marine Clamshell Dredge												
7		Clamshell Dredge hoist	Marine Equipment	71.151	71.151	71.151	2162.984	2.369	1233.280	119.875	94.302	0.000	0.000	94.302
7		Clamshell Dredge generator	Marine Equipment	53.363	53.363	53.363	1622.238	1.777	924.960	89.906	52.102	0.000	0.000	52.102
7		Clamshell Barge dump scow	Marine Equipment	7.546	7.546	7.546	143.380	0.251	130.802	7.946	5.156	0.000	0.000	5.156
7		Clamshell Tugboat propulsion engine	Marine Equipment	67.785	60.328	67.785	1325.785	1.101	996.831	73.476	58.962	0.001	0.003	59.813
7		Clamshell Tugboat auxiliary engine	Marine Equipment	5.033	4.479	5.033	184.425	0.198	197.726	10.221	10.632	0.000	0.001	10.785
7		Clamshell Tugboat propulsion engine	Marine Equipment	1220.121	1085.908	1220.121	23864.136	19.809	17942.959	1322.576	1061.316	0.011	0.050	1076.638
7		Clamshell Tugboat auxiliary engine	Marine Equipment	90.595	80.629	90.595	3319.644	3.572	3559.073	183.978	191.379	0.002	0.009	194.130
7		Clamshell Crew boat propulsion engine	Marine Equipment	45.007	40.057	45.007	880.293	0.731	661.874	48.787	39.149	0.000	0.002	39.715
7		Clamshell Crew boat auxiliary engine	Marine Equipment	1.921	1.709	1.921	70.383	0.076	75.459	3.901	4.058	0.000	0.000	4.116
7		Clamshell Survey boat propulsion engine	Marine Equipment	40.161	35.743	40.161	785.492	0.652	590.596	43.533	34.933	0.000	0.002	35.438
8	West Basin	(clam shell dredge 513,000 CY)												
8		Marine Clamshell Dredge												
8		Clamshell Dredge hoist	Marine Equipment	37.540	37.540	37.540	1141.206	1.250	650.688	63.247	49.754	0.000	0.000	49.754
8		Clamshell Dredge generator	Marine Equipment	28.155	28.155	28.155	855.905	0.937	488.016	47.435	27.489	0.000	0.000	27.489
8		Clamshell Barge dump scow	Marine Equipment	3.981	3.981	3.981	75.648	0.133	69.012	4.193	2.720	0.000	0.000	2.720
8		Clamshell Tugboat propulsion engine	Marine Equipment	35.764	31.830	35.764	699.494	0.581	525.935	38.767	31.109	0.000	0.001	31.558
8		Clamshell Tugboat auxiliary engine	Marine Equipment	2.655	2.363	2.655	97.304	0.105	104.322	5.393	5.610	0.000	0.000	5.690
8		Clamshell Tugboat propulsion engine	Marine Equipment	643.745	572.933	643.745	12590.894	10.451	9466.837	697.801	559.958	0.006	0.027	568.042
8		Clamshell Tugboat auxiliary engine	Marine Equipment	47.798	42.541	47.798	1751.469	1.885	1877.793	97.068	100.973	0.001	0.005	102.425
8		Clamshell Crew boat propulsion engine	Marine Equipment	23.746	21.134	23.746	464.449	0.386	349.210	25.740	20.656	0.000	0.001	20.954
8		Clamshell Crew boat auxiliary engine	Marine Equipment	1.013	0.902	1.013	37.134	0.040	39.813	2.058	2.141	0.000	0.000	2.172
8		Clamshell Survey boat propulsion engine	Marine Equipment	21.189	18.858	21.189	414.431	0.344	311.603	22.968	18.431	0.000	0.001	18.697
				Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.										

Table H1.28  
Alternative 4 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
9		Pier T Berths (clam shell dredge Berths T132 to T140, 44,000 CY)															
9		Marine Clamshell Dredge															
9		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	7	4.365	4.365	4.365	132.698	0.145	75.661	7.354	5.785	0.000	0.000	5.785
9		Clamshell Dredge generator	Marine Equipment	dredging	onsite	7	3.274	3.274	3.274	99.524	0.109	56.746	5.516	3.196	0.000	0.000	3.196
9		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	7	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
9		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	7	0.612	0.544	0.612	11.387	0.007	6.116	0.631	0.362	0.000	0.000	0.367
9		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	7	0.088	0.079	0.088	1.571	0.001	1.103	0.087	0.065	0.000	0.000	0.066
9		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	7	11.008	9.797	11.008	204.968	0.122	110.080	11.360	6.511	0.000	0.000	6.606
9		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	7	1.588	1.413	1.588	28.286	0.022	19.850	1.568	1.174	0.000	0.000	1.191
9		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	7	0.406	0.361	0.406	8.024	0.004	4.061	0.445	0.240	0.000	0.000	0.244
9		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	7	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
9		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	7	0.362	0.322	0.362	7.160	0.004	3.623	0.397	0.214	0.000	0.000	0.217
10		Pier J Basin (clam shell dredge 408,000 CY)															
10		Marine Clamshell Dredge															
10		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	68	4.365	4.365	4.365	132.698	0.145	75.661	7.354	5.785	0.000	0.000	5.785
10		Clamshell Dredge generator	Marine Equipment	dredging	onsite	68	3.274	3.274	3.274	99.524	0.109	56.746	5.516	3.196	0.000	0.000	3.196
10		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	68	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
10		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	68	0.612	0.544	0.612	11.387	0.007	6.116	0.631	0.362	0.000	0.000	0.367
10		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	68	0.088	0.079	0.088	1.571	0.001	1.103	0.087	0.065	0.000	0.000	0.066
10		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	68	11.008	9.797	11.008	204.968	0.122	110.080	11.360	6.511	0.000	0.000	6.606
10		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	68	1.588	1.413	1.588	28.286	0.022	19.850	1.568	1.174	0.000	0.000	1.191
10		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	68	0.406	0.361	0.406	8.024	0.004	4.061	0.445	0.240	0.000	0.000	0.244
10		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	68	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
10		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	68	0.362	0.322	0.362	7.160	0.004	3.623	0.397	0.214	0.000	0.000	0.217

Table H1.28  
Alternative 4 Emissions by Task

				Unmitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
9		Pier T Berths (clam shell dredge Berths T132 to T140, 44,000 CY)												
9		Marine Clamshell Dredge												
9		Clamshell Dredge hoist	Marine Equipment	30.556	30.556	30.556	928.889	1.017	529.630	51.480	40.498	0.000	0.000	40.498
9		Clamshell Dredge generator	Marine Equipment	22.917	22.917	22.917	696.667	0.763	397.222	38.610	22.375	0.000	0.000	22.375
9		Clamshell Barge dump scow	Marine Equipment	0.324	0.324	0.324	6.157	0.011	5.617	0.341	0.221	0.000	0.000	0.221
9		Clamshell Tugboat propulsion engine	Marine Equipment	4.281	3.810	4.281	79.710	0.047	42.809	4.418	2.532	0.000	0.000	2.569
9		Clamshell Tugboat auxiliary engine	Marine Equipment	0.618	0.550	0.618	11.000	0.009	7.719	0.610	0.457	0.000	0.000	0.463
9		Clamshell Tugboat propulsion engine	Marine Equipment	77.056	68.580	77.056	1434.776	0.851	770.557	79.517	45.578	0.001	0.002	46.241
9		Clamshell Tugboat auxiliary engine	Marine Equipment	11.116	9.893	11.116	198.002	0.153	138.949	10.973	8.219	0.000	0.000	8.338
9		Clamshell Crew boat propulsion engine	Marine Equipment	2.842	2.530	2.842	56.166	0.031	28.424	3.113	1.681	0.000	0.000	1.706
9		Clamshell Crew boat auxiliary engine	Marine Equipment	0.236	0.210	0.236	4.198	0.003	2.946	0.233	0.174	0.000	0.000	0.177
9		Clamshell Survey boat propulsion engine	Marine Equipment	2.536	2.257	2.536	50.117	0.028	25.363	2.778	1.500	0.000	0.000	1.522
10		Pier J Basin (clam shell dredge 408,000 CY)												
10		Marine Clamshell Dredge												
10		Clamshell Dredge hoist	Marine Equipment	296.825	296.825	296.825	9023.492	9.883	5144.974	500.091	393.406	0.000	0.000	393.406
10		Clamshell Dredge generator	Marine Equipment	222.619	222.619	222.619	6767.619	7.412	3858.730	375.069	217.358	0.000	0.000	217.358
10		Clamshell Barge dump scow	Marine Equipment	3.148	3.148	3.148	59.815	0.105	54.568	3.315	2.151	0.000	0.000	2.151
10		Clamshell Tugboat propulsion engine	Marine Equipment	41.586	37.011	41.586	774.324	0.459	415.856	42.914	24.598	0.000	0.001	24.955
10		Clamshell Tugboat auxiliary engine	Marine Equipment	5.999	5.339	5.999	106.858	0.083	74.988	5.922	4.436	0.000	0.000	4.500
10		Clamshell Tugboat propulsion engine	Marine Equipment	748.541	666.201	748.541	13937.827	8.264	7485.406	772.449	442.758	0.007	0.021	449.197
10		Clamshell Tugboat auxiliary engine	Marine Equipment	107.983	96.105	107.983	1923.448	1.490	1349.788	106.599	79.839	0.001	0.004	80.993
10		Clamshell Crew boat propulsion engine	Marine Equipment	27.612	24.575	27.612	545.612	0.305	276.119	30.238	16.332	0.000	0.001	16.570
10		Clamshell Crew boat auxiliary engine	Marine Equipment	2.289	2.038	2.289	40.781	0.032	28.618	2.260	1.693	0.000	0.000	1.717
10		Clamshell Survey boat propulsion engine	Marine Equipment	24.638	21.928	24.638	486.854	0.272	246.383	26.982	14.573	0.000	0.001	14.786

**Table H1.28**  
**Alternative 4 Emissions by Task**

			Mitigated											
			Peak Day											
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e	
Task ID		Construction Element/Equipment	Source Type 1	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
9	Pier T Berths	(clam shell dredge Berths T132 to T140, 44,000 CY)												
9		Marine Clamshell Dredge												
9		Clamshell Dredge hoist	Marine Equipment	0.437	0.437	0.437	13.270	0.015	7.566	0.735	0.579	0.000	0.000	0.579
9		Clamshell Dredge generator	Marine Equipment	0.327	0.327	0.327	9.952	0.011	5.675	0.552	0.320	0.000	0.000	0.320
9		Clamshell Barge dump scow	Marine Equipment	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
9		Clamshell Tugboat propulsion engine	Marine Equipment	0.416	0.370	0.416	8.134	0.007	6.116	0.451	0.362	0.000	0.000	0.367
9		Clamshell Tugboat auxiliary engine	Marine Equipment	0.031	0.027	0.031	1.131	0.001	1.213	0.063	0.065	0.000	0.000	0.066
9		Clamshell Tugboat propulsion engine	Marine Equipment	7.485	6.662	7.485	146.406	0.122	110.080	8.114	6.511	0.000	0.000	6.605
9		Clamshell Tugboat auxiliary engine	Marine Equipment	0.556	0.495	0.556	20.366	0.022	21.835	1.129	1.174	0.000	0.000	1.191
9		Clamshell Crew boat propulsion engine	Marine Equipment	0.276	0.246	0.276	5.401	0.004	4.061	0.299	0.240	0.000	0.000	0.244
9		Clamshell Crew boat auxiliary engine	Marine Equipment	0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.025
9		Clamshell Survey boat propulsion engine	Marine Equipment	0.246	0.219	0.246	4.819	0.004	3.623	0.267	0.214	0.000	0.000	0.217
10	Pier J Basin	(clam shell dredge 408,000 CY)												
10		Marine Clamshell Dredge												
10		Clamshell Dredge hoist	Marine Equipment	0.437	0.437	0.437	13.270	0.015	7.566	0.735	0.579	0.000	0.000	0.579
10		Clamshell Dredge generator	Marine Equipment	0.327	0.327	0.327	9.952	0.011	5.675	0.552	0.320	0.000	0.000	0.320
10		Clamshell Barge dump scow	Marine Equipment	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
10		Clamshell Tugboat propulsion engine	Marine Equipment	0.416	0.370	0.416	8.134	0.007	6.116	0.451	0.362	0.000	0.000	0.367
10		Clamshell Tugboat auxiliary engine	Marine Equipment	0.031	0.027	0.031	1.131	0.001	1.213	0.063	0.065	0.000	0.000	0.066
10		Clamshell Tugboat propulsion engine	Marine Equipment	7.485	6.662	7.485	146.406	0.122	110.080	8.114	6.511	0.000	0.000	6.605
10		Clamshell Tugboat auxiliary engine	Marine Equipment	0.556	0.495	0.556	20.366	0.022	21.835	1.129	1.174	0.000	0.000	1.191
10		Clamshell Crew boat propulsion engine	Marine Equipment	0.276	0.246	0.276	5.401	0.004	4.061	0.299	0.240	0.000	0.000	0.244
10		Clamshell Crew boat auxiliary engine	Marine Equipment	0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.025
10		Clamshell Survey boat propulsion engine	Marine Equipment	0.246	0.219	0.246	4.819	0.004	3.623	0.267	0.214	0.000	0.000	0.217
Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.														

**Table H1.28**  
**Alternative 4 Emissions by Task**

				Mitigated Emissions										
				Total										
		Construction Element/Equipment	Source Type 1	PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID				(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
9	Pier T Berths (clam shell dredge Berths T132 to T140, 44,000 CY)													
9		Marine Clamshell Dredge												
9		Clamshell Dredge hoist	Marine Equipment	3.056	3.056	3.056	92.889	0.102	52.963	5.148	4.050	0.000	0.000	4.050
9		Clamshell Dredge generator	Marine Equipment	2.292	2.292	2.292	69.667	0.076	39.722	3.861	2.238	0.000	0.000	2.238
9		Clamshell Barge dump scow	Marine Equipment	0.324	0.324	0.324	6.157	0.011	5.617	0.341	0.221	0.000	0.000	0.221
9		Clamshell Tugboat propulsion engine	Marine Equipment	2.911	2.591	2.911	56.936	0.047	42.809	3.155	2.532	0.000	0.000	2.569
9		Clamshell Tugboat auxiliary engine	Marine Equipment	0.216	0.192	0.216	7.920	0.009	8.491	0.439	0.457	0.000	0.000	0.463
9		Clamshell Tugboat propulsion engine	Marine Equipment	52.398	46.634	52.398	1024.840	0.851	770.557	56.798	45.578	0.000	0.002	46.236
9		Clamshell Tugboat auxiliary engine	Marine Equipment	3.891	3.463	3.891	142.561	0.153	152.844	7.901	8.219	0.000	0.000	8.337
9		Clamshell Crew boat propulsion engine	Marine Equipment	1.933	1.720	1.933	37.804	0.031	28.424	2.095	1.681	0.000	0.000	1.706
9		Clamshell Crew boat auxiliary engine	Marine Equipment	0.082	0.073	0.082	3.023	0.003	3.241	0.168	0.174	0.000	0.000	0.177
9		Clamshell Survey boat propulsion engine	Marine Equipment	1.725	1.535	1.725	33.733	0.028	25.363	1.870	1.500	0.000	0.000	1.522
10	Pier J Basin (clam shell dredge 408,000 CY)													
10		Marine Clamshell Dredge												
10		Clamshell Dredge hoist	Marine Equipment	29.683	29.683	29.683	902.349	0.988	514.497	50.009	39.341	0.000	0.000	39.341
10		Clamshell Dredge generator	Marine Equipment	22.262	22.262	22.262	676.762	0.741	385.873	37.507	21.736	0.000	0.000	21.736
10		Clamshell Barge dump scow	Marine Equipment	3.148	3.148	3.148	59.815	0.105	54.568	3.315	2.151	0.000	0.000	2.151
10		Clamshell Tugboat propulsion engine	Marine Equipment	28.278	25.168	28.278	553.088	0.459	415.856	30.653	24.598	0.000	0.001	24.953
10		Clamshell Tugboat auxiliary engine	Marine Equipment	2.100	1.869	2.100	76.938	0.083	82.487	4.264	4.436	0.000	0.000	4.499
10		Clamshell Tugboat propulsion engine	Marine Equipment	509.008	453.017	509.008	9955.590	8.264	7485.406	551.749	442.758	0.005	0.021	449.150
10		Clamshell Tugboat auxiliary engine	Marine Equipment	37.794	33.637	37.794	1384.882	1.490	1484.767	76.752	79.839	0.001	0.004	80.987
10		Clamshell Crew boat propulsion engine	Marine Equipment	18.776	16.711	18.776	367.239	0.305	276.119	20.353	16.332	0.000	0.001	16.568
10		Clamshell Crew boat auxiliary engine	Marine Equipment	0.801	0.713	0.801	29.362	0.032	31.480	1.627	1.693	0.000	0.000	1.717
10		Clamshell Survey boat propulsion engine	Marine Equipment	16.754	14.911	16.754	327.690	0.272	246.383	18.161	14.573	0.000	0.001	14.784
				Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.										

Table H1.28  
Alternative 4 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
11		Pier J Approach (clam shell dredge 1,066,000 CY)															
11		Marine Clamshell Dredge															
11		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	178	4.365	4.365	4.365	132.698	0.145	75.661	7.354	5.785	0.000	0.000	5.785
11		Clamshell Dredge generator	Marine Equipment	dredging	onsite	178	3.274	3.274	3.274	99.524	0.109	56.746	5.516	3.196	0.000	0.000	3.196
11		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	178	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
11		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	178	0.612	0.544	0.612	11.387	0.007	6.116	0.631	0.362	0.000	0.000	0.367
11		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	178	0.088	0.079	0.088	1.571	0.001	1.103	0.087	0.065	0.000	0.000	0.066
11		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	178	11.008	9.797	11.008	204.968	0.122	110.080	11.360	6.511	0.000	0.000	6.606
11		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	178	1.588	1.413	1.588	28.286	0.022	19.850	1.568	1.174	0.000	0.000	1.191
11		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	178	0.406	0.361	0.406	8.024	0.004	4.061	0.445	0.240	0.000	0.000	0.244
11		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	178	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
11		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	178	0.362	0.322	0.362	7.160	0.004	3.623	0.397	0.214	0.000	0.000	0.217
12		Pier J Approach (clam shell dredge 2,040,000 CY)															
12		Marine Clamshell Dredge															
12		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	340	4.365	4.365	4.365	132.698	0.145	75.661	7.354	5.785	0.000	0.000	5.785
12		Clamshell Dredge generator	Marine Equipment	dredging	onsite	340	3.274	3.274	3.274	99.524	0.109	56.746	5.516	3.196	0.000	0.000	3.196
12		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	340	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
12		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	340	0.612	0.544	0.612	11.387	0.007	6.116	0.631	0.362	0.000	0.000	0.367
12		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	340	0.088	0.079	0.088	1.571	0.001	1.103	0.087	0.065	0.000	0.000	0.066
12		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	340	11.008	9.797	11.008	204.968	0.122	110.080	11.360	6.511	0.000	0.000	6.606
12		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	340	1.588	1.413	1.588	28.286	0.022	19.850	1.568	1.174	0.000	0.000	1.191
12		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	340	0.406	0.361	0.406	8.024	0.004	4.061	0.445	0.240	0.000	0.000	0.244
12		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	340	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
12		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	340	0.362	0.322	0.362	7.160	0.004	3.623	0.397	0.214	0.000	0.000	0.217



Table H1.28  
Alternative 4 Emissions by Task

				Unmitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
11		Pier J Approach (clam shell dredge 1,066,000 CY)												
11		Marine Clamshell Dredge												
11		Clamshell Dredge hoist	Marine Equipment	776.984	776.984	776.984	23620.317	25.869	13467.725	1309.063	1029.797	0.000	0.000	1029.797
11		Clamshell Dredge generator	Marine Equipment	582.738	582.738	582.738	17715.238	19.402	10100.794	981.797	568.968	0.000	0.000	568.968
11		Clamshell Barge dump scow	Marine Equipment	8.241	8.241	8.241	156.574	0.274	142.840	8.678	5.631	0.000	0.000	5.631
11		Clamshell Tugboat propulsion engine	Marine Equipment	108.856	96.882	108.856	2026.906	1.202	1088.564	112.333	64.388	0.001	0.003	65.324
11		Clamshell Tugboat auxiliary engine	Marine Equipment	15.703	13.976	15.703	279.717	0.217	196.293	15.502	11.611	0.000	0.001	11.778
11		Clamshell Tugboat propulsion engine	Marine Equipment	1959.415	1743.880	1959.415	36484.311	21.632	19594.152	2021.999	1158.983	0.017	0.055	1175.840
11		Clamshell Tugboat auxiliary engine	Marine Equipment	282.661	251.569	282.661	5034.907	3.901	3533.268	279.040	208.991	0.002	0.010	212.012
11		Clamshell Crew boat propulsion engine	Marine Equipment	72.278	64.328	72.278	1428.219	0.798	722.783	79.153	42.752	0.001	0.002	43.375
11		Clamshell Crew boat auxiliary engine	Marine Equipment	5.993	5.334	5.993	106.750	0.083	74.912	5.916	4.431	0.000	0.000	4.495
11		Clamshell Survey boat propulsion engine	Marine Equipment	64.494	57.400	64.494	1274.411	0.712	644.945	70.629	38.148	0.001	0.002	38.704
12		Pier J Approach (clam shell dredge 2,040,000 CY)												
12		Marine Clamshell Dredge												
12		Clamshell Dredge hoist	Marine Equipment	1484.127	1484.127	1484.127	45117.460	49.413	25724.868	2500.457	1967.028	0.000	0.000	1967.028
12		Clamshell Dredge generator	Marine Equipment	1113.095	1113.095	1113.095	33838.095	37.060	19293.651	1875.343	1086.792	0.000	0.000	1086.792
12		Clamshell Barge dump scow	Marine Equipment	15.741	15.741	15.741	299.074	0.524	272.840	16.575	10.755	0.000	0.000	10.755
12		Clamshell Tugboat propulsion engine	Marine Equipment	207.928	185.056	207.928	3871.618	2.296	2079.280	214.569	122.988	0.002	0.006	124.777
12		Clamshell Tugboat auxiliary engine	Marine Equipment	29.995	26.696	29.995	534.291	0.414	374.941	29.611	22.178	0.000	0.001	22.498
12		Clamshell Tugboat propulsion engine	Marine Equipment	3742.703	3331.006	3742.703	69689.133	41.319	37427.032	3862.245	2213.788	0.033	0.105	2245.986
12		Clamshell Tugboat auxiliary engine	Marine Equipment	539.915	480.524	539.915	9617.238	7.451	6748.939	532.997	399.196	0.005	0.019	404.967
12		Clamshell Crew boat propulsion engine	Marine Equipment	138.060	122.873	138.060	2728.059	1.524	1380.597	151.192	81.662	0.001	0.004	82.851
12		Clamshell Crew boat auxiliary engine	Marine Equipment	11.447	10.188	11.447	203.904	0.158	143.090	11.301	8.464	0.000	0.000	8.586
12		Clamshell Survey boat propulsion engine	Marine Equipment	123.192	109.641	123.192	2434.268	1.360	1231.917	134.910	72.867	0.001	0.003	73.929

**Table H1.28**  
**Alternative 4 Emissions by Task**

				Mitigated											
				Peak Day											
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e	
Task ID		Construction Element/Equipment	Source Type 1	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/da y)	(tonnes/day)	(tonnes/day)	(tonnes/da y)
11	Pier J Approach (clam shell dredge 1,066,000 CY)														
11		Marine Clamshell Dredge													
11		Clamshell Dredge hoist	Marine Equipment	0.437	0.437	0.437	13.270	0.015	7.566	0.735	0.579	0.000	0.000	0.579	
11		Clamshell Dredge generator	Marine Equipment	0.327	0.327	0.327	9.952	0.011	5.675	0.552	0.320	0.000	0.000	0.320	
11		Clamshell Barge dump scow	Marine Equipment	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032	
11		Clamshell Tugboat propulsion engine	Marine Equipment	0.416	0.370	0.416	8.134	0.007	6.116	0.451	0.362	0.000	0.000	0.367	
11		Clamshell Tugboat auxiliary engine	Marine Equipment	0.031	0.027	0.031	1.131	0.001	1.213	0.063	0.065	0.000	0.000	0.066	
11		Clamshell Tugboat propulsion engine	Marine Equipment	7.485	6.662	7.485	146.406	0.122	110.080	8.114	6.511	0.000	0.000	6.605	
11		Clamshell Tugboat auxiliary engine	Marine Equipment	0.556	0.495	0.556	20.366	0.022	21.835	1.129	1.174	0.000	0.000	1.191	
11		Clamshell Crew boat propulsion engine	Marine Equipment	0.276	0.246	0.276	5.401	0.004	4.061	0.299	0.240	0.000	0.000	0.244	
11		Clamshell Crew boat auxiliary engine	Marine Equipment	0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.025	
11		Clamshell Survey boat propulsion engine	Marine Equipment	0.246	0.219	0.246	4.819	0.004	3.623	0.267	0.214	0.000	0.000	0.217	
12	Pier J Approach (clam shell dredge 2,040,000 CY)														
12		Marine Clamshell Dredge													
12		Clamshell Dredge hoist	Marine Equipment	0.437	0.437	0.437	13.270	0.015	7.566	0.735	0.579	0.000	0.000	0.579	
12		Clamshell Dredge generator	Marine Equipment	0.327	0.327	0.327	9.952	0.011	5.675	0.552	0.320	0.000	0.000	0.320	
12		Clamshell Barge dump scow	Marine Equipment	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032	
12		Clamshell Tugboat propulsion engine	Marine Equipment	0.416	0.370	0.416	8.134	0.007	6.116	0.451	0.362	0.000	0.000	0.367	
12		Clamshell Tugboat auxiliary engine	Marine Equipment	0.031	0.027	0.031	1.131	0.001	1.213	0.063	0.065	0.000	0.000	0.066	
12		Clamshell Tugboat propulsion engine	Marine Equipment	7.485	6.662	7.485	146.406	0.122	110.080	8.114	6.511	0.000	0.000	6.605	
12		Clamshell Tugboat auxiliary engine	Marine Equipment	0.556	0.495	0.556	20.366	0.022	21.835	1.129	1.174	0.000	0.000	1.191	
12		Clamshell Crew boat propulsion engine	Marine Equipment	0.276	0.246	0.276	5.401	0.004	4.061	0.299	0.240	0.000	0.000	0.244	
12		Clamshell Crew boat auxiliary engine	Marine Equipment	0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.025	
12		Clamshell Survey boat propulsion engine	Marine Equipment	0.246	0.219	0.246	4.819	0.004	3.623	0.267	0.214	0.000	0.000	0.217	
Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.															

**Table H1.28**  
**Alternative 4 Emissions by Task**

Alternative 4 Emissions by Task				Mitigated Emissions											
				Total											
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e	
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	
11	Pier J Approach (clam shell dredge 1,066,000 CY)														
11		Marine Clamshell Dredge													
11		Clamshell Dredge hoist	Marine Equipment	77.698	77.698	77.698	2362.032	2.587	1346.772	130.906	102.980	0.000	0.000	102.980	
11		Clamshell Dredge generator	Marine Equipment	58.274	58.274	58.274	1771.524	1.940	1010.079	98.180	56.897	0.000	0.000	56.897	
11		Clamshell Barge dump scow	Marine Equipment	8.241	8.241	8.241	156.574	0.274	142.840	8.678	5.631	0.000	0.000	5.631	
11		Clamshell Tugboat propulsion engine	Marine Equipment	74.022	65.880	74.022	1447.790	1.202	1088.564	80.238	64.388	0.001	0.003	65.318	
11		Clamshell Tugboat auxiliary engine	Marine Equipment	5.496	4.892	5.496	201.396	0.217	215.922	11.162	11.611	0.000	0.001	11.778	
11		Clamshell Tugboat propulsion engine	Marine Equipment	1332.402	1185.838	1332.402	26060.222	21.632	19594.152	1444.285	1158.983	0.012	0.055	1175.715	
11		Clamshell Tugboat auxiliary engine	Marine Equipment	98.932	88.049	98.932	3625.133	3.901	3886.595	200.909	208.991	0.002	0.010	211.995	
11		Clamshell Crew boat propulsion engine	Marine Equipment	49.149	43.743	49.149	961.301	0.798	722.783	53.276	42.752	0.000	0.002	43.369	
11		Clamshell Crew boat auxiliary engine	Marine Equipment	2.098	1.867	2.098	76.860	0.083	82.403	4.260	4.431	0.000	0.000	4.495	
11		Clamshell Survey boat propulsion engine	Marine Equipment	43.856	39.032	43.856	857.777	0.712	644.945	47.539	38.148	0.000	0.002	38.699	
12	Pier J Approach (clam shell dredge 2,040,000 CY)														
12		Marine Clamshell Dredge													
12		Clamshell Dredge hoist	Marine Equipment	148.413	148.413	148.413	4511.746	4.941	2572.487	250.046	196.703	0.000	0.000	196.703	
12		Clamshell Dredge generator	Marine Equipment	111.310	111.310	111.310	3383.810	3.706	1929.365	187.534	108.679	0.000	0.000	108.679	
12		Clamshell Barge dump scow	Marine Equipment	15.741	15.741	15.741	299.074	0.524	272.840	16.575	10.755	0.000	0.000	10.755	
12		Clamshell Tugboat propulsion engine	Marine Equipment	141.391	125.838	141.391	2765.442	2.296	2079.280	153.264	122.988	0.001	0.006	124.764	
12		Clamshell Tugboat auxiliary engine	Marine Equipment	10.498	9.344	10.498	384.690	0.414	412.435	21.320	22.178	0.000	0.001	22.496	
12		Clamshell Tugboat propulsion engine	Marine Equipment	2545.038	2265.084	2545.038	49777.952	41.319	37427.032	2758.747	2213.788	0.024	0.105	2245.749	
12		Clamshell Tugboat auxiliary engine	Marine Equipment	188.970	168.184	188.970	6924.411	7.451	7423.833	383.758	399.196	0.003	0.019	404.935	
12		Clamshell Crew boat propulsion engine	Marine Equipment	93.881	83.554	93.881	1836.194	1.524	1380.597	101.764	81.662	0.001	0.004	82.840	
12		Clamshell Crew boat auxiliary engine	Marine Equipment	4.007	3.566	4.007	146.811	0.158	157.399	8.136	8.464	0.000	0.000	8.585	
12		Clamshell Survey boat propulsion engine	Marine Equipment	83.770	74.556	83.770	1638.450	1.360	1231.917	90.805	72.867	0.001	0.003	73.919	
				Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.											

Table H1.28  
Alternative 4 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
							PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
13		Pier J Approach (clam shell dredge 297,000 CY)															
13		Marine Clamshell Dredge															
13		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	50	4.365	4.365	4.365	132.698	0.145	75.661	7.354	5.785	0.000	0.000	5.785
13		Clamshell Dredge generator	Marine Equipment	dredging	onsite	50	3.274	3.274	3.274	99.524	0.109	56.746	5.516	3.196	0.000	0.000	3.196
13		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	50	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
13		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	50	0.612	0.544	0.612	11.387	0.007	6.116	0.631	0.362	0.000	0.000	0.367
13		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	50	0.088	0.079	0.088	1.571	0.001	1.103	0.087	0.065	0.000	0.000	0.066
13		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	50	11.008	9.797	11.008	204.968	0.122	110.080	11.360	6.511	0.000	0.000	6.606
13		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	50	1.588	1.413	1.588	28.286	0.022	19.850	1.568	1.174	0.000	0.000	1.191
13		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	50	0.406	0.361	0.406	8.024	0.004	4.061	0.445	0.240	0.000	0.000	0.244
13		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	50	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
13		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	50	0.362	0.322	0.362	7.160	0.004	3.623	0.397	0.214	0.000	0.000	0.217

Table H1.28  
Alternative 4 Emissions by Task

				Unmitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
13	Pier J Approach (clam shell dredge 297,000 CY)													
13		Marine Clamshell Dredge												
13		Clamshell Dredge hoist	Marine Equipment	218.254	218.254	218.254	6634.921	7.267	3783.069	367.714	289.269	0.000	0.000	289.269
13		Clamshell Dredge generator	Marine Equipment	163.690	163.690	163.690	4976.190	5.450	2837.302	275.786	159.822	0.000	0.000	159.822
13		Clamshell Barge dump scow	Marine Equipment	2.315	2.315	2.315	43.981	0.077	40.123	2.438	1.582	0.000	0.000	1.582
13		Clamshell Tugboat propulsion engine	Marine Equipment	30.578	27.214	30.578	569.356	0.338	305.776	31.554	18.087	0.000	0.001	18.350
13		Clamshell Tugboat auxiliary engine	Marine Equipment	4.411	3.926	4.411	78.572	0.061	55.138	4.355	3.261	0.000	0.000	3.309
13		Clamshell Tugboat propulsion engine	Marine Equipment	550.398	489.854	550.398	10248.402	6.076	5503.975	567.977	325.557	0.005	0.015	330.292
13		Clamshell Tugboat auxiliary engine	Marine Equipment	79.399	70.665	79.399	1414.300	1.096	992.491	78.382	58.705	0.001	0.003	59.554
13		Clamshell Crew boat propulsion engine	Marine Equipment	20.303	18.070	20.303	401.185	0.224	203.029	22.234	12.009	0.000	0.001	12.184
13		Clamshell Crew boat auxiliary engine	Marine Equipment	1.683	1.498	1.683	29.986	0.023	21.043	1.662	1.245	0.000	0.000	1.263
13		Clamshell Survey boat propulsion engine	Marine Equipment	18.116	16.124	18.116	357.981	0.200	181.164	19.840	10.716	0.000	0.001	10.872

Table H1.28  
Alternative 4 Emissions by Task

				Mitigated										
				Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
13		Pier J Approach (clam shell dredge 297,000 CY)												
13		Marine Clamshell Dredge												
13		Clamshell Dredge hoist	Marine Equipment	0.437	0.437	0.437	13.270	0.015	7.566	0.735	0.579	0.000	0.000	0.579
13		Clamshell Dredge generator	Marine Equipment	0.327	0.327	0.327	9.952	0.011	5.675	0.552	0.320	0.000	0.000	0.320
13		Clamshell Barge dump scow	Marine Equipment	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
13		Clamshell Tugboat propulsion engine	Marine Equipment	0.416	0.370	0.416	8.134	0.007	6.116	0.451	0.362	0.000	0.000	0.367
13		Clamshell Tugboat auxiliary engine	Marine Equipment	0.031	0.027	0.031	1.131	0.001	1.213	0.063	0.065	0.000	0.000	0.066
13		Clamshell Tugboat propulsion engine	Marine Equipment	7.485	6.662	7.485	146.406	0.122	110.080	8.114	6.511	0.000	0.000	6.605
13		Clamshell Tugboat auxiliary engine	Marine Equipment	0.556	0.495	0.556	20.366	0.022	21.835	1.129	1.174	0.000	0.000	1.191
13		Clamshell Crew boat propulsion engine	Marine Equipment	0.276	0.246	0.276	5.401	0.004	4.061	0.299	0.240	0.000	0.000	0.244
13		Clamshell Crew boat auxiliary engine	Marine Equipment	0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.025
13		Clamshell Survey boat propulsion engine	Marine Equipment	0.246	0.219	0.246	4.819	0.004	3.623	0.267	0.214	0.000	0.000	0.217

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.28  
Alternative 4 Emissions by Task

				Mitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
13		Pier J Approach (clam shell dredge 297,000 CY)												
13		Marine Clamshell Dredge												
13		Clamshell Dredge hoist	Marine Equipment	21.825	21.825	21.825	663.492	0.727	378.307	36.771	28.927	0.000	0.000	28.927
13		Clamshell Dredge generator	Marine Equipment	16.369	16.369	16.369	497.619	0.545	283.730	27.579	15.982	0.000	0.000	15.982
13		Clamshell Barge dump scow	Marine Equipment	2.315	2.315	2.315	43.981	0.077	40.123	2.438	1.582	0.000	0.000	1.582
13		Clamshell Tugboat propulsion engine	Marine Equipment	20.793	18.506	20.793	406.683	0.338	305.776	22.539	18.087	0.000	0.001	18.348
13		Clamshell Tugboat auxiliary engine	Marine Equipment	1.544	1.374	1.544	56.572	0.061	60.652	3.135	3.261	0.000	0.000	3.308
13		Clamshell Tugboat propulsion engine	Marine Equipment	374.270	333.101	374.270	7320.287	6.076	5503.975	405.698	325.557	0.003	0.015	330.257
13		Clamshell Tugboat auxiliary engine	Marine Equipment	27.790	24.733	27.790	1018.296	1.096	1091.740	56.435	58.705	0.000	0.003	59.549
13		Clamshell Crew boat propulsion engine	Marine Equipment	13.806	12.287	13.806	270.029	0.224	203.029	14.965	12.009	0.000	0.001	12.182
13		Clamshell Crew boat auxiliary engine	Marine Equipment	0.589	0.524	0.589	21.590	0.023	23.147	1.197	1.245	0.000	0.000	1.263
13		Clamshell Survey boat propulsion engine	Marine Equipment	12.319	10.964	12.319	240.949	0.200	181.164	13.354	10.716	0.000	0.001	10.870

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.29  
Alternative 5 Emissions by Task

						Unmitigated Emissions										
						Peak Day										
Task ID	Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
1	Electrical Substation Construction at Pier J (mitigation only)															
1	Off-Road Equipment															
1	Caterpillar 320 excavator	Offroad Construction Equipment		onsite	20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Small asphalt roller	Offroad Construction Equipment		onsite	26	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Water truck	Offroad Construction Equipment		onsite	20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Forklift	Offroad Construction Equipment		onsite	22	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Mobile crane (35 ton)	Offroad Construction Equipment		onsite	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	On-Road Vehicles															
1	Haul trucks	Onroad Construction Vehicles		onsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Supply trucks	Onroad Construction Vehicles		onsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Haul trucks	Onroad Construction Vehicles		offsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Supply trucks	Onroad Construction Vehicles		offsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Workers	Onroad Construction Vehicles		offsite	60	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Fugitive Dust															
1	Soil handling	Fugitive Emissions		onsite	20	n/a	n/a									
1	Asphalting	Fugitive Emissions		onsite												
2	Pier J Breakwater Construction															
2	Marine Activities															
2	Pier J Breakwater Tugboat propulsion engine	Marine Equipment		onsite	54	5.8097516	5.170679	5.80975164	108.17758	0.0641397	58.097516	5.9953151	3.4364356	5.16519E-05	0.000163389	3.4864167
2	Pier J Breakwater Tugboat auxiliary engine	Marine Equipment		onsite	54	1.0586571	0.9422048	1.05865709	18.857329	0.0146095	13.233214	1.045093	0.7827372	9.00388E-06	3.7216E-05	0.7940526
2	Pier J Breakwater Crew boat propulsion engine	Marine Equipment		onsite	54	0.4060579	0.3613915	0.40605791	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
2	Pier J Breakwater Crew boat auxiliary engine	Marine Equipment		onsite	54	0.0336683	0.0299648	0.03366828	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
2	Pier J Breakwater Survey boat propulsion engine	Marine Equipment		onsite	54	0.3623286	0.3224725	0.3623286	7.1596131	0.0040001	3.623286	0.3967933	0.2143153	3.41853E-06	1.01898E-05	0.2174374
2	Off-Road Equipment															
2	Piling crane	Offroad Construction Equipment		onsite	54	0.208629	0.1919387	0.208629	5.0022874	0.0077334	2.6745656	0.4666913	0.3799798	0	0	0.3799798
2	Long arm excavator	Offroad Construction Equipment		onsite	54	0.0752002	0.0691842	0.07520024	2.1876515	0.0129141	2.7752975	0.3208734	0.6339765	0	0	0.6339765
2	On-Road Vehicles															
2	Delivery Trucks	Onroad Construction Vehicles		onsite	5	0.1472023	0.0369081	0.00015221	0.0787952	0.0002454	0.0091846	0.0010522	0.0117847	2.21692E-08	1.85239E-06	0.0123372
2	Delivery Trucks	Onroad Construction Vehicles		offsite	5	0.3360402	0.1510393	0.0222394	3.216786	0.0191435	0.1848032	0.0255705	0.919133	5.38734E-07	0.000144475	0.9622
2	Workers	Onroad Construction Vehicles		offsite	54	0.0643898	0.0267123	0	0.0582129	0.0036865	0.9591501	0.0149813	0.1690333	1.73503E-06	2.96976E-06	0.1699616
3	Approach Channel (hopper dredge 2,600,000 CY)															
3	Marine Hopper Dredge															
3	Hopper propulsion engine	Marine Equipment	dredging	onsite	150	26.632138	23.702603	26.6321383	495.89041	0.2940188	266.32138	27.482769	15.752761	0.000236775	0.000748981	15.981876
3	Hopper propulsion engine	Marine Equipment	transit	offsite	150	50.30515	44.771584	50.3051501	936.68189	0.5553689	503.0515	51.911897	29.755215	0.000447241	0.001414742	30.187989
3	Hopper auxiliary engine	Marine Equipment	disposal	near shore	150	0.2219345	0.1975217	0.22193449	5.0601063	0.0040836	3.6989081	0.2804364	0.2187883	2.41607E-06	1.04025E-05	0.2219487
3	Hopper Crew boat propulsion engine	Marine Equipment	support	onsite	150	0.4060579	0.3613915	0.40605791	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
3	Hopper Crew boat auxiliary engine	Marine Equipment	support	onsite	150	0.0336683	0.0299648	0.03366828	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
3	Hopper Survey boat propulsion engine	Marine Equipment	dredging	onsite	150	1.4493144	1.2898898	1.44931439	28.638452	0.0160004	14.493144	1.5871732	0.8572613	1.36741E-05	4.07594E-05	0.8697495



Table H1.29  
Alternative 5 Emissions by Task

		Unmitigated Emissions											
		Total											
		PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e	
Task ID	Construction Element/Equipment	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	
1	Electrical Substation Construction at Pier J (mitigation on												
1	Off-Road Equipment												
1	Caterpillar 320 excavator	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
1	Small asphalt roller	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
1	Water truck	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
1	Forklift	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
1	Mobile crane (35 ton)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
1	On-Road Vehicles												
1	Haul trucks	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
1	Supply trucks	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
1	Haul trucks	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
1	Supply trucks	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
1	Workers	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
1	Fugitive Dust												
1	Soil handling	n/a	n/a										
1	Asphalting												
2	Pier J Breakwater Construction												
2	Marine Activities												
2	Pier J Breakwater Tugboat propulsion engine	313.72659	279.21666	313.72659	5841.5891	3.4635415	3137.2659	323.74702	185.56752	0.002789205	0.008822996	188.2665	
2	Pier J Breakwater Tugboat auxiliary engine	57.167483	50.87906	57.167483	1018.2958	0.7889113	714.59353	56.435024	42.267807	0.000486209	0.002009666	42.878843	
2	Pier J Breakwater Crew boat propulsion engine	21.927127	19.515143	21.927127	433.28003	0.2420755	219.27127	24.012836	12.969773	0.00020688	0.000616661	13.15871	
2	Pier J Breakwater Crew boat auxiliary engine	1.8180873	1.6180977	1.8180873	32.38468	0.0250896	22.726091	1.7947931	1.3442356	1.54628E-05	6.3913E-05	1.3636682	
2	Pier J Breakwater Survey boat propulsion engine	19.565744	17.413512	19.565744	386.61911	0.2160058	195.65744	21.426838	11.573028	0.0001846	0.000550251	11.741618	
2	Off-Road Equipment												
2	Piling crane	11.265966	10.364689	11.265966	270.12352	0.4176015	144.42654	25.20133	20.518908	0	0	20.518908	
2	Long arm excavator	4.0608129	3.7359478	4.0608129	118.13318	0.6973593	149.86606	17.327165	34.234729	0	0	34.234729	
2	On-Road Vehicles												
2	Delivery Trucks	0.7360113	0.1845407	0.0007611	0.3939759	0.0012272	0.0459231	0.0052612	0.0589233	1.10846E-07	9.26193E-06	0.0616862	
2	Delivery Trucks	1.680201	0.7551964	0.111197	16.08393	0.0957177	0.924016	0.1278527	4.595665	2.69367E-06	0.000722375	4.811	
2	Workers	3.4770481	1.4424651	0	3.1434973	0.199072	51.794108	0.8089905	9.1277972	9.36918E-05	0.000160367	9.1779288	
3	Approach Channel (hopper dredge 2,600,000 CY)												
3	Marine Hopper Dredge												
3	Hopper propulsion engine	3994.8207	3555.3905	3994.8207	74383.562	44.102821	39948.207	4122.4153	2362.9141	0.035516193	0.112347143	2397.2814	
3	Hopper propulsion engine	7545.7725	6715.7375	7545.7725	140502.28	83.305328	75457.725	7786.7845	4463.2822	0.067086143	0.212211269	4528.1983	
3	Hopper auxiliary engine	33.290173	29.628254	33.290173	759.01594	0.6125392	554.83621	42.065462	32.818251	0.00036241	0.001560377	33.292304	
3	Hopper Crew boat propulsion engine	60.908687	54.208731	60.908687	1203.5556	0.6724319	609.08687	66.702321	36.027147	0.000574666	0.001712947	36.551972	
3	Hopper Crew boat auxiliary engine	5.0502425	4.4947158	5.0502425	89.957445	0.0696933	63.128031	4.9855363	3.7339877	4.29523E-05	0.000177536	3.7879673	
3	Hopper Survey boat propulsion engine	217.39716	193.48347	217.39716	4295.7678	2.4000646	2173.9716	238.07598	128.5892	0.002051116	0.006113904	130.46242	

Table H1.29  
Alternative 5 Emissions by Task

			Mitigated										
			Peak Day										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment		(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
1	Electrical Substation Construction at Pier J (mitigation on)												
1	Off-Road Equipment												
1	Caterpillar 320 excavator		0.0164868	0.0164868	0.01648677	0.3297354	0.005393	1.2259134	0.1560831	0.2647818	0	0	0.2647818
1	Small asphalt roller		0.0048656	0.0048656	0.00486561	0.7353704	0.0011814	0.9067725	0.040755	0.058124	0	0	0.058124
1	Water truck		0.0301587	0.0301587	0.03015873	0.6031746	0.0098162	2.5873661	0.2964	0	0	0	0
1	Forklift		0.00097	0.00097	0.00097002	0.1466049	0.0002398	0.1631393	0.008125	0	0	0	0
1	Mobile crane (35 ton)		0.0216349	0.0216349	0.02163492	0.4326984	0.0069786	2.413528	0.212628	0	0	0	0
1	On-Road Vehicles												
1	Haul trucks		0.0883214	0.0221449	9.1328E-05	0.0472771	0.0001473	0.0055108	0.0006313	0.0070708	1.33015E-08	1.11143E-06	0.0074023
1	Supply trucks		0.2060832	0.0516714	0.0002131	0.1103132	0.0003436	0.0128585	0.0014731	0.0164985	3.10369E-08	2.59334E-06	0.0172721
1	Haul trucks		0.0110893	0.0049843	0.0007339	0.1061539	0.0006317	0.0060985	0.0008438	0.0303314	1.77782E-08	4.76767E-06	0.0317526
1	Supply trucks		0.0470456	0.0211455	0.00311352	0.45035	0.0026801	0.0258724	0.0035799	0.1286786	7.54228E-08	2.02265E-05	0.134708
1	Workers		0.0613236	0.0254403	0	0.0554409	0.003511	0.9134763	0.0142679	0.1609841	1.65241E-06	2.82834E-06	0.1618682
1	Fugitive Dust												
1	Soil handling		2.0058916	0.3037493									
1	Asphalting												
2	Pier J Breakwater Construction												
2	Marine Activities												
2	Pier J Breakwater Tugboat propulsion engine		3.9506311	3.5160617	3.95063112	77.269697	0.0641397	58.097516	4.2823679	3.4364356	3.68942E-05	0.000163389	3.4860478
2	Pier J Breakwater Tugboat auxiliary engine		0.37053	0.3297717	0.37052998	13.577277	0.0146095	14.556535	0.752467	0.7827372	6.48279E-06	3.7216E-05	0.7939896
2	Pier J Breakwater Crew boat propulsion engine		0.2761194	0.2457462	0.27611938	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
2	Pier J Breakwater Crew boat auxiliary engine		0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
2	Pier J Breakwater Survey boat propulsion engine		0.2463834	0.2192813	0.24638345	4.8189703	0.0040001	3.623286	0.2670724	0.2143153	2.30093E-06	1.01898E-05	0.2174094
2	Off-Road Equipment												
2	Piling crane		0.0239749	0.0239749	0.02397487	0.4794974	0.0077334	2.6745656	0.235625	0.3799798	0	0	0.3799798
2	Long arm excavator		0.0395833	0.0395833	0.03958333	0.7916667	0.0129141	2.7752975	0.3208734	0.6339765	0	0	0.6339765
2	On-Road Vehicles												
2	Delivery Trucks		0.1472023	0.0369081	0.00015221	0.0787952	0.0002454	0.0091846	0.0010522	0.0117847	2.21692E-08	1.85239E-06	0.0123372
2	Delivery Trucks		0.3360402	0.1510393	0.0222394	3.216786	0.0191435	0.1848032	0.0255705	0.919133	5.38734E-07	0.000144475	0.9622
2	Workers		0.0643898	0.0267123	0	0.0582129	0.0036865	0.9591501	0.0149813	0.1690333	1.73503E-06	2.96976E-06	0.1699616
3	Approach Channel (hopper dredge 2,600,000 CY)												
3	Marine Hopper Dredge												
3	Hopper propulsion engine		26.632138	23.702603	26.6321383	495.89041	0.2940188	266.32138	27.482769	15.752761	0.000236775	0.000748981	15.981876
3	Hopper propulsion engine		50.30515	44.771584	50.3051501	936.68189	0.5553689	503.0515	51.911897	29.755215	0.000447241	0.001414742	30.187989
3	Hopper auxiliary engine		0.2219345	0.1975217	0.22193449	5.0601063	0.0040836	3.6989081	0.2804364	0.2187883	2.41607E-06	1.04025E-05	0.2219487
3	Hopper Crew boat propulsion engine		0.2761194	0.2457462	0.27611938	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
3	Hopper Crew boat auxiliary engine		0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
3	Hopper Survey boat propulsion engine		0.9855338	0.8771251	0.98553378	19.275881	0.0160004	14.493144	1.0682896	0.8572613	9.20373E-06	4.07594E-05	0.8696377

Table H1.29

## Alternative 5 Emissions by Task

			Mitigated Emissions										
			Total										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
1		Electrical Substation Construction at Pier J (mitigation on											
1		Off-Road Equipment											
1		Caterpillar 320 excavator	0.3297354	0.3297354	0.3297354	6.594709	0.1078608	24.518268	3.1216628	5.2956351	0	0	5.2956351
1		Small asphalt roller	0.1265058	0.1265058	0.1265058	19.11963	0.0307154	23.576085	1.05963	1.5112234	0	0	1.5112234
1		Water truck	0.6031746	0.6031746	0.6031746	12.063492	0.1963245	51.747323	5.928	0	0	0	0
1		Forklift	0.0213404	0.0213404	0.0213404	3.2253086	0.0052753	3.5890653	0.17875	0	0	0	0
1		Mobile crane (35 ton)	0.0432698	0.0432698	0.0432698	0.8653968	0.0139572	4.827056	0.425256	0	0	0	0
1		On-Road Vehicles											
1		Haul trucks	0.4416068	0.1107244	0.0004566	0.2363855	0.0007363	0.0275539	0.0031567	0.035354	6.65075E-08	5.55716E-06	0.0370117
1		Supply trucks	1.0304159	0.258357	0.0010655	0.5515662	0.0017181	0.0642924	0.0073657	0.0824927	1.55184E-07	1.29667E-05	0.0863606
1		Haul trucks	0.0554466	0.0249215	0.0036695	0.5307697	0.0031587	0.0304925	0.0042191	0.1516569	8.88911E-08	2.38384E-05	0.158763
1		Supply trucks	0.2352281	0.1057275	0.0155676	2.2517502	0.0134005	0.1293622	0.0178994	0.6433931	3.77114E-07	0.000101132	0.67354
1		Workers	3.679416	1.526418	0	3.3264522	0.2106582	54.80858	0.8560746	9.6590447	9.91447E-05	0.0001697	9.712094
1		Fugitive Dust											
1		Soil handling	40.117832	6.074986									
1		Asphalting											
2		Pier J Breakwater Construction											
2		Marine Activities											
2		Pier J Breakwater Tugboat propulsion engine	213.33408	189.86733	213.33408	4172.5636	3.4635415	3137.2659	231.24787	185.56752	0.001992289	0.008822996	188.24658
2		Pier J Breakwater Tugboat auxiliary engine	20.008619	17.807671	20.008619	733.17297	0.7889113	786.05289	40.633218	42.267807	0.000350071	0.002009666	42.87544
2		Pier J Breakwater Crew boat propulsion engine	14.910446	13.270297	14.910446	291.63079	0.2420755	219.27127	16.162485	12.969773	0.000139246	0.000616661	13.157019
2		Pier J Breakwater Crew boat auxiliary engine	0.6363306	0.5663342	0.6363306	23.31697	0.0250896	24.9987	1.292251	1.3442356	1.11332E-05	6.3913E-05	1.36356
2		Pier J Breakwater Survey boat propulsion engine	13.304706	11.841188	13.304706	260.2244	0.2160058	195.65744	14.42191	11.573028	0.00012425	0.000550251	11.740109
2		Off-Road Equipment											
2		Piling crane	1.2946429	1.2946429	1.2946429	25.892857	0.4176015	144.42654	12.72375	20.518908	0	0	20.518908
2		Long arm excavator	2.1375	2.1375	2.1375	42.75	0.6973593	149.86606	17.327165	34.234729	0	0	34.234729
2		On-Road Vehicles											
2		Delivery Trucks	0.7360113	0.1845407	0.0007611	0.3939759	0.0012272	0.0459231	0.0052612	0.0589233	1.10846E-07	9.26193E-06	0.0616862
2		Delivery Trucks	1.680201	0.7551964	0.111197	16.08393	0.0957177	0.924016	0.1278527	4.595665	2.69367E-06	0.000722375	4.811
2		Workers	3.4770481	1.4424651	0	3.1434973	0.199072	51.794108	0.8089905	9.1277972	9.36918E-05	0.000160367	9.1779288
3		Approach Channel (hopper dredge 2,600,000 CY)											
3		Marine Hopper Dredge											
3		Hopper propulsion engine	3994.8207	3555.3905	3994.8207	74383.562	44.102821	39948.207	4122.4153	2362.9141	0.035516193	0.112347143	2397.2814
3		Hopper propulsion engine	7545.7725	6715.7375	7545.7725	140502.28	83.305328	75457.725	7786.7845	4463.2822	0.067086143	0.212211269	4528.1983
3		Hopper auxiliary engine	33.290173	29.628254	33.290173	759.01594	0.6125392	554.83621	42.065462	32.818251	0.00036241	0.001560377	33.292304
3		Hopper Crew boat propulsion engine	41.417907	36.861937	41.417907	810.08553	0.6724319	609.08687	44.895793	36.027147	0.000386795	0.001712947	36.547275
3		Hopper Crew boat auxiliary engine	1.7675849	1.5731505	1.7675849	64.76936	0.0696933	69.440835	3.5895861	3.7339877	3.09257E-05	0.000177536	3.7876666
3		Hopper Survey boat propulsion engine	147.83007	131.56876	147.83007	2891.3822	2.4000646	2173.9716	160.24345	128.5892	0.001380559	0.006113904	130.44566

Table H1.29  
Alternative 5 Emissions by Task

						Unmitigated Emissions										
						Peak Day										
						PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
Task ID	Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)				
4	Main Channel Widening (clam shell dredge 1,065,000 CY)															
4	Marine Clamshell Dredge															
4	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	177	4.3650794	4.3650794	4.36507937	132.69841	0.145332	75.661376	7.3542857	5.7853765	0	0	5.7853765
4	Clamshell Dredge generator	Marine Equipment	dredging	onsite	177	3.2738095	3.2738095	3.27380952	99.52381	0.108999	56.746032	5.5157143	3.1964473	0	0	3.1964473
4	Clamshell Barge dump scow	Marine Equipment	disposal	offsite	177	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
4	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	177	0.6115528	0.544282	0.6115528	11.387113	0.0067515	6.115528	0.6310858	0.3617301	5.43705E-06	1.71988E-05	0.3669912
4	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	177	0.0882214	0.0785171	0.08822142	1.5714441	0.0012175	1.1027678	0.0870911	0.0652281	7.50323E-07	3.10134E-06	0.0661711
4	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	177	11.00795	9.7970759	11.0079505	204.96804	0.1215278	110.0795	11.359544	6.5111411	9.78668E-05	0.000309579	6.6058422
4	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	177	1.5879856	1.4133072	1.58798563	28.285994	0.0219142	19.84982	1.5676396	1.1741058	1.35058E-05	5.5824E-05	1.191079
4	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	177	0.4060579	0.3613915	0.40605791	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
4	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	177	0.0336683	0.0299648	0.03366828	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
4	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	177	0.3623286	0.3224725	0.3623286	7.1596131	0.0040001	3.623286	0.3967933	0.2143153	3.41853E-06	1.01898E-05	0.2174374
5	West Basin (clam shell dredge 717,000 CY)															
5	Marine Clamshell Dredge															
5	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	120	4.3650794	4.3650794	4.36507937	132.69841	0.145332	75.661376	7.3542857	5.7853765	0	0	5.7853765
5	Clamshell Dredge generator	Marine Equipment	dredging	onsite	120	3.2738095	3.2738095	3.27380952	99.52381	0.108999	56.746032	5.5157143	3.1964473	0	0	3.1964473
5	Clamshell Barge dump scow	Marine Equipment	disposal	offsite	120	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
5	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	120	0.6115528	0.544282	0.6115528	11.387113	0.0067515	6.115528	0.6310858	0.3617301	5.43705E-06	1.71988E-05	0.3669912
5	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	120	0.0882214	0.0785171	0.08822142	1.5714441	0.0012175	1.1027678	0.0870911	0.0652281	7.50323E-07	3.10134E-06	0.0661711
5	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	120	11.00795	9.7970759	11.0079505	204.96804	0.1215278	110.0795	11.359544	6.5111411	9.78668E-05	0.000309579	6.6058422
5	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	120	1.5879856	1.4133072	1.58798563	28.285994	0.0219142	19.84982	1.5676396	1.1741058	1.35058E-05	5.5824E-05	1.191079
5	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	120	0.4060579	0.3613915	0.40605791	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
5	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	120	0.0336683	0.0299648	0.03366828	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
5	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	120	0.3623286	0.3224725	0.3623286	7.1596131	0.0040001	3.623286	0.3967933	0.2143153	3.41853E-06	1.01898E-05	0.2174374
6	Pier J Basin (clam shell dredge 258,000 CY)															
6	Marine Clamshell Dredge															
6	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	43	4.3650794	4.3650794	4.36507937	132.69841	0.145332	75.661376	7.3542857	5.7853765	0	0	5.7853765
6	Clamshell Dredge generator	Marine Equipment	dredging	onsite	43	3.2738095	3.2738095	3.27380952	99.52381	0.108999	56.746032	5.5157143	3.1964473	0	0	3.1964473
6	Clamshell Barge dump scow	Marine Equipment	disposal	offsite	43	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
6	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	43	0.6115528	0.544282	0.6115528	11.387113	0.0067515	6.115528	0.6310858	0.3617301	5.43705E-06	1.71988E-05	0.3669912
6	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	43	0.0882214	0.0785171	0.08822142	1.5714441	0.0012175	1.1027678	0.0870911	0.0652281	7.50323E-07	3.10134E-06	0.0661711
6	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	43	11.00795	9.7970759	11.0079505	204.96804	0.1215278	110.0795	11.359544	6.5111411	9.78668E-05	0.000309579	6.6058422
6	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	43	1.5879856	1.4133072	1.58798563	28.285994	0.0219142	19.84982	1.5676396	1.1741058	1.35058E-05	5.5824E-05	1.191079
6	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	43	0.4060579	0.3613915	0.40605791	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
6	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	43	0.0336683	0.0299648	0.03366828	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
6	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	43	0.3623286	0.3224725	0.3623286	7.1596131	0.0040001	3.623286	0.3967933	0.2143153	3.41853E-06	1.01898E-05	0.2174374
7	Pier J Basin (clam shell dredge 46,000 CY)															
7	Marine Clamshell Dredge															
7	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	8	4.3650794	4.3650794	4.36507937	132.69841	0.145332	75.661376	7.3542857	5.7853765	0	0	5.7853765
7	Clamshell Dredge generator	Marine Equipment	dredging	onsite	8	3.2738095	3.2738095	3.27380952	99.52381	0.108999	56.746032	5.5157143	3.1964473	0	0	3.1964473
7	Clamshell Barge dump scow	Marine Equipment	disposal	offsite	8	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
7	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	8	0.6115528	0.544282	0.6115528	11.387113	0.0067515	6.115528	0.6310858	0.3617301	5.43705E-06	1.71988E-05	0.3669912
7	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	8	0.0882214	0.0785171	0.08822142	1.5714441	0.0012175	1.1027678	0.0870911	0.0652281	7.50323E-07	3.10134E-06	0.0661711
7	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	8	11.00795	9.7970759	11.0079505	204.96804	0.1215278	110.0795	11.359544	6.5111411	9.78668E-05	0.000309579	6.6058422
7	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	8	1.5879856	1.4133072	1.58798563	28.285994	0.0219142	19.84982	1.5676396	1.1741058	1.35058E-05	5.5824E-05	1.191079
7	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	8	0.4060579	0.3613915	0.40605791	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
7	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	8	0.0336683	0.0299648	0.03366828	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
7	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	8	0.3623286	0.3224725	0.3623286	7.1596131	0.0040001	3.623286	0.3967933	0.2143153	3.41853E-06	1.01898E-05	0.2174374

Table H1.29  
Alternative 5 Emissions by Task

			Unmitigated Emissions										
			Total										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
4		Main Channel Widening (clam shell dredge 1,065,000 CY)											
4		Marine Clamshell Dredge											
4		Clamshell Dredge hoist	772.61905	772.61905	772.61905	23487.619	25.723764	13392.063	1301.7086	1024.0116	0	0	1024.0116
4		Clamshell Dredge generator	579.46429	579.46429	579.46429	17615.714	19.292823	10044.048	976.28143	565.77116	0	0	565.77116
4		Clamshell Barge dump scow	8.1944444	8.1944444	8.1944444	155.69444	0.2728278	142.03704	8.62875	6.7663102	0	0	6.7663102
4		Clamshell Tugboat propulsion engine	108.24485	96.337913	108.24485	2015.519	1.1950231	1082.4485	111.70219	64.02622	0.000962357	0.003044191	64.957448
4		Clamshell Tugboat auxiliary engine	15.615192	13.897521	15.615192	278.14561	0.2154897	195.1899	15.415122	11.545373	0.000132807	0.000548936	11.712277
4		Clamshell Tugboat propulsion engine	1948.4072	1734.0824	1948.4072	36279.343	21.510416	19484.072	2010.6394	1152.472	0.017322431	0.054795446	1169.2341
4		Clamshell Tugboat auxiliary engine	281.07346	250.15538	281.07346	5006.6209	3.8788137	3513.4182	277.4722	207.81672	0.00239053	0.009880856	210.82098
4		Clamshell Crew boat propulsion engine	71.87225	63.966303	71.87225	1420.1957	0.7934696	718.7225	78.708739	42.512033	0.000678106	0.002021278	43.131327
4		Clamshell Crew boat auxiliary engine	5.9592862	5.3037647	5.9592862	106.14978	0.0822381	74.491077	5.8829328	4.4061055	5.06837E-05	0.000209493	4.4698014
4		Clamshell Survey boat propulsion engine	64.132162	57.077624	64.132162	1267.2515	0.7080191	641.32162	70.232413	37.933814	0.000605079	0.001803602	38.486415
5		West Basin (clam shell dredge 717,000 CY)											
5		Marine Clamshell Dredge											
5		Clamshell Dredge hoist	523.80952	523.80952	523.80952	15923.81	17.43984	9079.3651	882.51429	694.24519	0	0	694.24519
5		Clamshell Dredge generator	392.85714	392.85714	392.85714	11942.857	13.07988	6809.5238	661.88571	383.57367	0	0	383.57367
5		Clamshell Barge dump scow	5.5555556	5.5555556	5.5555556	105.55556	0.184968	96.296296	5.85	4.587329	0	0	4.587329
5		Clamshell Tugboat propulsion engine	73.386337	65.31384	73.386337	1366.4536	0.8101852	733.86337	75.730296	43.407607	0.000652446	0.002063859	44.038948
5		Clamshell Tugboat auxiliary engine	10.586571	9.4220481	10.586571	188.57329	0.1460947	132.33214	10.45093	7.8273717	9.00388E-05	0.00037216	7.9405265
5		Clamshell Tugboat propulsion engine	1320.9541	1175.6491	1320.9541	24596.165	14.583333	13209.541	1363.1453	781.33693	0.011744021	0.037149455	792.70107
5		Clamshell Tugboat auxiliary engine	190.55828	169.59687	190.55828	3394.3193	2.6297042	2381.9784	188.11675	140.89269	0.001620698	0.006698886	142.92948
5		Clamshell Crew boat propulsion engine	48.726949	43.366985	48.726949	962.84452	0.5379455	487.26949	53.361857	28.821718	0.000459733	0.001370358	29.241578
5		Clamshell Crew boat auxiliary engine	4.040194	3.5957727	4.040194	71.965956	0.0557547	50.502425	3.988429	2.9871902	3.43619E-05	0.000142029	3.0303738
5		Clamshell Survey boat propulsion engine	43.479432	38.696694	43.479432	859.15357	0.4800129	434.79432	47.615195	25.71784	0.000410223	0.001222781	26.092485
6		Pier J Basin (clam shell dredge 258,000 CY)											
6		Marine Clamshell Dredge											
6		Clamshell Dredge hoist	187.69841	187.69841	187.69841	5706.0317	6.249276	3253.4392	316.23429	248.77119	0	0	248.77119
6		Clamshell Dredge generator	140.77381	140.77381	140.77381	4279.5238	4.686957	2440.0794	237.17571	137.44723	0	0	137.44723
6		Clamshell Barge dump scow	1.9907407	1.9907407	1.9907407	37.824074	0.0662802	34.506173	2.09625	1.6437929	0	0	1.6437929
6		Clamshell Tugboat propulsion engine	26.296771	23.404126	26.296771	489.64587	0.2903163	262.96771	27.136689	15.554393	0.000233793	0.000739549	15.780623
6		Clamshell Tugboat auxiliary engine	3.7935212	3.3762339	3.7935212	67.572097	0.0523506	47.419015	3.7449167	2.8048082	3.22639E-05	0.000133357	2.8453553
6		Clamshell Tugboat propulsion engine	473.34187	421.27426	473.34187	8813.6256	5.2256943	4733.4187	488.46041	279.97907	0.004208274	0.013311888	284.05122
6		Clamshell Tugboat auxiliary engine	68.283382	60.77221	68.283382	1216.2977	0.9423107	853.54228	67.408501	50.486548	0.00058075	0.002400434	51.216396
6		Clamshell Crew boat propulsion engine	17.46049	15.539836	17.46049	345.01929	0.1927638	174.6049	19.121332	10.327782	0.000164738	0.000491045	10.478232
6		Clamshell Crew boat auxiliary engine	1.4477362	1.2884852	1.4477362	25.787801	0.0199788	18.096702	1.4291871	1.0704098	1.2313E-05	5.08937E-05	1.085884
6		Clamshell Survey boat propulsion engine	15.58013	13.866315	15.58013	307.86336	0.1720046	155.8013	17.062112	9.2155595	0.000146997	0.000438163	9.349807
7		Pier J Basin (clam shell dredge 46,000 CY)											
7		Marine Clamshell Dredge											
7		Clamshell Dredge hoist	34.920635	34.920635	34.920635	1061.5873	1.162656	605.29101	58.834286	46.283012	0	0	46.283012
7		Clamshell Dredge generator	26.190476	26.190476	26.190476	796.19048	0.871992	453.96825	44.125714	25.571578	0	0	25.571578
7		Clamshell Barge dump scow	0.3703704	0.3703704	0.3703704	7.037037	0.0123312	6.4197531	0.39	0.3058219	0	0	0.3058219
7		Clamshell Tugboat propulsion engine	4.8924224	4.354256	4.8924224	91.096906	0.0540123	48.924224	5.0486864	2.8938405	4.34964E-05	0.000137591	2.9359299
7		Clamshell Tugboat auxiliary engine	0.7057714	0.6281365	0.7057714	12.571553	0.0097396	8.8221424	0.6967287	0.5218248	6.00259E-06	2.48107E-05	0.5293684
7		Clamshell Tugboat propulsion engine	88.063604	78.376607	88.063604	1639.7443	0.9722222	880.63604	90.876355	52.089129	0.000782935	0.00247663	52.846738
7		Clamshell Tugboat auxiliary engine	12.703885	11.306458	12.703885	226.28795	0.1753136	158.79856	12.541117	9.3928461	0.000108047	0.000446592	9.5286318
7		Clamshell Crew boat propulsion engine	3.2484633	2.8911323	3.2484633	64.189634	0.035863	32.484633	3.5574571	1.9214478	3.06489E-05	9.13572E-05	1.9494385
7		Clamshell Crew boat auxiliary engine	0.2693463	0.2397182	0.2693463	4.7977304	0.003717	3.3668283	0.2658953	0.199146	2.29079E-06	9.4686E-06	0.2020249
7		Clamshell Survey boat propulsion engine	2.8986288	2.5797796	2.8986288	57.276905	0.0320009	28.986288	3.1743463	1.7145227	2.73482E-05	8.15187E-05	1.739499

**Table H1.29**  
**Alternative 5 Emissions by Task**

		Mitigated										
		Peak Day										
		PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
4	Main Channel Widening (clam shell dredge 1,065,000 CY)											
4	Marine Clamshell Dredge											
4	Clamshell Dredge hoist	0.4365079	0.4365079	0.43650794	13.269841	0.0145332	7.5661376	0.7354286	0.5785377	0	0	0.5785377
4	Clamshell Dredge generator	0.327381	0.327381	0.32738095	9.952381	0.0108999	5.6746032	0.5515714	0.3196447	0	0	0.3196447
4	Clamshell Barge dump scow	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
4	Clamshell Tugboat propulsion engine	0.4158559	0.3701118	0.41585591	8.1336523	0.0067515	6.115528	0.4507756	0.3617301	3.8836E-06	1.71988E-05	0.3669524
4	Clamshell Tugboat auxiliary engine	0.0308775	0.027481	0.0308775	1.1314398	0.0012175	1.2130446	0.0627056	0.0652281	5.40233E-07	3.10134E-06	0.0661658
4	Clamshell Tugboat propulsion engine	7.4854063	6.6620116	7.48540633	146.40574	0.1215278	110.0795	8.1139603	6.5111411	6.99049E-05	0.000309579	6.6051432
4	Clamshell Tugboat auxiliary engine	0.555795	0.4946575	0.55579497	20.365916	0.0219142	21.834802	1.1287005	1.1741058	9.72419E-06	5.5824E-05	1.1909844
4	Clamshell Crew boat propulsion engine	0.2761194	0.2457462	0.27611938	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
4	Clamshell Crew boat auxiliary engine	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
4	Clamshell Survey boat propulsion engine	0.2463834	0.2192813	0.24638345	4.8189703	0.0040001	3.623286	0.2670724	0.2143153	2.30093E-06	1.01898E-05	0.2174094
5	West Basin (clam shell dredge 717,000 CY)											
5	Marine Clamshell Dredge											
5	Clamshell Dredge hoist	0.4365079	0.4365079	0.43650794	13.269841	0.0145332	7.5661376	0.7354286	0.5785377	0	0	0.5785377
5	Clamshell Dredge generator	0.327381	0.327381	0.32738095	9.952381	0.0108999	5.6746032	0.5515714	0.3196447	0	0	0.3196447
5	Clamshell Barge dump scow	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
5	Clamshell Tugboat propulsion engine	0.4158559	0.3701118	0.41585591	8.1336523	0.0067515	6.115528	0.4507756	0.3617301	3.8836E-06	1.71988E-05	0.3669524
5	Clamshell Tugboat auxiliary engine	0.0308775	0.027481	0.0308775	1.1314398	0.0012175	1.2130446	0.0627056	0.0652281	5.40233E-07	3.10134E-06	0.0661658
5	Clamshell Tugboat propulsion engine	7.4854063	6.6620116	7.48540633	146.40574	0.1215278	110.0795	8.1139603	6.5111411	6.99049E-05	0.000309579	6.6051432
5	Clamshell Tugboat auxiliary engine	0.555795	0.4946575	0.55579497	20.365916	0.0219142	21.834802	1.1287005	1.1741058	9.72419E-06	5.5824E-05	1.1909844
5	Clamshell Crew boat propulsion engine	0.2761194	0.2457462	0.27611938	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
5	Clamshell Crew boat auxiliary engine	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
5	Clamshell Survey boat propulsion engine	0.2463834	0.2192813	0.24638345	4.8189703	0.0040001	3.623286	0.2670724	0.2143153	2.30093E-06	1.01898E-05	0.2174094
6	Pier J Basin (clam shell dredge 258,000 CY)											
6	Marine Clamshell Dredge											
6	Clamshell Dredge hoist	0.4365079	0.4365079	0.43650794	13.269841	0.0145332	7.5661376	0.7354286	0.5785377	0	0	0.5785377
6	Clamshell Dredge generator	0.327381	0.327381	0.32738095	9.952381	0.0108999	5.6746032	0.5515714	0.3196447	0	0	0.3196447
6	Clamshell Barge dump scow	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
6	Clamshell Tugboat propulsion engine	0.4158559	0.3701118	0.41585591	8.1336523	0.0067515	6.115528	0.4507756	0.3617301	3.8836E-06	1.71988E-05	0.3669524
6	Clamshell Tugboat auxiliary engine	0.0308775	0.027481	0.0308775	1.1314398	0.0012175	1.2130446	0.0627056	0.0652281	5.40233E-07	3.10134E-06	0.0661658
6	Clamshell Tugboat propulsion engine	7.4854063	6.6620116	7.48540633	146.40574	0.1215278	110.0795	8.1139603	6.5111411	6.99049E-05	0.000309579	6.6051432
6	Clamshell Tugboat auxiliary engine	0.555795	0.4946575	0.55579497	20.365916	0.0219142	21.834802	1.1287005	1.1741058	9.72419E-06	5.5824E-05	1.1909844
6	Clamshell Crew boat propulsion engine	0.2761194	0.2457462	0.27611938	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
6	Clamshell Crew boat auxiliary engine	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
6	Clamshell Survey boat propulsion engine	0.2463834	0.2192813	0.24638345	4.8189703	0.0040001	3.623286	0.2670724	0.2143153	2.30093E-06	1.01898E-05	0.2174094
7	Pier J Basin (clam shell dredge 46,000 CY)											
7	Marine Clamshell Dredge											
7	Clamshell Dredge hoist	0.4365079	0.4365079	0.43650794	13.269841	0.0145332	7.5661376	0.7354286	0.5785377	0	0	0.5785377
7	Clamshell Dredge generator	0.327381	0.327381	0.32738095	9.952381	0.0108999	5.6746032	0.5515714	0.3196447	0	0	0.3196447
7	Clamshell Barge dump scow	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
7	Clamshell Tugboat propulsion engine	0.4158559	0.3701118	0.41585591	8.1336523	0.0067515	6.115528	0.4507756	0.3617301	3.8836E-06	1.71988E-05	0.3669524
7	Clamshell Tugboat auxiliary engine	0.0308775	0.027481	0.0308775	1.1314398	0.0012175	1.2130446	0.0627056	0.0652281	5.40233E-07	3.10134E-06	0.0661658
7	Clamshell Tugboat propulsion engine	7.4854063	6.6620116	7.48540633	146.40574	0.1215278	110.0795	8.1139603	6.5111411	6.99049E-05	0.000309579	6.6051432
7	Clamshell Tugboat auxiliary engine	0.555795	0.4946575	0.55579497	20.365916	0.0219142	21.834802	1.1287005	1.1741058	9.72419E-06	5.5824E-05	1.1909844
7	Clamshell Crew boat propulsion engine	0.2761194	0.2457462	0.27611938	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
7	Clamshell Crew boat auxiliary engine	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
7	Clamshell Survey boat propulsion engine	0.2463834	0.2192813	0.24638345	4.8189703	0.0040001	3.623286	0.2670724	0.2143153	2.30093E-06	1.01898E-05	0.2174094
Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.												

**Table H1.29**  
**Alternative 5 Emissions by Task**

		Mitigated Emissions										
		Total										
		PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
4	Main Channel Widening (clam shell dredge 1,065,000 CY)											
4	Marine Clamshell Dredge											
4	Clamshell Dredge hoist	77.261905	77.261905	77.261905	2348.7619	2.5723764	1339.2063	130.17086	102.40116	0	0	102.40116
4	Clamshell Dredge generator	57.946429	57.946429	57.946429	1761.5714	1.9292823	1004.4048	97.628143	56.577116	0	0	56.577116
4	Clamshell Barge dump scow	8.1944444	8.1944444	8.1944444	155.69444	0.2728278	142.03704	8.62875	6.7663102	0	0	6.7663102
4	Clamshell Tugboat propulsion engine	73.606496	65.509781	73.606496	1439.6565	1.1950231	1082.4485	79.787276	64.02622	0.000687398	0.003044191	64.950574
4	Clamshell Tugboat auxiliary engine	5.4653172	4.8641323	5.4653172	200.26484	0.2154897	214.70889	11.098888	11.545373	9.56212E-05	0.000548936	11.711347
4	Clamshell Tugboat propulsion engine	1324.9169	1179.1761	1324.9169	25913.816	21.510416	19484.072	1436.171	1152.472	0.012373165	0.054795446	1169.11307
4	Clamshell Tugboat auxiliary engine	98.37571	87.554382	98.37571	3604.7671	3.8788137	3864.76	199.77999	207.81672	0.001721181	0.009880856	210.80424
4	Clamshell Crew boat propulsion engine	48.87313	43.497086	48.87313	955.90093	0.7934696	718.7225	52.977036	42.512033	0.000456418	0.002021278	43.125785
4	Clamshell Crew boat auxiliary engine	2.0857502	1.8563176	2.0857502	76.427845	0.0822383	81.940185	4.2357116	4.4061055	3.64923E-05	0.000209493	4.4694466
4	Clamshell Survey boat propulsion engine	43.60987	38.812784	43.60987	852.95775	0.7080191	641.32162	47.271816	37.933814	0.000407265	0.001803602	38.481469
5	West Basin (clam shell dredge 717,000 CY)											
5	Marine Clamshell Dredge											
5	Clamshell Dredge hoist	52.380952	52.380952	52.380952	1592.381	1.743984	907.93651	88.251429	69.424519	0	0	69.424519
5	Clamshell Dredge generator	39.285714	39.285714	39.285714	1194.2857	1.307988	680.95238	66.188571	38.357367	0	0	38.357367
5	Clamshell Barge dump scow	5.5555556	5.5555556	5.5555556	105.55556	0.184968	96.296296	5.85	4.587329	0	0	4.587329
5	Clamshell Tugboat propulsion engine	49.902709	44.413411	49.902709	976.03828	0.8101852	733.86337	54.093069	43.407607	0.000466033	0.002063859	44.034288
5	Clamshell Tugboat auxiliary engine	3.7052998	3.2977168	3.7052998	135.77277	0.1460947	145.56535	7.5246699	7.8273717	6.48279E-05	0.00037216	7.9398962
5	Clamshell Tugboat propulsion engine	898.24876	799.4414	898.24876	17568.689	14.583333	13209.541	973.67524	781.33693	0.008388587	0.037149455	792.61718
5	Clamshell Tugboat auxiliary engine	66.695396	59.358903	66.695396	2443.9099	2.6297042	2620.1763	135.44406	140.89269	0.001166903	0.006698886	142.91813
5	Clamshell Crew boat propulsion engine	33.134326	29.48955	33.134326	648.06843	0.5379455	487.26949	35.916634	28.821718	0.000309436	0.001370358	29.23782
5	Clamshell Crew boat auxiliary engine	1.4140679	1.2585204	1.4140679	51.815488	0.0557547	55.552668	2.8716689	2.9871902	2.47405E-05	0.000142029	3.0013333
5	Clamshell Survey boat propulsion engine	29.566014	26.313752	29.566014	578.27644	0.4800129	434.79432	32.048689	25.71784	0.000276112	0.001222781	26.089132
6	Pier J Basin (clam shell dredge 258,000 CY)											
6	Marine Clamshell Dredge											
6	Clamshell Dredge hoist	18.769841	18.769841	18.769841	570.60317	0.6249276	325.34392	31.623429	24.877119	0	0	24.877119
6	Clamshell Dredge generator	14.077381	14.077381	14.077381	427.95238	0.4686957	244.00794	23.717571	13.744723	0	0	13.744723
6	Clamshell Barge dump scow	1.9907407	1.9907407	1.9907407	37.824074	0.0662802	34.506173	2.09625	1.6437929	0	0	1.6437929
6	Clamshell Tugboat propulsion engine	17.881804	15.914806	17.881804	349.74705	0.2903163	262.96771	19.38335	15.554393	0.000166995	0.000739549	15.778953
6	Clamshell Tugboat auxiliary engine	1.3277324	1.1861819	1.3277324	48.65191	0.0253506	52.160917	2.6963401	2.8048082	2.323E-05	0.000133357	2.8451295
6	Clamshell Tugboat propulsion engine	321.87247	286.4665	321.87247	6295.4469	5.0526693	4733.4187	348.90029	279.97907	0.00300591	0.013311888	284.02116
6	Clamshell Tugboat auxiliary engine	23.899184	21.270274	23.899184	875.73438	0.9423107	938.8955	48.534121	50.486548	0.00041814	0.002400434	51.212331
6	Clamshell Crew boat propulsion engine	11.873133	10.567089	11.873133	232.22452	0.1927638	174.6049	12.870127	10.327782	0.000101881	0.000491045	10.476886
6	Clamshell Crew boat auxiliary engine	0.5067077	0.4509698	0.5067077	18.567217	0.0199788	19.906373	1.0290147	1.0704098	8.86536E-06	5.08937E-05	1.0857978
6	Clamshell Survey boat propulsion engine	10.594488	9.4290945	10.594488	207.21572	0.1720046	155.8013	11.484114	9.2155595	9.89401E-05	0.000438163	9.3486056
7	Pier J Basin (clam shell dredge 46,000 CY)											
7	Marine Clamshell Dredge											
7	Clamshell Dredge hoist	3.4920635	3.4920635	3.4920635	106.15873	0.1162656	60.529101	5.8834286	4.6283012	0	0	4.6283012
7	Clamshell Dredge generator	2.6190476	2.6190476	2.6190476	79.619048	0.0871992	45.396825	4.4215714	2.5571578	0	0	2.5571578
7	Clamshell Barge dump scow	0.3073074	0.3073074	0.3073074	7.037037	0.0123312	6.4197531	0.39	0.3058219	0	0	0.3058219
7	Clamshell Tugboat propulsion engine	3.3268473	2.9608941	3.3268473	65.069218	0.0540123	48.924224	3.6062046	2.8938405	3.10688E-05	0.000137591	2.9356192
7	Clamshell Tugboat auxiliary engine	0.24702	0.2198478	0.24702	9.0515181	0.0097396	9.7043566	0.5016447	0.5218248	4.32186E-06	2.48107E-05	0.5293264
7	Clamshell Tugboat propulsion engine	59.883251	53.296093	59.883251	1171.2459	0.9722222	880.63604	64.911682	52.089129	0.000559239	0.002476632	56.841145
7	Clamshell Tugboat auxiliary engine	4.4463598	3.9572602	4.4463598	162.29733	0.1753136	174.67842	9.026039	9.3928461	7.77935E-05	0.000446592	9.5278754
7	Clamshell Crew boat propulsion engine	2.208955	1.96597	2.208955	30.244652	0.035863	32.484633	2.3944423	1.9214478	0.002629E-05	9.13572E-05	1.949188
7	Clamshell Crew boat auxiliary engine	0.0942712	0.0839014	0.0942712	3.4543659	0.003717	3.7035112	0.1914446	0.199146	1.64937E-06	9.4686E-06	0.2020089
7	Clamshell Survey boat propulsion engine	1.9710676	1.7542501	1.9710676	38.551763	0.0320009	28.986288	2.136579	1.7145227	1.84075E-05	8.15187E-05	1.7392755
Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.												

Table H1.29  
Alternative 5 Emissions by Task

						Unmitigated Emissions										
						Peak Day										
						PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
Task ID	Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)				
<b>8 Pier J Approach (clam shell dredge 1,994,000 CY)</b>																
8	<b>Marine Clamshell Dredge</b>															
8	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	332	4.3650794	4.3650794	4.36507937	132.69841	0.145332	75.661376	7.3542857	5.7853765	0	0	5.7853765
8	Clamshell Dredge generator	Marine Equipment	dredging	onsite	332	3.2738095	3.2738095	3.27380952	99.52381	0.108999	56.746032	5.5157143	3.1964473	0	0	3.1964473
8	Clamshell Barge dump scow	Marine Equipment	disposal	offsite	332	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
8	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	332	0.6115528	0.544282	0.6115528	11.387113	0.0067515	6.115528	0.6310858	0.3617301	5.43705E-06	1.71988E-05	0.3669912
8	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	332	0.0882214	0.0785171	0.08822142	1.5714441	0.0012175	1.1027678	0.0870911	0.0652281	7.50323E-07	3.10134E-06	0.0661711
8	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	332	11.00795	9.7970759	11.0079505	204.96804	0.1215278	110.0795	11.359544	6.5111411	9.78668E-05	0.000309579	6.6058422
8	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	332	1.5879856	1.4133072	1.58798563	28.285994	0.0219142	19.84982	1.5676396	1.1741058	1.35058E-05	5.5824E-05	1.191079
8	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	332	0.4060579	0.3613915	0.40605791	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
8	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	332	0.0336683	0.0299648	0.03366828	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
8	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	332	0.3623286	0.3224725	0.3623286	7.1596131	0.0040001	3.623286	0.3967933	0.2143153	3.41853E-06	1.01898E-05	0.2174374
<b>9 Pier J Approach (clam shell dredge 679,000 CY)</b>																
9	<b>Marine Clamshell Dredge</b>															
9	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	113	4.3650794	4.3650794	4.36507937	132.69841	0.145332	75.661376	7.3542857	5.7853765	0	0	5.7853765
9	Clamshell Dredge generator	Marine Equipment	dredging	onsite	113	3.2738095	3.2738095	3.27380952	99.52381	0.108999	56.746032	5.5157143	3.1964473	0	0	3.1964473
9	Clamshell Barge dump scow	Marine Equipment	disposal	offsite	113	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
9	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	113	0.6115528	0.544282	0.6115528	11.387113	0.0067515	6.115528	0.6310858	0.3617301	5.43705E-06	1.71988E-05	0.3669912
9	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	113	0.0882214	0.0785171	0.08822142	1.5714441	0.0012175	1.1027678	0.0870911	0.0652281	7.50323E-07	3.10134E-06	0.0661711
9	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	113	11.00795	9.7970759	11.0079505	204.96804	0.1215278	110.0795	11.359544	6.5111411	9.78668E-05	0.000309579	6.6058422
9	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	113	1.5879856	1.4133072	1.58798563	28.285994	0.0219142	19.84982	1.5676396	1.1741058	1.35058E-05	5.5824E-05	1.191079
9	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	113	0.4060579	0.3613915	0.40605791	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
9	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	113	0.0336683	0.0299648	0.03366828	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
9	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	113	0.3623286	0.3224725	0.3623286	7.1596131	0.0040001	3.623286	0.3967933	0.2143153	3.41853E-06	1.01898E-05	0.2174374
<b>10 Standby Area (clam shell dredge 921,000 CY)</b>																
10	<b>Marine Clamshell Dredge</b>															
10	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	227	4.3650794	4.3650794	4.36507937	132.69841	0.145332	75.661376	7.3542857	5.7853765	0	0	5.7853765
10	Clamshell Dredge generator	Marine Equipment	dredging	onsite	227	3.2738095	3.2738095	3.27380952	99.52381	0.108999	56.746032	5.5157143	3.1964473	0	0	3.1964473
10	Clamshell Barge dump scow	Marine Equipment	disposal	offsite	227	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
10	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	227	0.6115528	0.544282	0.6115528	11.387113	0.0067515	6.115528	0.6310858	0.3617301	5.43705E-06	1.71988E-05	0.3669912
10	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	227	0.0882214	0.0785171	0.08822142	1.5714441	0.0012175	1.1027678	0.0870911	0.0652281	7.50323E-07	3.10134E-06	0.0661711
10	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	227	11.00795	9.7970759	11.0079505	204.96804	0.1215278	110.0795	11.359544	6.5111411	9.78668E-05	0.000309579	6.6058422
10	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	227	1.5879856	1.4133072	1.58798563	28.285994	0.0219142	19.84982	1.5676396	1.1741058	1.35058E-05	5.5824E-05	1.191079
10	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	227	0.4060579	0.3613915	0.40605791	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
10	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	227	0.0336683	0.0299648	0.03366828	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
10	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	227	0.3623286	0.3224725	0.3623286	7.1596131	0.0040001	3.623286	0.3967933	0.2143153	3.41853E-06	1.01898E-05	0.2174374
<b>11 Standby Area (clam shell dredge 118,000 CY)</b>																
11	<b>Marine Clamshell Dredge</b>															
11	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	54	4.3650794	4.3650794	4.36507937	132.69841	0.145332	75.661376	7.3542857	5.7853765	0	0	5.7853765
11	Clamshell Dredge generator	Marine Equipment	dredging	onsite	54	3.2738095	3.2738095	3.27380952	99.52381	0.108999	56.746032	5.5157143	3.1964473	0	0	3.1964473
11	Clamshell Barge dump scow	Marine Equipment	disposal	offsite	54	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
11	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	54	0.6115528	0.544282	0.6115528	11.387113	0.0067515	6.115528	0.6310858	0.3617301	5.43705E-06	1.71988E-05	0.3669912
11	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	54	0.0882214	0.0785171	0.08822142	1.5714441	0.0012175	1.1027678	0.0870911	0.0652281	7.50323E-07	3.10134E-06	0.0661711
11	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	54	11.00795	9.7970759	11.0079505	204.96804	0.1215278	110.0795	11.359544	6.5111411	9.78668E-05	0.000309579	6.6058422
11	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	54	1.5879856	1.4133072	1.58798563	28.285994	0.0219142	19.84982	1.5676396	1.1741058	1.35058E-05	5.5824E-05	1.191079
11	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	54	0.4060579	0.3613915	0.40605791	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
11	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	54	0.0336683	0.0299648	0.03366828	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
11	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	54	0.3623286	0.3224725	0.3623286	7.1596131	0.0040001	3.623286	0.3967933	0.2143153	3.41853E-06	1.01898E-05	0.2174374



Table H1.29

## Alternative 5 Emissions by Task

			Unmitigated Emissions										
			Total										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment		(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
8	Pier J Approach (clam shell dredge 1,994,000 CY)												
8	Marine Clamshell Dredge												
8	Clamshell Dredge hoist		1449.2063	1449.2063	1449.2063	44055.873	48.250224	25119.577	2441.6229	1920.745	0	0	1920.745
8	Clamshell Dredge generator		1086.9048	1086.9048	1086.9048	33041.905	36.187668	18839.683	1831.2171	1061.2205	0	0	1061.2205
8	Clamshell Barge dump scow		15.37037	15.37037	15.37037	292.03704	0.5117448	266.41975	16.185	12.69161	0	0	12.69161
8	Clamshell Tugboat propulsion engine		203.03553	180.70162	203.03553	3780.5216	2.2415123	2030.3553	209.52049	120.09438	0.0018051	0.005710009	121.84109
8	Clamshell Tugboat auxiliary engine		29.289513	26.067666	29.289513	521.71945	0.4041953	366.11891	28.914241	21.655728	0.000249107	0.001029644	21.96879
8	Clamshell Tugboat propulsion engine		3654.6396	3252.6292	3654.6396	68049.389	40.347221	36546.396	3771.3687	2161.6988	0.032491792	0.102780159	2193.1396
8	Clamshell Tugboat auxiliary engine		527.21123	469.21799	527.21123	9390.95	7.275515	6590.1404	520.45634	389.80311	0.004483932	0.018533584	395.43822
8	Clamshell Crew boat propulsion engine		134.81123	119.98199	134.81123	2663.8698	1.4883159	1348.1123	147.63447	79.740085	0.001271928	0.003791323	80.901698
8	Clamshell Crew boat auxiliary engine		11.17787	9.9483044	11.17787	199.10581	0.1542546	139.72338	11.034654	8.2645595	9.50678E-05	0.000392947	8.3840343
8	Clamshell Survey boat propulsion engine		120.29309	107.06085	120.29309	2376.9915	1.3280358	1202.9309	131.73537	71.152692	0.001134951	0.003383027	72.189207
9	Pier J Approach (clam shell dredge 679,000 CY)												
9	Marine Clamshell Dredge												
9	Clamshell Dredge hoist		493.25397	493.25397	493.25397	14994.921	16.422516	8549.7354	831.03429	653.74755	0	0	653.74755
9	Clamshell Dredge generator		369.94048	369.94048	369.94048	11246.19	12.316887	6412.3016	623.27571	361.19854	0	0	361.19854
9	Clamshell Barge dump scow		5.2314815	5.2314815	5.2314815	99.398148	0.1741782	90.679012	5.50875	4.3197348	0	0	4.3197348
9	Clamshell Tugboat propulsion engine		69.105467	61.503866	69.105467	1286.7438	0.7629244	691.05467	71.312696	40.875497	0.000614386	0.001943467	41.470009
9	Clamshell Tugboat auxiliary engine		9.9690209	8.8724286	9.9690209	177.57318	0.1375725	124.61276	9.8412928	7.370775	8.47865E-05	0.000350451	7.4773291
9	Clamshell Tugboat propulsion engine		1243.8984	1107.0696	1243.8984	23161.388	13.732638	12438.984	1283.6285	735.75894	0.011058953	0.034982404	746.46017
9	Clamshell Tugboat auxiliary engine		179.44238	159.70371	179.44238	3196.3173	2.4763048	2243.0297	177.14327	132.67395	0.001526157	0.006308117	134.59192
9	Clamshell Crew boat propulsion engine		45.884544	40.837244	45.884544	906.67859	0.5065654	458.84544	50.249082	27.140451	0.000432915	0.00129042	27.535819
9	Clamshell Crew boat auxiliary engine		3.804516	3.3860193	3.804516	67.767942	0.0525023	47.55645	3.7557707	2.8129374	3.23574E-05	0.000133744	2.853602
9	Clamshell Survey boat propulsion engine		40.943131	36.439387	40.943131	809.03628	0.4520122	409.43131	44.837642	24.217633	0.000386294	0.001151452	24.570423
10	Standby Area (clam shell dredge 921,000 CY)												
10	Marine Clamshell Dredge												
10	Clamshell Dredge hoist		990.87302	990.87302	990.87302	30122.54	32.990364	17175.132	1669.4229	1313.2805	0	0	1313.2805
10	Clamshell Dredge generator		743.15476	743.15476	743.15476	22591.905	24.742773	12881.349	1252.0671	725.59353	0	0	725.59353
10	Clamshell Barge dump scow		10.509259	10.509259	10.509259	199.67593	0.3498978	182.16049	11.06625	8.6776973	0	0	8.6776973
10	Clamshell Tugboat propulsion engine		138.82249	123.55201	138.82249	2584.8747	1.5326003	1388.2249	143.25648	82.112723	0.00123421	0.003904133	83.30701
10	Clamshell Tugboat auxiliary engine		20.026263	17.823374	20.026263	356.71781	0.2763624	250.32829	19.769677	14.806778	0.000170323	0.000704003	15.020829
10	Clamshell Tugboat propulsion engine		2498.8048	2223.9362	2498.8048	46527.745	27.586805	24988.048	2578.6166	1478.029	0.022215774	0.070274386	1499.5262
10	Clamshell Tugboat auxiliary engine		360.47274	320.82074	360.47274	6420.9206	4.9745238	4505.9092	355.85418	266.52201	0.003065821	0.012672059	270.37493
10	Clamshell Crew boat propulsion engine		92.175146	82.03588	92.175146	1821.3809	1.0176136	921.75146	100.94285	54.521082	0.000869661	0.00259226	55.315318
10	Clamshell Crew boat auxiliary engine		7.6427003	6.8020033	7.6427003	136.1356	0.1054693	95.533754	7.5447782	5.6507681	6.50012E-05	0.000268671	5.7324572
10	Clamshell Survey boat propulsion engine		82.248592	73.201246	82.248592	1625.2322	0.9080245	822.48592	90.072078	48.649581	0.000776006	0.002313094	49.358283
11	Standby Area (clam shell dredge 118,000 CY)												
11	Marine Clamshell Dredge												
11	Clamshell Dredge hoist		235.71429	235.71429	235.71429	7165.7143	7.847928	4085.7143	397.13143	312.41033	0	0	312.41033
11	Clamshell Dredge generator		176.78571	176.78571	176.78571	5374.2857	5.885946	3064.2857	297.84857	172.60815	0	0	172.60815
11	Clamshell Barge dump scow		2.5	2.5	2.5	47.5	0.0832356	43.333333	2.6325	2.064298	0	0	2.064298
11	Clamshell Tugboat propulsion engine		33.023851	29.391228	33.023851	614.90411	0.3645833	330.23851	34.078633	19.533423	0.000293601	0.000928736	19.817527
11	Clamshell Tugboat auxiliary engine		4.7639569	4.2399216	4.7639569	84.857982	0.0657426	59.549461	4.7029187	3.5223173	4.05175E-05	0.000167472	3.5732369
11	Clamshell Tugboat propulsion engine		594.42933	529.0421	594.42933	11068.274	6.5624998	5944.2933	613.4154	351.60162	0.00528481	0.016717255	356.71548
11	Clamshell Tugboat auxiliary engine		85.751224	76.318589	85.751224	1527.4437	1.1833669	1071.8903	84.652537	63.401711	0.000729314	0.003014499	64.318264
11	Clamshell Crew boat propulsion engine		21.927127	19.515143	21.927127	433.28003	0.2420755	219.27127	24.012836	12.969773	0.00020688	0.000616661	13.15871
11	Clamshell Crew boat auxiliary engine		1.8180873	1.6180977	1.8180873	32.38468	0.0250896	22.726091	1.7947931	1.3442356	1.54628E-05	6.3913E-05	1.3636682
11	Clamshell Survey boat propulsion engine		19.565744	17.413512	19.565744	386.61911	0.2160058	195.65744	21.426838	11.573028	0.0001846	0.000550251	11.741618

Table H1.29  
Alternative 5 Emissions by Task

			Mitigated											
			Peak Day											
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e	
Task ID		Construction Element/Equipment	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
8		Pier J Approach (clam shell dredge 1,994,000 CY)												
8		Marine Clamshell Dredge												
8		Clamshell Dredge hoist	0.4365079	0.4365079	0.43650794	13.269841	0.0145332	7.5661376	0.7354286	0.5785377		0	0	0.5785377
8		Clamshell Dredge generator	0.327381	0.327381	0.32738095	9.952381	0.0108999	5.6746032	0.5515714	0.3196447		0	0	0.3196447
8		Clamshell Barge dump scow	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277		0	0	0.0382277
8		Clamshell Tugboat propulsion engine	0.4158559	0.3701118	0.41585591	8.1336523	0.0067515	6.115528	0.4507756	0.3617301	3.8836E-06	1.71988E-05	0.3669524	
8		Clamshell Tugboat auxiliary engine	0.0308775	0.027481	0.0308775	1.1314398	0.0012175	1.2130446	0.0627056	0.0652281	5.40233E-07	3.10134E-06	0.0661658	
8		Clamshell Tugboat propulsion engine	7.4854063	6.6620116	7.48540633	146.40574	0.1215278	110.0795	8.1139603	6.5111411	6.99049E-05	0.000309579	6.6051432	
8		Clamshell Tugboat auxiliary engine	0.555795	0.4946575	0.55579497	20.365916	0.0219142	21.834802	1.1287005	1.1741058	9.72419E-06	5.5824E-05	1.1909844	
8		Clamshell Crew boat propulsion engine	0.2761194	0.2457462	0.27611938	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485	
8		Clamshell Crew boat auxiliary engine	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511	
8		Clamshell Survey boat propulsion engine	0.2463834	0.2192813	0.24638345	4.8189703	0.0040001	3.623286	0.2670724	0.2143153	2.30093E-06	1.01898E-05	0.2174094	
9		Pier J Approach (clam shell dredge 679,000 CY)												
9		Marine Clamshell Dredge												
9		Clamshell Dredge hoist	0.4365079	0.4365079	0.43650794	13.269841	0.0145332	7.5661376	0.7354286	0.5785377		0	0	0.5785377
9		Clamshell Dredge generator	0.327381	0.327381	0.32738095	9.952381	0.0108999	5.6746032	0.5515714	0.3196447		0	0	0.3196447
9		Clamshell Barge dump scow	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277		0	0	0.0382277
9		Clamshell Tugboat propulsion engine	0.4158559	0.3701118	0.41585591	8.1336523	0.0067515	6.115528	0.4507756	0.3617301	3.8836E-06	1.71988E-05	0.3669524	
9		Clamshell Tugboat auxiliary engine	0.0308775	0.027481	0.0308775	1.1314398	0.0012175	1.2130446	0.0627056	0.0652281	5.40233E-07	3.10134E-06	0.0661658	
9		Clamshell Tugboat propulsion engine	7.4854063	6.6620116	7.48540633	146.40574	0.1215278	110.0795	8.1139603	6.5111411	6.99049E-05	0.000309579	6.6051432	
9		Clamshell Tugboat auxiliary engine	0.555795	0.4946575	0.55579497	20.365916	0.0219142	21.834802	1.1287005	1.1741058	9.72419E-06	5.5824E-05	1.1909844	
9		Clamshell Crew boat propulsion engine	0.2761194	0.2457462	0.27611938	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485	
9		Clamshell Crew boat auxiliary engine	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511	
9		Clamshell Survey boat propulsion engine	0.2463834	0.2192813	0.24638345	4.8189703	0.0040001	3.623286	0.2670724	0.2143153	2.30093E-06	1.01898E-05	0.2174094	
10		Standby Area (clam shell dredge 921,000 CY)												
10		Marine Clamshell Dredge												
10		Clamshell Dredge hoist	0.4365079	0.4365079	0.43650794	13.269841	0.0145332	7.5661376	0.7354286	0.5785377		0	0	0.5785377
10		Clamshell Dredge generator	0.327381	0.327381	0.32738095	9.952381	0.0108999	5.6746032	0.5515714	0.3196447		0	0	0.3196447
10		Clamshell Barge dump scow	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277		0	0	0.0382277
10		Clamshell Tugboat propulsion engine	0.4158559	0.3701118	0.41585591	8.1336523	0.0067515	6.115528	0.4507756	0.3617301	3.8836E-06	1.71988E-05	0.3669524	
10		Clamshell Tugboat auxiliary engine	0.0308775	0.027481	0.0308775	1.1314398	0.0012175	1.2130446	0.0627056	0.0652281	5.40233E-07	3.10134E-06	0.0661658	
10		Clamshell Tugboat propulsion engine	7.4854063	6.6620116	7.48540633	146.40574	0.1215278	110.0795	8.1139603	6.5111411	6.99049E-05	0.000309579	6.6051432	
10		Clamshell Tugboat auxiliary engine	0.555795	0.4946575	0.55579497	20.365916	0.0219142	21.834802	1.1287005	1.1741058	9.72419E-06	5.5824E-05	1.1909844	
10		Clamshell Crew boat propulsion engine	0.2761194	0.2457462	0.27611938	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485	
10		Clamshell Crew boat auxiliary engine	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511	
10		Clamshell Survey boat propulsion engine	0.2463834	0.2192813	0.24638345	4.8189703	0.0040001	3.623286	0.2670724	0.2143153	2.30093E-06	1.01898E-05	0.2174094	
11		Standby Area (clam shell dredge 118,000 CY)												
11		Marine Clamshell Dredge												
11		Clamshell Dredge hoist	0.4365079	0.4365079	0.43650794	13.269841	0.0145332	7.5661376	0.7354286	0.5785377		0	0	0.5785377
11		Clamshell Dredge generator	0.327381	0.327381	0.32738095	9.952381	0.0108999	5.6746032	0.5515714	0.3196447		0	0	0.3196447
11		Clamshell Barge dump scow	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277		0	0	0.0382277
11		Clamshell Tugboat propulsion engine	0.4158559	0.3701118	0.41585591	8.1336523	0.0067515	6.115528	0.4507756	0.3617301	3.8836E-06	1.71988E-05	0.3669524	
11		Clamshell Tugboat auxiliary engine	0.0308775	0.027481	0.0308775	1.1314398	0.0012175	1.2130446	0.0627056	0.0652281	5.40233E-07	3.10134E-06	0.0661658	
11		Clamshell Tugboat propulsion engine	7.4854063	6.6620116	7.48540633	146.40574	0.1215278	110.0795	8.1139603	6.5111411	6.99049E-05	0.000309579	6.6051432	
11		Clamshell Tugboat auxiliary engine	0.555795	0.4946575	0.55579497	20.365916	0.0219142	21.834802	1.1287005	1.1741058	9.72419E-06	5.5824E-05	1.1909844	
11		Clamshell Crew boat propulsion engine	0.2761194	0.2457462	0.27611938	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485	
11		Clamshell Crew boat auxiliary engine	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511	
11		Clamshell Survey boat propulsion engine	0.2463834	0.2192813	0.24638345	4.8189703	0.0040001	3.623286	0.2670724	0.2143153	2.30093E-06	1.01898E-05	0.2174094	

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.29  
Alternative 5 Emissions by Task

			Mitigated Emissions										
			Total										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
8		Pier J Approach (clam shell dredge 1,994,000 CY)											
8		Marine Clamshell Dredge											
8		Clamshell Dredge hoist	144.92063	144.92063	144.92063	4405.5873	4.8250224	2511.9577	244.16229	192.0745	0	0	192.0745
8		Clamshell Dredge generator	108.69048	108.69048	108.69048	3304.1905	3.6187668	1883.9683	183.12171	106.12205	0	0	106.12205
8		Clamshell Barge dump scow	15.37037	15.37037	15.37037	292.03704	0.5117448	266.41975	16.185	12.69161	0	0	12.69161
8		Clamshell Tugboat propulsion engine	138.06416	122.8771	138.06416	2700.3726	2.2415123	2030.3553	149.65749	120.09438	0.001289357	0.005710009	121.8282
8		Clamshell Tugboat auxiliary engine	10.251329	9.1236832	10.251329	375.638	0.4041953	402.7308	20.818253	21.655728	0.000179357	0.001029644	21.967046
8		Clamshell Tugboat propulsion engine	2485.1549	2211.7879	2485.1549	48606.706	40.347221	36546.396	2693.8348	2161.6988	0.023208423	0.102780159	2192.9075
8		Clamshell Tugboat auxiliary engine	184.52393	164.2263	184.52393	6761.484	7.275515	7249.1544	374.72856	389.80311	0.003228431	0.018533584	395.40683
8		Clamshell Crew boat propulsion engine	91.671634	81.587754	91.671634	1792.9893	1.4883159	1348.1123	99.369355	79.740085	0.000856105	0.003791323	80.891302
8		Clamshell Crew boat auxiliary engine	3.9122545	3.4819065	3.9122545	143.35618	0.1542546	153.69571	7.9449506	8.2645595	6.84488E-05	0.000392947	8.3833688
8		Clamshell Survey boat propulsion engine	81.799304	72.801381	81.799304	1599.8982	1.3280358	1202.9309	88.66804	71.152692	0.000763909	0.003383027	72.179931
9		Pier J Approach (clam shell dredge 679,000 CY)											
9		Marine Clamshell Dredge											
9		Clamshell Dredge hoist	49.325397	49.325397	49.325397	1499.4921	1.6422516	854.97354	83.103429	65.374755	0	0	65.374755
9		Clamshell Dredge generator	36.994048	36.994048	36.994048	1124.619	1.2316887	641.23016	62.327571	36.119854	0	0	36.119854
9		Clamshell Barge dump scow	5.2314815	5.2314815	5.2314815	99.398148	0.1741782	90.679012	5.50875	4.3197348	0	0	4.3197348
9		Clamshell Tugboat propulsion engine	46.991718	41.822629	46.991718	919.10271	0.7629244	691.05467	50.93764	40.875497	0.000438847	0.001943467	41.465621
9		Clamshell Tugboat auxiliary engine	3.4891573	3.10535	3.4891573	127.85269	0.1375725	137.07404	7.0857308	7.370775	6.10463E-05	0.000350451	7.4767356
9		Clamshell Tugboat propulsion engine	845.85092	752.80731	845.85092	16543.849	13.732638	12438.984	916.87751	735.75894	0.007899252	0.034982404	746.38118
9		Clamshell Tugboat auxiliary engine	62.804832	55.8963	62.804832	2301.3485	2.4763048	2467.3327	127.54316	132.67395	0.001098833	0.006308117	134.58124
9		Clamshell Crew boat propulsion engine	31.20149	27.769326	31.20149	610.26443	0.5065654	458.84544	33.821497	27.140451	0.000291385	0.00129042	27.532281
9		Clamshell Crew boat auxiliary engine	1.3315806	1.1851067	1.3315806	48.792918	0.0525023	52.312095	2.7041549	2.8129374	2.32973E-05	0.000133744	2.8533755
9		Clamshell Survey boat propulsion engine	27.841329	24.778783	27.841329	544.54365	0.4520122	409.43131	30.179182	24.217633	0.000260005	0.001151452	24.567266
10		Standby Area (clam shell dredge 921,000 CY)											
10		Marine Clamshell Dredge											
10		Clamshell Dredge hoist	99.087302	99.087302	99.087302	3012.254	3.2990364	1717.5132	166.94229	131.32805	0	0	131.32805
10		Clamshell Dredge generator	74.315476	74.315476	74.315476	2259.1905	2.4742773	1288.1349	125.20671	72.559353	0	0	72.559353
10		Clamshell Barge dump scow	10.509259	10.509259	10.509259	199.67593	0.3498978	182.16049	11.06625	8.6776973	0	0	8.6776973
10		Clamshell Tugboat propulsion engine	94.399291	84.015369	94.399291	1846.3391	1.5326003	1388.2249	102.32605	82.112723	0.000881578	0.003904133	83.298194
10		Clamshell Tugboat auxiliary engine	7.0091921	6.238181	7.0091921	256.83683	0.2763624	275.36112	14.234167	14.806778	0.000122633	0.000704003	15.019637
10		Clamshell Tugboat propulsion engine	1699.1872	1512.2766	1699.1872	33234.103	27.586805	24988.048	1841.869	1478.029	0.01586841	0.070274386	1499.3675
10		Clamshell Tugboat auxiliary engine	126.16546	112.28726	126.16546	4623.0629	4.9745238	4956.5002	256.21501	266.52201	0.002207391	0.012672059	270.35347
10		Clamshell Crew boat propulsion engine	62.679099	55.784398	62.679099	1225.9294	1.0176136	921.75146	67.9423	54.521082	0.000585349	0.00259226	55.30821
10		Clamshell Crew boat auxiliary engine	2.6749451	2.3807012	2.6749451	98.017632	0.1054693	105.08713	5.4322403	5.6507681	4.68008E-05	0.000268671	5.7320022
10		Clamshell Survey boat propulsion engine	55.929042	49.776848	55.929042	1093.9063	0.9080245	822.48592	60.625437	48.649581	0.000522311	0.002313094	49.351941
11		Standby Area (clam shell dredge 118,000 CY)											
11		Marine Clamshell Dredge											
11		Clamshell Dredge hoist	23.571429	23.571429	23.571429	716.57143	0.7847928	408.57143	39.713143	31.241033	0	0	31.241033
11		Clamshell Dredge generator	17.678571	17.678571	17.678571	537.42857	0.5885946	306.42857	29.784857	17.260815	0	0	17.260815
11		Clamshell Barge dump scow	2.5	2.5	2.5	47.5	0.0832356	43.333333	2.6325	2.064298	0	0	2.064298
11		Clamshell Tugboat propulsion engine	22.456219	19.986035	22.456219	439.21722	0.3645833	330.23851	24.341881	19.533423	0.000209715	0.000928736	19.81543
11		Clamshell Tugboat auxiliary engine	1.6673849	1.4839726	1.6673849	61.097747	0.0657426	65.504407	3.3861015	3.5223173	2.91726E-05	0.000167472	3.5729533
11		Clamshell Tugboat propulsion engine	404.21194	359.74863	404.21194	7905.91	6.5624998	5944.2933	438.15386	351.60162	0.003774864	0.016717255	356.67773
11		Clamshell Tugboat auxiliary engine	30.012928	26.711506	30.012928	1099.7594	1.1833669	1179.0793	60.949826	63.401711	0.000525106	0.003014499	64.313159
11		Clamshell Crew boat propulsion engine	14.910446	13.270297	14.910446	291.63079	0.2420755	219.27127	16.162485	12.969773	0.000139246	0.000616661	13.157019
11		Clamshell Crew boat auxiliary engine	0.6363306	0.5663342	0.6363306	23.31697	0.0250896	24.9987	1.292251	1.3442356	1.11332E-05	6.3913E-05	1.36356
11		Clamshell Survey boat propulsion engine	13.304706	11.841188	13.304706	260.2244	0.2160058	195.65744	14.42191	11.573028	0.00012425	0.000550251	11.740109

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

## **Appendix H2. Criteria Pollutant Dispersion Modeling Analysis**

### **H2.1 Introduction**

This appendix describes the methods and results of the air dispersion modeling performed to evaluate ground-level concentrations of criteria pollutants resulting from construction activities of All Action Alternatives. The Action Alternatives are described in detail in Section 4 (Plan Formulation). The No Action Alternative is also described in detail in Section 4 (Plan Formulation), is assessed qualitatively in Sections 5.5 (Air Quality Environmental Consequences) and 5.6 (Greenhouse Gas Environmental Consequences) of the DEIS/DEIR, and therefore is not included in this appendix. Implementation of the No Action and Action Alternatives would not result in operational activities and would therefore not result in operational impacts.

The air dispersion modeling was performed using the U.S. Environmental Protection Agency's (USEPA) AERMOD Modeling System, version 18081 (USEPA 2019a), which was the most recent version available at the time of the analysis. The following pollutants and averaging times were modeled:

- Nitrogen dioxide (NO<sub>2</sub>) - 1-hour and annual
- Carbon monoxide (CO) - 1-hour and 8-hour
- Sulfur dioxide (SO<sub>2</sub>) - 1-hour and 24-hour
- Particulate matter less than 10 microns in diameter (PM<sub>10</sub>) - 24-hour and annual
- Particulate matter less than 2.5 microns in diameter (PM<sub>2.5</sub>) - 24-hour

For CEQA impacts, the predicted ground-level concentrations were compared to applicable South Coast Air Quality Management District (SCAQMD) ambient air quality thresholds (SCAQMD 2019a) and the federal 1-hour NO<sub>2</sub> standard (USEPA 2019b) to determine their significance. SCAQMD also has ambient air quality thresholds for sulfate and lead; however, these pollutants were not modeled because impacts from the Action Alternatives would be well below the thresholds due to the low sulfur and lead levels in modern diesel fuel used in marine and other diesel equipment. The predicted ground-level concentrations were compared to the national ambient air quality standards (NAAQS) to determine their significance under NEPA.

### **H2.2 Development of Emission Scenarios**

#### **Construction Emissions**

The dispersion modeling analysis included emissions from the following construction sources:

- Marine sources (i.e., diesel engine exhaust from hopper dredge, clamshell dredge, tugboats, crew boats, and survey boats)
- Off-road construction equipment (diesel engine exhaust)
- On-road vehicles driving and idling onsite (diesel engine exhaust)
- Onsite fugitive dust

These construction sources are further described in Section 5.5 of the EIS/EIR. Construction emissions used in the modeling analysis were calculated using the methods described in Appendix H1. The approach to developing the emissions for the various averaging times required for the dispersion modeling analysis is described in the following paragraphs.

Annual emissions were calculated for each year of construction based on the proposed construction schedule and the number of workdays anticipated for each construction activity. Peak daily (i.e., 24-hour) emissions were calculated for each year of construction based on the construction schedule and the anticipated daily hours of operation for each construction activity and equipment type. The peak daily emissions represent the highest emissions that would occur from the various combinations of overlapping construction activities during each year of construction. Peak 8-hour and 1-hour emission rates were scaled from the peak daily emission rates in proportion to the number of operating hours for each activity or equipment type. For example, equipment that would operate 8 hours per day would have scaling factors of 1.0 (8-hr averaging time/8 hours operation per day) for peak 8-hour and 0.125 (1-hr averaging time/8 hours operation per day) for peak 1-hour emissions (applied to the peak daily emission rates). Equipment that would operate 4 hours per day would have scaling factors of 1.0 (i.e., all emissions) for peak 8-hour and 0.25 (1-hr averaging time/4 hours operation per day) for peak 1-hour emissions. This approach conservatively assumes that all equipment that operates on the peak day would also operate during the peak 8-hour and 1-hour periods.

The construction schedule and activity assumptions were developed by USACE, the Port, and the Port's engineering consultant, AECOM, and are presented in Appendix H1 tables.

For the annual averaging period, the analysis year producing the highest total construction emissions within the modeling domain was selected for modeling. Specifically, the construction period when hopper dredging and clamshell dredging would occur in the same year would produce the highest emissions. For Action Alternatives 2, 3, and 5, this construction period would occur in 2025; for Action Alternative 4, this construction period would occur in 2026.

For short-term averaging periods (24-hour, 8-hour, 1-hour), the combination of overlapping construction tasks, described in Appendix H1, that would produce the highest concentrations was selected for modeling. The following three combinations were considered and evaluated via AERMOD test runs:

- Combination 1: Overlap of construction Task 1 (Electrical Substation Construction, mitigated scenario only), Task 2 (Pier J Breakwater Construction), Task 3 (Pier J Wharf Upgrade), and Task 4 (Pier T Wharf Upgrade)
- Combination 2: Overlap of construction Task 5 (Approach Channel Dredging) and Task 6 (Main Channel Widening)
- Combination 3: Construction Task 7 (Dredging of West Basin). This task would not overlap with other construction tasks but was chosen for consideration because dredging in the West Basin would be closest to land-receptors.

AERMOD test runs showed that for all Action Alternatives, the highest short-term concentrations would occur for Combination 2, during overlap of construction Task 5 (Approach Channel Dredging) and Task 6 (Main Channel Widening). Therefore, Combination 2 was selected for modeling.

The schedule and equipment utilization assumed in this analysis are anticipated to result in conservatively high emission estimates because assumptions reflect an accelerated schedule and the earliest foreseeable construction years. Postponement of construction activities from the assumed schedule would likely result in lower impacts as increasingly stringent regulatory requirements are implemented compared to those assumed in the analysis years. The anticipated construction schedule and equipment utilization for each Action Alternative are included in Appendix H1.

## H2.3 Dispersion Model Selection and Inputs

### Model Selection

AERMOD version 18081 (USEPA 2019a) was used to perform the dispersion modeling for the air quality impact analysis. The AERMOD model was selected for the following reasons:

- AERMOD is a USEPA regulatory default model for dispersion modeling;
- General acceptance by the modeling community and regulatory agencies of its ability to provide reasonable results for large industrial complexes with multiple emission sources;
- Ability of the model to handle the various physical characteristics of Project emission sources, including “point,” “area,” and “volume” source types.

### Temporal Distribution

Construction emission sources were modeled with diurnal emission patterns that reflect the daily cycle of activity associated with the Action Alternatives. The diurnal emission patterns assumed in AERMOD are shown in Table H2.1.

**Table H2.1. Temporal Distribution of Emissions in AERMOD**

Source Category	Time Period	Hours per Day
Hopper dredge	12am-12am	24
Clamshell dredge	12am-12am	24
Tugboats	12am-12am	24
Off-road construction equipment	7am-3pm	8
Crew boats	6am-6pm	12
Construction trucks	7am-3pm	8
Fugitive dust	7am-3pm	8

### Emission Source Representation

AERMOD simulated all construction emissions as a collection of line and polygon-area sources. Polygon area sources simulate emissions emanating from a flat, non-rectangular, area with no thermal buoyancy or velocity (plume rise) associated with the emissions. Polygon area sources were used to model all dredging activities, harbor craft activities during dredging activities, on-site truck emissions, and land-side on-site fugitive dust. Line sources simulate emissions from volume sources moving along a path based on a start-point, end-point, and the path width with no thermal buoyancy or velocity (plume rise) associated with the emissions. Line sources were used to model hopper dredge and tugboat activities during transit to off-shore disposal locations.

Table H2.2 provides the source parameters used in AERMOD for the polygon-area and line sources. The initial vertical dimensions for polygon-area and line sources were determined based on USEPA guidance (USEPA 2019c).

All emission sources were positioned by using the Universal Transverse Mercator 13 coordinate system (NAD-83) referenced to topographic data obtained from the United States Geological Survey (USGS).

Figure H2.1 shows the locations of the construction sources modeled in AERMOD. The figure depicts the sources used to model annual concentrations. For short-term concentrations (1-hour, 8-hour, and 24-hour averages), the AERMOD sources associated with dredging activities were condensed into reasonable daily work areas conservatively located closest to on-land receptors. For example, the Approach Channel Dredging task ("J" in the figure) was condensed into a 200 meter by 100 meter rectangular source at the far northern end of the dredging area for the short-term modeling.

**Table H2.2. Source Parameters in AERMOD**

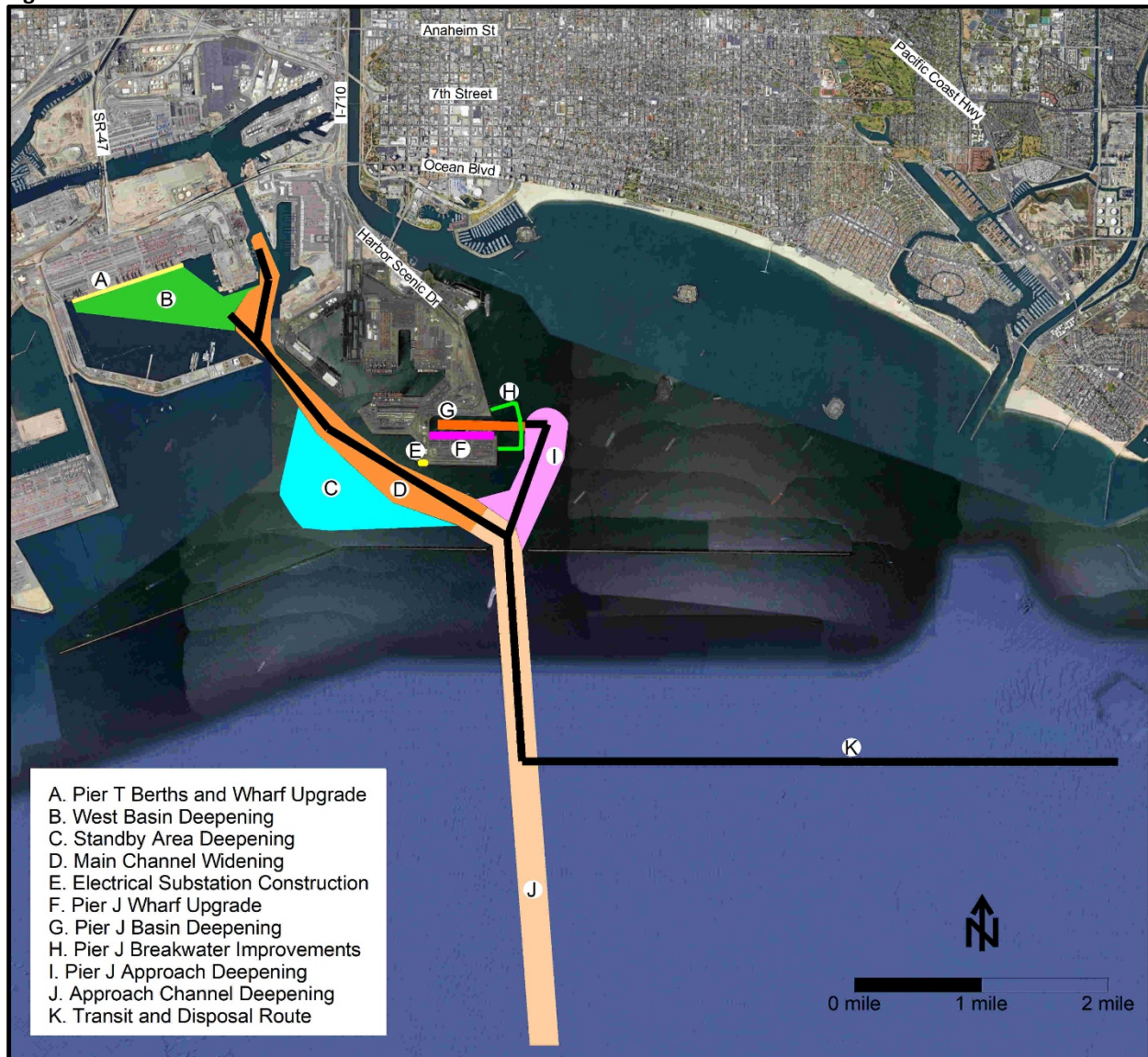
Source Category	Source Type	Source Height (m)	Vertical Dispersion Coefficient $\sigma_z$ (m) <sup>h</sup>	Line Source Width (m)
Hopper dredge – transit <sup>a</sup>	Line	21.29	4.95	100
Hopper dredge – dredging <sup>a</sup>	Poly-area	21.29	4.95	n/a
Clamshell dredge <sup>b</sup>	Poly-area	24.23	5.64	n/a
Tugboats – transit <sup>c</sup>	Line	15.2	3.5	100
Tugboats – dredging <sup>c</sup>	Poly-area	15.2	3.5	n/a
Off-road construction equipment <sup>d</sup>	Poly-area	4.6	1.1	n/a
Crew boats <sup>e</sup>	Poly-area	15.2	3.5	n/a
Construction trucks <sup>f</sup>	Poly-area	4.6	1.1	n/a
Fugitive dust <sup>g</sup>	Poly-area	1.0	0.2	n/a

**Notes:**

- a. Release height (69'10") provided by Dutra Group (dredging contractor) for Stuyvesant hopper dredge (email from Dutra to iLanco 7/26/19). Width assumed to be 100 meters (approximately 50% of channel width).
- b. Release height (79'6") provided by Dutra Group (dredging contractor) for Stuyvesant hopper dredge (email from Dutra to iLanco 7/26/19).
- c. Source height (50') is from the Pier S Marine Terminal + Back Channel Improvements Project FEIS/FEIR (November 2012), Appendix B, Page A-2-7; and the Middle Harbor Redevelopment Project FEIS/FEIR (April 2009), Appendix A-2, Page A-2-6. Width assumed to be 100 meters (approximately 50% of channel width).
- d. Source height (15') is from the Pier S Marine Terminal + Back Channel Improvements Project FEIS/FEIR (November 2012), Appendix B, Page A-2-5; and the Middle Harbor Redevelopment Project FEIS/FEIR (April 2009), Appendix A-2, Page A-2-4.
- e. Source height is assumed to be similar to tugboats and therefore was set to 50'.
- f. Source height (15') is from the Pier S Marine Terminal + Back Channel Improvements Project FEIS/FEIR (November 2012), Appendix B, Page A-2-8; and the Middle Harbor Redevelopment Project FEIS/FEIR (April 2009), Appendix A-2, Page A-2-7.
- g. Fugitive dust source height is set close to ground-level, at a nominal 1 meter.
- h. Vertical dispersion coefficient was calculated by dividing the source height (assumed to be representative of the vertical dimension) by 4.3 in accordance with USEPA AERMOD guidelines (USEPA, 2019c).



**Figure H2.1. Construction Sources Modeled in AERMOD**



## Meteorological Data

Meteorological data recorded at the POLB Gull Park monitoring station was selected to simulate meteorological conditions within the dispersion modeling domain because of its proximity to the dredging areas and affected terminals. The AERMOD sources for the construction modeling are located in the Middle Harbor, Outer Harbor, and Beyond the Breakwater meteorological zones as defined in Figure I-3 of the San Pedro Bay Ports' "Sphere of Influence" analysis (POLB and POLA 2010). According to the analysis, the four meteorological stations representative of those meteorological zones are Liberty Hill Plaza, Terminal Island Treatment Plant, Berth 47, and Gull Park. Figure I-3 of the analysis shows that the Gull Park station is the most centrally located station relative to the AERMOD sources. Therefore, meteorological data from the Gull Park station were selected for the AERMOD modeling.

The Gull Park meteorological data set was processed for use in AERMOD in 2018 (Leidos 2018) using the most recent available USEPA guidance (USEPA 2015; USEPA 2016). The SCAQMD provided additional input



and guidance on the overall methodology, dataset choice, physical parameter characterization, and seasonality/precipitation parameters. The processing was accomplished using USEPA's AERMET processor (Version 16216) and pre-processor programs AERMINUTE (Version 15272) and AERSURFACE (Version 13016). Consistent with USEPA's *Guideline on Air Quality Models* (USEPA 2017), the data set consists of hourly readings over a period of five calendar years. The five most recent available years meeting USEPA's data completeness requirements for wind speed, wind direction, and temperature were selected. For Gull Park, the selected years were 2011, 2012, 2013, 2015, and 2016. Year 2014 was not selected because it did not meet the data completeness requirement. Per USEPA guidance (USEPA 2017), the five selected years of data do not have to be consecutive.

## Modeling Approach

Standard control parameters were used in AERMOD, including stack-tip downwash, non-screening mode, non-flat terrain, and sequential meteorological data check. Use of these options follows the USEPA modeling guidance (USEPA 2017). Source and receptor elevations were determined using USEPA's AERMAP terrain preprocessor (version 18081) with 1 arcsecond national elevation dataset (NED) files. As recommended by SCAQMD (SCAQMD 2019b), all sources were modeled with urban dispersion coefficients. An urban population of 9,818,605 representative of the Los Angeles County was used in AERMOD.

Consistent with USEPA AERMOD Guidance (USEPA 2019), the conversion of nitrogen oxide (NO<sub>x</sub>) to NO<sub>2</sub> in ambient air was simulated in AERMOD using the Ambient Ratio Method (ARM2). The ARM2 option applies an ambient ratio to the 1-hr modeled NO<sub>x</sub> concentrations based on a formula derived empirically from ambient monitored ratios of NO<sub>2</sub>/NO<sub>x</sub>. The default upper and lower limits on the ambient ratio applied to the modeled NO<sub>x</sub> concentration are 0.9 and 0.5, respectively.

For each combination of pollutant and averaging time except for the federal 1-hour NO<sub>2</sub> concentration, the highest concentration of all modeled off-site receptors is reported in the results tables at the end of this appendix. To be consistent with the federal 1-hour NO<sub>2</sub> standard, the federal 1-hour NO<sub>2</sub> concentration is the 98th percentile (8th highest) of the annual distribution of the daily maximum 1-hour concentrations, averaged over all five years of meteorological data.

The CEQA significance thresholds for ambient concentrations are presented in Section 12.2.3 of the EIS/EIR. The NO<sub>2</sub> and CO thresholds are absolute concentration thresholds, meaning that the modeled concentrations are added to the background concentrations for the Project vicinity, and the resulting total concentrations are compared to the thresholds (SCAQMD 2011, USEPA 2019b). The PM<sub>10</sub> and PM<sub>2.5</sub> thresholds are incremental concentration thresholds, meaning that the modeled concentrations are compared directly to the thresholds without adding the background concentrations (SCAQMD 2011).

The NEPA significance thresholds for ambient concentrations are the NAAQS, as presented in Section 5.5.1 of the EIS/EIR. Therefore, all of the thresholds are absolute concentration thresholds, meaning that the modeled concentrations are added to the background concentrations near the project area, and the resulting total concentrations are compared to the thresholds.

Table H2.3 presents the background concentrations used in the dispersion modeling. The background concentrations were derived from the monitored concentrations near the project area over the last 3 calendar years (2016, 2017, and 2018) of available data. Because it is the most representative site, the POLB Gull Park monitoring station was used for all pollutants except for PM<sub>2.5</sub>. POLB's Superblock station was used for the PM<sub>2.5</sub> background concentration because the Gull Park station has no Federal Reference Method (FRM) PM<sub>2.5</sub> monitor (POLB 2016; POLB 2017; POLB 2018). The Superblock station is located about 2 miles north of the construction site, in a commercial/industrial area adjacent to the Port.

**Table H2.3. Background Concentrations**

Pollutant	Averaging Period	Monitored Concentration <sup>a,i,j</sup>			Background Concentration <sup>c</sup>	
		2016	2017	2018	(ppm)	(ug/m <sup>3</sup> ) <sup>d</sup>
NO <sub>2</sub> (ppm)	1-Hour State	0.086	0.096	0.083	0.096	181
	1-Hour Federal <sup>b</sup>	--	--	--	0.075	141
	Annual	0.018	0.018	0.017	0.018	34
CO (ppm)	1-Hour	2.0	2.1	1.9	2.1	2,411
	8-Hour	1.7	1.7	1.5	1.7	1,952
SO <sub>2</sub> (ppm)	1-Hour State	0.012	0.012	0.011	0.012	32
	1-Hour Federal <sup>e</sup>	--	--	--	0.009	24
	24-Hour	0.003	0.005	0.004	0.005	13
PM <sub>10</sub> (ug/m <sup>3</sup> )	24-Hour Federal <sup>f</sup>	51.2	66.4	48.6	--	66.4
PM <sub>2.5</sub> (ug/m <sup>3</sup> )	24-Hour Federal <sup>g</sup>	--	--	--	--	27.2
	Annual Federal <sup>h</sup>	8.7	9.3	9.5	--	9.2

ppm = parts per million; ug/m<sup>3</sup> = micrograms per cubic meter.

Notes:

- a. All reported values represent the highest recorded concentration during the year unless otherwise noted.
- b. The background concentration reported for the federal 1-hour NO<sub>2</sub> standard represents the three-year average (2016-2018) of the 98th percentile of the annual distribution of daily maximum 1-hour average concentrations.
- c. The background concentrations for 1-hour federal NO<sub>2</sub>, 1-hour federal SO<sub>2</sub>, 24-hour federal PM<sub>2.5</sub>, and annual federal PM<sub>2.5</sub> are three-year averages. The background concentrations for all other pollutants or averaging periods are the maximum of the concentrations for the 3 reported years.
- d. The concentration in micrograms per cubic meter (ug/m<sup>3</sup>) is calculated as follows: ug/m<sup>3</sup> = ppm x MW / 0.0244. The molecular weights (MW) are 28.01 for CO, 46.0055 for NO<sub>2</sub>, and 64.066 for SO<sub>2</sub>.
- e. The background concentration reported for the federal 1-hour SO<sub>2</sub> standard represents the three-year average (2016-2018) of the 99th percentile of the annual distribution of daily maximum 1-hour average concentrations.
- f. The 24-hour federal PM<sub>10</sub> concentration reported for each year is the 2nd highest concentration during the year. The background concentration is the highest of the 2nd highest concentrations.
- g. The background concentration reported for the federal 24-hour PM<sub>2.5</sub> standard represents the three-year average (2016-2018) of the 98th percentile of the annual distribution of 24-hour average concentrations.
- h. The background concentration reported for the federal annual PM<sub>2.5</sub> concentration is the three-year average of the annual mean concentrations.
- i. The concentrations in this table were recorded at POLB's Gull Park monitoring station except for PM<sub>2.5</sub>, which was recorded at POLB's Superblock station because the Gull Park station has no Federal Reference Method (FRM) PM<sub>2.5</sub> monitor.
- j. Source: Air Quality Monitoring Program at the Port of Long Beach. Annual Summary Reports. Calendar Years 2016, 2017, and 2018 (POLB 2016; POLB 2017; POLB 2018).

## Receptor Locations

Cartesian coordinate receptor grids were used to provide adequate spatial coverage surrounding the Project area to assess ground-level pollution concentrations, identify the extent of significant impacts, and identify maximum-impact locations. Receptors over water were not considered in determining the maximum receptor locations because any human exposure would be brief and transient. The following receptor spacing was used in the modeling:

- Receptors positioned every 50 m along the site boundary, which, for this project, is considered to be the shoreline.

- Receptor grid starting at the site boundary and extending outwards to 500 m, with receptors spaced 50 m apart;
- Receptor grid starting at 500 m and extending outwards to 1 kilometer (km), with receptors placed 100 m apart; and
- Receptor grid starting at 1 km and extending outwards to 5 km, with receptors placed 250 meters (m) apart.

## H2.4 Predicted Air Quality Impacts

Table H2.4 presents the maximum offsite pollutant concentrations for the CEQA analysis associated with all unmitigated Action Alternatives. This table presents the highest modeled concentrations on land. Concentrations at all other modeled on-land receptors would be less than the displayed values.

**Table H2.4. Maximum Pollutant Concentrations for CEQA, Prior to Mitigation – Action Alternatives**

Pollutant	Averaging Time	Maximum Modeled Project Concentration (ug/m3)	Background Concentration (ug/m3)	Total Concentration (ug/m3)	Significance Threshold (ug/m3)	Concentration Above Threshold?
<b>Alternative 2</b>						
NO <sub>2</sub>	1-Hour State	173.2	181.0	354	339	Yes
	1-Hour Federal	133.0	141.4	274	188	Yes
	Annual	2.0	33.9	36	57	No
SO <sub>2</sub>	1-Hour State	0.4	31.5	32	655	No
	1-Hour Federal	0.4	23.6	24	196	No
	24-Hour State	0.05	13.1	13	105	No
CO	1-Hour	197.1	2,410.7	2,608	23,000	No
	8-Hour	57.9	1,951.5	2,009	10,000	No
PM <sub>10</sub>	24-Hour	1.9	n/a	1.9	10.4	No
	Annual	0.1	n/a	0.1	1.0	No
PM <sub>2.5</sub>	24-Hour	1.7	n/a	1.7	10.4	No
<b>Alternative 3</b>						
NO <sub>2</sub>	1-Hour State	173.2	181.0	354	339	Yes
	1-Hour Federal	133.0	141.4	274	188	Yes
	Annual	2.3	33.9	36	57	No
SO <sub>2</sub>	1-Hour State	0.4	31.5	32	655	No
	1-Hour Federal	0.4	23.6	24	196	No
	24-Hour State	0.05	13.1	13	105	No
CO	1-Hour	197.1	2,410.7	2,608	23,000	No

Pollutant	Averaging Time	Maximum Modeled Project Concentration (ug/m3)	Background Concentration (ug/m3)	Total Concentration (ug/m3)	Significance Threshold (ug/m3)	Concentration Above Threshold?
	8-Hour	57.9	1,951.5	2,009	10,000	No
PM <sub>10</sub>	24-Hour	1.9	n/a	1.9	10.4	No
	Annual	0.1	n/a	0.1	1.0	No
PM <sub>2.5</sub>	24-Hour	1.7	n/a	1.7	10.4	No
<b>Alternative 4</b>						
NO <sub>2</sub>	1-Hour State	173.2	181.0	354	339	<b>Yes</b>
	1-Hour Federal	133.0	141.4	274	188	<b>Yes</b>
	Annual	3.0	33.9	37	57	No
SO <sub>2</sub>	1-Hour State	0.4	31.5	32	655	No
	1-Hour Federal	0.4	23.6	24	196	No
	24-Hour State	0.05	13.1	13	105	No
CO	1-Hour	197.1	2,410.7	2,608	23,000	No
	8-Hour	57.9	1,951.5	2,009	10,000	No
PM <sub>10</sub>	24-Hour	1.9	n/a	1.9	10.4	No
	Annual	0.2	n/a	0.2	1.0	No
PM <sub>2.5</sub>	24-Hour	1.7	n/a	1.7	10.4	No
<b>Alternative 5</b>						
NO <sub>2</sub>	1-Hour State	173.2	181.0	354	339	<b>Yes</b>
	1-Hour Federal	133.0	141.4	274	188	<b>Yes</b>
	Annual	2.3	33.9	36	57	No
SO <sub>2</sub>	1-Hour State	0.4	31.5	32	655	No
	1-Hour Federal	0.4	23.6	24	196	No
	24-Hour State	0.05	13.1	13	105	No
CO	1-Hour	197.1	2,410.7	2,608	23,000	No
	8-Hour	57.9	1,951.5	2,009	10,000	No
PM <sub>10</sub>	24-Hour	1.9	n/a	1.9	10.4	No
	Annual	0.1	n/a	0.1	1.0	No
PM <sub>2.5</sub>	24-Hour	1.7	n/a	1.7	10.4	No

Table H2.5 presents the maximum offsite pollutant concentrations for the NEPA analysis associated with all unmitigated Action Alternatives. This table presents the highest modeled concentrations on land. Concentrations at all other modeled on-land receptors would be less than the displayed values.

**Table H2.5. Maximum Pollutant Concentrations for NEPA, Prior to Mitigation – Action Alternatives**

<b>Pollutant</b>	<b>Averaging Time</b>	<b>Maximum Modeled Project Concentration (ug/m3)</b>	<b>Background Concentration (ug/m3)</b>	<b>Total Concentration (ug/m3)</b>	<b>NAAQS (ug/m3)</b>	<b>Concentration Exceeds NAAQS?</b>
<i>Alternative 2</i>						
NO <sub>2</sub>	1-Hour	133.0	141.4	274	188	<b>Yes</b>
	Annual	2.0	33.9	36	100	No
SO <sub>2</sub>	1-Hour	0.4	23.6	24	196	No
CO	1-Hour	197.1	2,410.7	2,608	40,000	No
	8-Hour	57.9	1,951.5	2,009	10,000	No
PM <sub>10</sub>	24-Hour	1.9	66.4	68	150	No
PM <sub>2.5</sub>	24-Hour	1.7	27.2	29	35	No
	Annual	0.09	9.2	9.3	12.0	No
<i>Alternative 3</i>						
NO <sub>2</sub>	1-Hour	133.0	141.4	274	188	<b>Yes</b>
	Annual	2.3	33.9	36	100	No
SO <sub>2</sub>	1-Hour	0.4	23.6	24	196	No
CO	1-Hour	197.1	2,410.7	2,608	40,000	No
	8-Hour	57.9	1,951.5	2,009	10,000	No
PM <sub>10</sub>	24-Hour	1.9	66.4	68	150	No
PM <sub>2.5</sub>	24-Hour	1.7	27.2	29	35	No
	Annual	0.1	9.2	9.3	12.0	No
<i>Alternative 4</i>						
NO <sub>2</sub>	1-Hour	133.0	141.4	274	188	<b>Yes</b>
	Annual	3.0	33.9	37	100	No
SO <sub>2</sub>	1-Hour	0.4	23.6	24	196	No
CO	1-Hour	197.1	2,410.7	2,608	40,000	No
	8-Hour	57.9	1,951.5	2,009	10,000	No
PM <sub>10</sub>	24-Hour	1.9	66.4	68	150	No
PM <sub>2.5</sub>	24-Hour	1.7	27.2	29	35	No
	Annual	0.1	9.2	9.3	12.0	No
<i>Alternative 5</i>						
NO <sub>2</sub>	1-Hour	133.0	141.4	274	188	<b>Yes</b>
	Annual	2.3	33.9	36	100	No
SO <sub>2</sub>	1-Hour	0.4	23.6	24	196	No
CO	1-Hour	197.1	2,410.7	2,608	40,000	No
	8-Hour	57.9	1,951.5	2,009	10,000	No
PM <sub>10</sub>	24-Hour	1.9	66.4	68	150	No
PM <sub>2.5</sub>	24-Hour	1.7	27.2	29	35	No
	Annual	0.1	9.2	9.3	12.0	No

Figure H2.2 shows the areas where the modeled 1-hour federal NO<sub>2</sub> concentration (presented in both Tables H2.4 and H2.5) would exceed the threshold, and the location of the maximum on-land receptor. Figure H2.3 shows the areas where the modeled 1-hour state NO<sub>2</sub> concentration (presented in Table H2.4 only) would exceed the threshold, and the location of the maximum receptor. Both figures apply to all Action Alternatives because short-term activities (24-hour, 8-hour, and 1-hour) would be nearly identical and would therefore result in the same concentrations for all Action Alternatives. In all cases, the exceedance areas are over Port property and open water.

Section 5.5.5 of the EIS/EIR identifies five mitigation measures to reduce construction emissions, of which three are quantified. The following three measures were quantified in the dispersion modeling. The remaining mitigation measures were assessed qualitatively in the EIS/EIR.

**MM-AQ-1: Electric clamshell dredge.** The use of an electric clamshell dredge shall be required for project clamshell dredging activities during the entire construction period of the project, and the construction of an electrical substation at Pier J is also required to provide electric power to the clamshell dredge. This mitigation measure would reduce significant Impacts AQ-1, AQ-3, and AQ-4.

**MM-AQ-2: Construction-Related Harbor Craft.** Construction-related harbor craft (tugboats, crew boats, and survey boats) with Category 1 or Category 2 marine engines shall meet USEPA Tier 3 emission standards for marine engines. In addition, the construction contractor shall require all construction-related tugboats that home fleet in the San Pedro Bay Ports: 1) to shut down their main engines and 2) to refrain from using auxiliary engines while at dock and instead use electrical shore power, if feasible. This mitigation measure would reduce significant Impacts AQ-1, AQ-3, and AQ-4.

**MM-AQ-3: Off-Road Construction Equipment.** Self-propelled, diesel-fueled off-road construction equipment 25 hp or greater shall meet USEPA/CARB Tier 4 emission standards for non-road equipment. This mitigation measure would reduce significant Impacts AQ-1, AQ-3, and AQ-4.



**Figure H2.2. Location of Maximum Concentration and Area of Exceedance of the 1-Hour Federal NO<sub>2</sub> Threshold, Without Mitigation**





**Figure H2.2. Location of Maximum Concentration and Area of Exceedance of the 1-Hour State NO<sub>2</sub> Threshold, Without Mitigation**

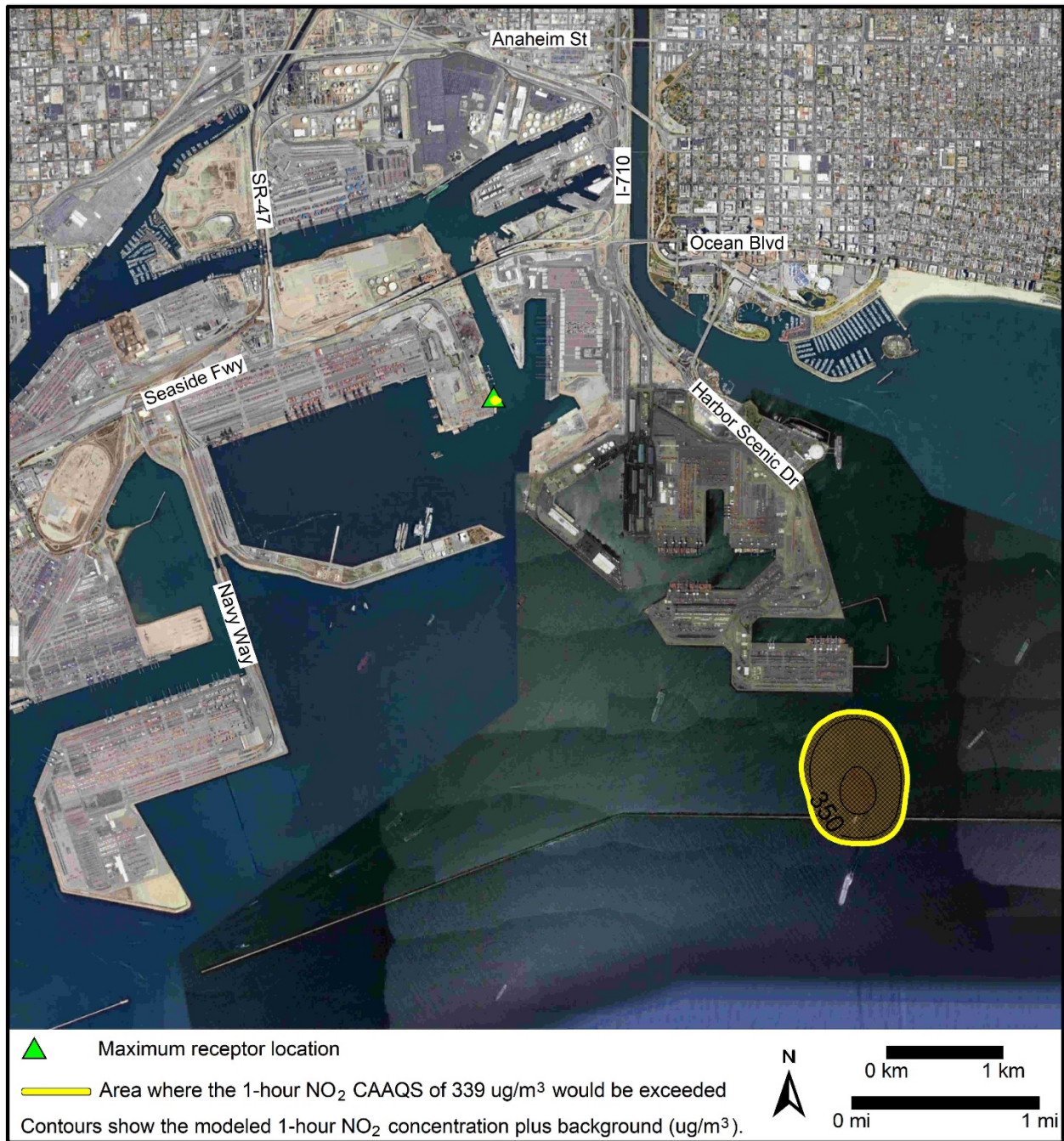




Table H2.6 presents the maximum offsite pollutant concentrations for the CEQA analysis associated with all mitigated Action Alternatives. This table presents the highest modeled concentrations on land. Concentrations at all other modeled on-land receptors would be less than the displayed values.

**Table H2.6. Maximum Pollutant Concentrations for CEQA, After Mitigation – Action Alternatives**

Pollutant	Averaging Time	Maximum Modeled Project Concentration (ug/m3)	Background Concentration (ug/m3)	Total Concentration (ug/m3)	Significance Threshold (ug/m3)	Concentration Above Threshold?
<b>Alternative 2</b>						
NO <sub>2</sub>	1-Hour State	138.8	181.0	320	339	No
	1-Hour Federal	114.9	141.4	256	188	Yes
	Annual	0.9	33.9	35	57	No
SO <sub>2</sub>	1-Hour State	0.1	31.5	32	655	No
	1-Hour Federal	0.1	23.6	24	196	No
	24-Hour State	0.02	13.1	13	105	No
CO	1-Hour	129.7	2,410.7	2,540	23,000	No
	8-Hour	44.0	1,951.5	1,995	10,000	No
PM <sub>10</sub>	24-Hour	1.9	n/a	1.9	10.4	No
	Annual	0.05	n/a	0.05	1.0	No
PM <sub>2.5</sub>	24-Hour	1.7	n/a	1.7	10.4	No
<b>Alternative 3</b>						
NO <sub>2</sub>	1-Hour State	138.8	181.0	320	339	No
	1-Hour Federal	114.9	141.4	256	188	Yes
	Annual	1.2	33.9	35	57	No
SO <sub>2</sub>	1-Hour State	0.1	31.5	32	655	No
	1-Hour Federal	0.1	23.6	24	196	No
	24-Hour State	0.02	13.1	13	105	No
CO	1-Hour	129.7	2,410.7	2,540	23,000	No
	8-Hour	44.0	1,951.5	1,995	10,000	No
PM <sub>10</sub>	24-Hour	1.9	n/a	1.9	10.4	No
	Annual	0.06	n/a	0.06	1.0	No
PM <sub>2.5</sub>	24-Hour	1.7	n/a	1.7	10.4	No
<b>Alternative 4</b>						
NO <sub>2</sub>	1-Hour State	138.8	181.0	320	339	No
	1-Hour Federal	114.9	141.4	256	188	Yes

Pollutant	Averaging Time	Maximum Modeled Project Concentration (ug/m3)	Background Concentration (ug/m3)	Total Concentration (ug/m3)	Significance Threshold (ug/m3)	Concentration Above Threshold?
	Annual	1.9	33.9	36	57	No
SO <sub>2</sub>	1-Hour State	0.1	31.5	32	655	No
	1-Hour Federal	0.1	23.6	24	196	No
	24-Hour State	0.02	13.1	13	105	No
CO	1-Hour	129.7	2,410.7	2,540	23,000	No
	8-Hour	44.0	1,951.5	1,995	10,000	No
PM <sub>10</sub>	24-Hour	1.9	n/a	1.9	10.4	No
	Annual	0.1	n/a	0.1	1.0	No
PM <sub>2.5</sub>	24-Hour	1.7	n/a	1.7	10.4	No
<b>Alternative 5</b>						
NO <sub>2</sub>	1-Hour State	138.8	181.0	320	339	No
	1-Hour Federal	114.9	141.4	256	188	<b>Yes</b>
	Annual	1.2	33.9	35	57	No
SO <sub>2</sub>	1-Hour State	0.1	31.5	32	655	No
	1-Hour Federal	0.1	23.6	24	196	No
	24-Hour State	0.02	13.1	13	105	No
CO	1-Hour	129.7	2,410.7	2,540	23,000	No
	8-Hour	44.0	1,951.5	1,995	10,000	No
PM <sub>10</sub>	24-Hour	1.9	n/a	1.9	10.4	No
	Annual	0.06	n/a	0.06	1.0	No
PM <sub>2.5</sub>	24-Hour	1.7	n/a	1.7	10.4	No

Table H2.7 presents the maximum offsite pollutant concentrations for the NEPA analysis associated with all mitigated Action Alternatives. This table presents the highest modeled concentrations on land. Concentrations at all other modeled on-land receptors would be less than the displayed values.

**Table H2.7. Maximum Pollutant Concentrations for NEPA, After Mitigation – Action Alternatives**

<b>Pollutant</b>	<b>Averaging Time</b>	<b>Maximum Modeled Project Concentration (ug/m3)</b>	<b>Background Concentration (ug/m3)</b>	<b>Total Concentration (ug/m3)</b>	<b>NAAQS (ug/m3)</b>	<b>Concentration Exceeds NAAQS?</b>
<b>Alternative 2</b>						
NO <sub>2</sub>	1-Hour	114.9	141.4	256	188	<b>Yes</b>
	Annual	0.9	33.9	35	100	No
SO <sub>2</sub>	1-Hour	0.1	23.6	24	196	No
CO	1-Hour	129.7	2,410.7	2,540	40,000	No
	8-Hour	44.0	1,951.5	1,995	10,000	No
PM <sub>10</sub>	24-Hour	1.9	66.4	68	150	No
PM <sub>2.5</sub>	24-Hour	1.7	27.2	29	35	No
	Annual	0.04	9.2	9.2	12.0	No
<b>Alternative 3</b>						
NO <sub>2</sub>	1-Hour	114.9	141.4	256	188	<b>Yes</b>
	Annual	1.2	33.9	35	100	No
SO <sub>2</sub>	1-Hour	0.1	23.6	24	196	No
CO	1-Hour	129.7	2,410.7	2,540	40,000	No
	8-Hour	44.0	1,951.5	1,995	10,000	No
PM <sub>10</sub>	24-Hour	1.9	66.4	68	150	No
PM <sub>2.5</sub>	24-Hour	1.7	27.2	29	35	No
	Annual	0.06	9.2	9.2	12.0	No
<b>Alternative 4</b>						
NO <sub>2</sub>	1-Hour	114.9	141.4	256	188	<b>Yes</b>
	Annual	1.9	33.9	36	100	No
SO <sub>2</sub>	1-Hour	0.1	23.6	24	196	No
CO	1-Hour	129.7	2,410.7	2,540	40,000	No
	8-Hour	44.0	1,951.5	1,995	10,000	No
PM <sub>10</sub>	24-Hour	1.9	66.4	68	150	No
PM <sub>2.5</sub>	24-Hour	1.7	27.2	29	35	No
	Annual	0.1	9.2	9.3	12.0	No
<b>Alternative 5</b>						
NO <sub>2</sub>	1-Hour	114.9	141.4	256	188	<b>Yes</b>
	Annual	1.2	33.9	35	100	No
SO <sub>2</sub>	1-Hour	0.1	23.6	24	196	No
CO	1-Hour	129.7	2,410.7	2,540	40,000	No
	8-Hour	44.0	1,951.5	1,995	10,000	No
PM <sub>10</sub>	24-Hour	1.9	66.4	68	150	No
PM <sub>2.5</sub>	24-Hour	1.7	27.2	29	35	No
	Annual	0.06	9.2	9.2	12.0	No

Figure H2.4 shows the area where the mitigated modeled 1-hour federal NO<sub>2</sub> concentration (presented in both Tables H2.6 and H2.7) would exceed the threshold, and the location of the maximum on-land receptor. The figure applies to all Action Alternatives because short-term activities (24-hour, 8-hour, and 1-hour) would be nearly identical and would therefore result in the same concentrations for all Action Alternatives. The exceedance area is over Port property and open water. There is no figure for the 1-hour

state  $\text{NO}_2$  concentration because the mitigation measures would reduce the modeled on-land concentrations to less than significant.

**Figure H2.3. Location of Maximum Concentration and Area of Exceedance of the 1-Hour Federal  $\text{NO}_2$  Threshold, With Mitigation**





## References for Appendix H2

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## Appendix H3. Potential Impacts of Criteria Pollutant Emissions on Public Health

### H3.1. Potential Impact of Significant Regional Emissions on Public Health

In *Sierra Club v. County of Fresno (2018)*, the California Supreme Court ruled that an EIR for a proposed master-planned, mixed-use development in Fresno County known as Friant Ranch did not adequately relate the expected adverse air quality impacts to likely health consequences or explain in meaningful detail why it is not feasible at the time of drafting to provide such an analysis. The specific language in the Court's decision is provided below.

*The EIR fails to provide an adequate discussion of health and safety problems that will be caused by the rise in various pollutants resulting from the Project's development. At this point, we cannot know whether the required additional analysis will disclose that the Project's effects on air quality are less than significant or unavoidable, or whether that analysis will require reassessment of proposed mitigation measures. Absent an analysis that reasonably informs the public how anticipated air quality effects will adversely affect human health, an EIR may still be sufficient if it adequately explains why it is not scientifically feasible at the time of drafting to provide such an analysis.*

In response to the Court's decision, this section provides a discussion of the potential health effects associated with the TSP's significant construction emissions identified in Impact AQ-1.

Impact AQ-1 concluded that the TSP's mitigated construction emissions would exceed the SCAQMD's daily emission thresholds for PM<sub>2.5</sub>, NO<sub>x</sub>, CO, and VOC with mitigation. The SCAQMD's daily emission thresholds relate to *regional* air quality impacts. An exceedance of a daily emission threshold means the TSP would make a significant contribution to regional air pollutant emissions in the SCAB. However, a daily emission threshold exceedance does not necessarily mean that the TSP would contribute to a violation of the CAAQS or NAAQS or cause adverse health effects. Further analysis, discussed below, would be necessary to determine the downwind ambient concentrations of the emitted pollutant (or secondary pollutants formed from that pollutant) in the atmosphere where the general population would be exposed.

The pollutants evaluated for potential regional health effects associated with TSP construction are PM<sub>2.5</sub>, NO<sub>2</sub>, CO, and ozone. PM<sub>2.5</sub> would be both directly emitted ("primary" PM<sub>2.5</sub>) and would form through secondary reactions of precursor pollutants NO<sub>x</sub> and VOC ("secondary" PM<sub>2.5</sub>). NO<sub>2</sub> would be directly emitted as one of the NO<sub>x</sub> components and would form through secondary photochemical reactions between nitric oxide (NO) and other air pollutants (CARB, 2019a). CO would be directly emitted. Ozone would not be directly emitted, but would form through secondary photochemical reactions between precursor pollutant NO<sub>x</sub> and VOC. Primary pollutants typically reach their peak ambient concentrations in close proximity to the emission sources. Secondary pollutants typically reach their peak ambient concentrations farther downwind of the sources, sometimes many miles downwind, as the secondary reactions can take a considerable amount of time.

### ***Approach and Limitations***

This analysis links TSP emissions to regional health effects qualitatively because technical and scientific limitations prevent the accurate quantification of regional health effects. The quantification of regional health effects would not be possible for some pollutants and would produce an unacceptably high level of uncertainty for other pollutants.

Health effects quantification would require a two-stage process consisting of (a) regional modeling of emissions to estimate ambient pollutant concentrations in the region and to determine the exposed population; and (b) applying available methodologies to estimate the quantities of adverse health outcomes for the exposed population at the predicted concentration levels. There are modeling tools that could theoretically carry out these steps for ozone and secondary PM<sub>2.5</sub>. For example, the Community Multiscale Air Quality Modeling System (CMAQ) (USEPA 2019a) and Comprehensive Air Quality Model with Extensions (CAMx) (Ramboll Environ 2019) are air quality modeling systems that can estimate ozone and secondary PM concentrations on a regional scale. The Environmental Benefits Mapping and Analysis Program (BenMAP) (USEPA 2019b) is a regional-scale health effects estimation model for ozone and PM. CARB also developed a methodology (CARB 2010) for estimating premature mortality associated with regional exposure to PM. Currently, there is no reliable methodology available to quantify health effects associated with regional exposure to CO and NO<sub>2</sub> concentrations.

The SCAQMD and San Joaquin Valley Air Pollution Control District (SJVAPCD) filed separate *amicus curiae* briefs with the California Supreme Court for the Friant Ranch case (SCAQMD 2015, SJVAPCD 2015). Both districts concluded that currently available regional modeling tools are not well suited to analyze relatively small changes in pollutant concentrations associated with individual projects. Regional modeling tools are generally designed to be used at the national, state, regional, and/or city levels. They are not equipped to analyze whether and to what extent the criteria pollutant emissions of an individual project directly impact human health in a particular area (SJVAPCD 2015). For example, running a photochemical grid model used for predicting ozone attainment with the emissions solely from an individual project is not likely to yield valid information given the relative scale involved (SJVAPCD 2015). SCAQMD stated that it does not currently know of a way to accurately quantify ozone-related health impacts caused by NO<sub>x</sub> or VOC emissions from relatively small projects. The primary author of the CARB methodology (CARB 2010) for PM mortality has reported that this methodology is not suited for small projects and may yield unreliable results due to various uncertainties (SCAQMD 2015). Therefore, quantification of regional health effects associated with the TSP's criteria pollutant emissions is not feasible for this analysis. As a result, this document provides a qualitative discussion of the potential for the TSP's construction emissions to cause regional adverse health effects.

The qualitative regional health effects discussion follows a two-step approach. The first step determines whether the TSP's significant regional emissions would likely contribute to a violation of the CAAQS or NAAQS outside of the local Port area. If so, then the TSP is presumed to contribute to regional adverse health effects. If not, then the TSP is presumed not to contribute to regional adverse health effects because the CAAQS and NAAQS were established by CARB and USEPA to protect public health and welfare. Specifically, the CAAQS were established to protect public health, including the most sensitive groups (CARB 2019b). The NAAQS were established to protect public health with an adequate margin of safety (Title 42 United States Code [U.S.C.] Chapter 85, Subchapter I, Part A, Section 7409). The final step

describes the general types of adverse health effects that could be associated with the TSP's significant regional pollutant impacts.

A discussion of the TSP's *local* contributions to adverse health effects in the Port vicinity is provided below as part of Impact AQ-2.

### ***Identification of Potential Regional Adverse Health Effects***

**PM2.5.** The SCAB is currently nonattainment of the CAAQS and NAAQS for PM2.5. The state standard for PM2.5 is 12 µg/m<sup>3</sup> for an annual average. The federal standards for PM2.5 are 35 µg/m<sup>3</sup> for a 3-year average of the 98th percentile of the 24-hour concentrations, and 12 µg/m<sup>3</sup> for a 3-year annual average. The highest annual PM2.5 concentration recorded in the SCAB over the last 3 available years (2016-2018) is 14.73 µg/m<sup>3</sup>, which is 1.2 times the state standard. This concentration occurred in 2016 at a station adjacent to Route 60 in Ontario. Exceedances of the annual standard occurred at several stations in the SCAB in each year of the 3-year period. The highest 3-year average of the 98th percentile of the 24-hour PM2.5 concentrations recorded in the SCAB over the last 3 available years (2016-2018) is 35.9 µg/m<sup>3</sup>, which is 1.03 times the federal standard. This concentration occurred at the Mira Loma (Jurupa Valley) station in Riverside County. The 24-hour PM2.5 concentration threshold of 35 µg/m<sup>3</sup> was exceeded somewhere in the SCAB on 3 percent of days over the 3-year period. The highest 3-year annual average PM2.5 concentration recorded in the SCAB over the last 3 available years (2016-2018) is 14.5 µg/m<sup>3</sup>, which is 1.2 times the federal standard. This concentration occurred at a station adjacent to Route 60 in Ontario (SCAQMD 2019). Therefore, because (a) the region is nonattainment for PM2.5 and (b) construction of the TSP would exceed the SCAQMD's daily emission threshold for PM2.5, the TSP would potentially contribute to regional violations of the PM2.5 standards and to regional adverse health effects related to PM2.5.

Table 5.5-31 shows that the TSP's mitigated peak daily construction emissions would be 0.04 ton per day of PM2.5 (reported emissions were converted from pounds to tons). By comparison and for context, the most recent USEPA-approved SCAB emissions inventory estimated total anthropogenic emissions within the SCAB in 2012 to be 66 tons per day of PM2.5 (SCAQMD 2017). This estimate shows that the TSP's direct maximum regional PM2.5 contribution would be equivalent to about 0.06 percent of the total SCAB emissions. This emissions comparison shows that the TSP's contribution to regional violations of the PM2.5 standards would be relatively small. The TSP's VOC and NO<sub>x</sub> emissions, described below under ozone, would also contribute to secondary PM2.5 formation in the region.

The following summary of adverse health effects associated with PM10 and PM2.5 exposure was compiled in the 2016 AQMP (SCAQMD 2017). Appendix I of the 2016 AQMP provides an expanded discussion of the adverse health effects.

*Several studies have found correlations between elevated ambient particulate matter levels (PM) and an increase in mortality rates, respiratory infections, number and severity of asthma attacks, and the number of hospital admissions in different parts of the United States and in various areas around the world. In recent years, studies have reported an association between long-term exposure to PM2.5 and increased total mortality (reduction in life-span and increased mortality from lung cancer). Higher levels of PM2.5 have also been related to increased mortality due to cardiovascular or respiratory diseases, hospital admissions for acute respiratory conditions, school absences, lost work days, a decrease in respiratory function in children, and increased medication*



*use in children and adults with asthma. Long-term exposure to PM has been found to be associated with reduced lung function growth in children, and increased risk of cardiovascular diseases in adults. Elderly persons, young children, and people with pre-existing respiratory and/or cardiovascular disease appear to be more susceptible to the effects of PM<sub>10</sub> and PM<sub>2.5</sub>. In its most recent review, USEPA concluded that both short-term and long-term exposures to PM<sub>2.5</sub> are causally related to increased mortality risk (USEPA 2009).*

**Nitrogen Dioxide.** The SCAB is currently in attainment of the CAAQS and NAAQS for NO<sub>2</sub>. The most stringent state and federal NO<sub>2</sub> standards are 0.18 ppm for a 1-hour average (state 1-hour standard), 0.100 ppm for a 3-year average of the 98th percentile of the annual distributions of daily maximum 1-hour average concentrations (federal 1-hour standard), and 0.030 ppm for an annual average. The highest NO<sub>2</sub> concentrations recorded anywhere in the SCAB over the last 3 available years (2016-2018) are 0.1155 ppm for the state 1-hour average, 0.079 ppm for the federal 1-hour average (3-year average), and 0.0321 ppm for an annual average (SCAQMD 2019). These pollutant levels are 64, 79, and 107 percent of the state 1-hour, federal 1-hour, and state annual standards, respectively. The exceedance of the state annual standard of 0.030 ppm occurred in all 3 years at a single monitoring station adjacent to Route 60 in Ontario. This station is one of four near-road sites in the SCAB purposely placed by the SCAQMD to capture impacts from heavily traveled roadways (SCAQMD 2016). In November 2018, CARB proposed to separate the area surrounding this monitor from the remainder of the SCAB and reclassify the area as nonattainment. CARB is currently working with the SCAQMD to define the specific boundary of the nonattainment area. The remainder of the SCAB will remain classified as attainment (CARB 2018).

Table 5.5-31 shows that the TSP's mitigated peak daily construction emissions would be 0.8 ton per day of NO<sub>x</sub>. By comparison and for context, the most recent EPA-approved SCAB emissions inventory estimated total anthropogenic emissions within the SCAB in 2012 to be 540 tons per day of NO<sub>x</sub> (SCAQMD, 2017). This estimate shows that the TSP's maximum regional NO<sub>x</sub> contribution would be equivalent to about 0.1 percent of the total SCAB emissions. Therefore, given (a) the attainment status of the region and (b) the relatively small increase in regional NO<sub>x</sub> emissions contributions from the TSP, the TSP would not contribute to a regional violation of the NO<sub>2</sub> standards and would not contribute to regional adverse health effects related to NO<sub>2</sub> outside of the local Port area. Adverse health effects related to the TSP's NO<sub>2</sub> emissions are also addressed on a *local* level in Impact AQ-2.

**Carbon Monoxide.** The SCAB is currently in attainment of the CAAQS and NAAQS for CO. The most stringent CAAQS or NAAQS for CO are 20 ppm for a 1-hour average and 9.0 ppm for an 8-hour average. The highest CO concentrations recorded anywhere in the SCAB over the last 3 available years (2016-2018) are 8.4 ppm for a 1-hour average and 4.6 ppm for an 8-hour average (SCAQMD 2019). These pollutant levels are 42 and 51 percent of the 1-hour and 8-hour standards, respectively.

Table 5.5-31 shows that the TSP's mitigated peak daily construction emissions would be 0.5 ton per day of CO. By comparison and for context, the most recent EPA-approved SCAB emissions inventory estimated total anthropogenic emissions within the SCAB in 2012 to be 2,123 tons per day of CO (SCAQMD, 2017). This estimate shows that the TSP's maximum regional CO contribution would be equivalent to about 0.02 percent of the total SCAB emissions. Therefore, given (a) the attainment status of the region and (b) the relatively small regional emissions contribution from the TSP, the TSP would not contribute to a regional violation of the CO standards and would not contribute to regional adverse health effects related to CO.

**Ozone.** VOC and NO<sub>x</sub> are precursors to ozone, for which the SCAB is currently in nonattainment of the CAAQS and NAAQS (also referred to as state and federal standards). The most stringent state and federal ozone standards are 0.09 ppm for a 1-hour average, 0.070 ppm for the 3-year average of the fourth-highest 8-hour concentration each year (known as the federal 8-hour standard), and 0.07 ppm for an 8-hour average (known as the state 8-hour standard). The highest 1-hour ozone concentration recorded in the SCAB over the last three available years (2016-2018) is 0.163 ppm, which is 1.8 times the standard. This concentration occurred in 2016 at the Crestline station in the central San Bernardino Mountains. The standard was exceeded somewhere in the SCAB on 25 percent of days during the 3-year period. The highest federal 8-hour ozone concentration (3-year average) recorded in the SCAB over the last three available years (2016-2018) is 0.112 ppm, which is 1.6 times the standard. This concentration occurred at both the Crestline and San Bernardino stations. The threshold of 0.070 ppm was exceeded somewhere in the SCAB on 38 percent of days during the 3-year period. The highest state 8-hour ozone concentration recorded in the SCAB over the last three available years (2016-2018) is 0.136 ppm, which is 1.9 times the standard. This concentration occurred in 2017 at the San Bernardino station. The standard was exceeded somewhere in the SCAB on 38 percent of days during the 3-year period (SCAQMD 2019). Therefore, because (a) the region is nonattainment for ozone and (b) construction of the TSP would exceed the SCAQMD's daily emission thresholds for NO<sub>x</sub> and VOC, the TSP would potentially contribute to regional violations of the ozone standards and to regional adverse health effects related to ozone.

Table 5.5-31 shows that the TSP's mitigated peak daily construction emissions would be 0.05 ton per day of VOC and 0.8 ton per day of NO<sub>x</sub>. By comparison and for context, the most recent EPA-approved SCAB emissions inventory estimated total anthropogenic emissions within the SCAB in 2012 to be 470 tons per day of VOC and 540 tons per day of NO<sub>x</sub> (SCAQMD, 2017). These estimates show that the TSP's maximum regional VOC and NO<sub>x</sub> contributions would be equivalent to about 0.01 and 0.1 percent, respectively, of the total SCAB emissions. These emissions comparisons show that the TSP's contribution to regional violations of the ozone standards would be relatively small.

The following summary of adverse health effects associated with ozone exposure was compiled by the SCAQMD in its Final 2016 AQMP (SCAQMD 2017). Appendix I of the 2016 AQMP provides an expanded discussion of the adverse health effects:

*Short-term exposures (lasting for a few hours) to ozone at levels typically observed in Southern California can result in breathing pattern changes, reduction of breathing capacity, increased susceptibility to infections, inflammation of the lung tissue, and some immunological changes. Individuals working outdoors, children (including teenagers), older adults, people with pre-existing lung disease, such as asthma, and individuals with certain nutritional deficiencies are considered to be the subgroups most susceptible to ozone effects. Elevated ozone levels are associated with increased school absences and daily hospital admission rates, as well as increased mortality. An increased risk for asthma has been found in children who participate in multiple sports and live in high-ozone communities. Ozone exposure under exercising conditions is known to increase the severity of respiratory symptoms. Although lung volume and airway resistance changes observed after a single exposure diminish with repeated exposures, biochemical and cellular changes appear to persist, which can lead to subsequent lung structural changes.*

In summary, construction of the TSP would potentially contribute to regional adverse health effects associated with exposure to PM<sub>2.5</sub> and ozone in the SCAB. The TSP would not contribute to regional adverse health effects associated with exposure to CO or NO<sub>2</sub>. Impacts would be temporary, occurring only during the construction period.

### **H3.2. Potential Impact of Significant Local Ambient Concentrations on Public Health**

In response to the California Supreme Court's recent decision on *Sierra Club v. County of Fresno (2018)*, this section provides a discussion of the potential health effects associated with the significant local ambient pollutant concentrations identified in Impact AQ-2 for TSP construction. These pollutant concentrations are considered local impacts because they were determined through dispersion modeling of the TSP's primary pollutant emissions in the local Port area, and because the maximum pollutant concentrations predicted by the dispersion model would be located very close to the construction activities. By definition, a modeled exceedance of a SCAQMD ambient concentration threshold means that the TSP would contribute to a local violation of the CAAQS or NAAQS and therefore would contribute to local adverse health effects in the modeled exceedance area. If no modeled exceedance is predicted, the TSP is presumed not to contribute to local adverse health effects because the CAAQS and NAAQS were established by CARB and USEPA to protect public health and welfare.

Tables 5.5-32 and 5.5-33 show that construction of the TSP would produce significant local NO<sub>2</sub> concentrations with mitigation. The local concentrations would be less than significant for SO<sub>2</sub>, CO, PM<sub>10</sub>, and PM<sub>2.5</sub>. Therefore, construction of the TSP would potentially contribute to local adverse health effects associated with exposure to NO<sub>2</sub>.

#### ***Analysis Approach and Limitations***

There is currently no reliable methodology available that can quantify health effects associated with local exposure to NO<sub>2</sub> concentrations. Therefore, this document provides a qualitative discussion of the potential for the TSP's local NO<sub>2</sub> impacts to cause adverse health effects. The qualitative discussion (a) identifies the local area where NO<sub>2</sub> concentrations are predicted to exceed the standards, which is presumed to be the area where project-related adverse health effects could potentially occur; and (b) describes the general types of adverse health effects that could be associated with exposure to elevated NO<sub>2</sub> levels.

A discussion of the TSP's *regional* contributions to adverse health effects in the SCAB is provided as part of Impact AQ-1.

#### ***Identification of Potential Local Adverse Health Effects***

**Nitrogen Dioxide.** Table 5.5-32 shows that construction of the TSP with mitigation would produce local ambient NO<sub>2</sub> concentrations that exceed the 1-hour NAAQS. The maximum concentration on land is predicted to be 256 ug/m<sup>3</sup> (Project plus background), which is 1.4 times the standard. Therefore, construction of the TSP would potentially contribute to local adverse health effects associated with short-term exposure to NO<sub>2</sub>.

Appendix A, Figure A2.4 shows the area where the modeled NO<sub>2</sub> concentration would exceed the federal 1-hour NO<sub>2</sub> standard during TSP construction, after mitigation. This is the area where the potential for adverse health effects associated with NO<sub>2</sub> exposure during construction is presumed to exist. Most of

the impact area is over water, but a portion of the area covers Pier J, which is a POLB container terminal. The significant impact area would not extend over any existing residences.

The following summary of adverse health effects associated with NO<sub>2</sub> exposure was compiled in the 2016 AQMP. Appendix I of the 2016 AQMP provides an expanded discussion of the adverse health effects.

*USEPA noted the respiratory effects of NO<sub>2</sub>, and evidence suggestive of impacts on cardiovascular health, mortality and cancer (USEPA 2016). Evidence for low-level nitrogen dioxide (NO<sub>2</sub>) exposure effects is derived from laboratory studies of asthmatics and from epidemiological studies. Additional evidence is derived from animal studies. USEPA cited the coherence of the results from a variety of studies, and a plausible biological mechanism to support the determination of a causal relationship between short term NO<sub>2</sub> exposures and asthma exacerbations (“asthma attacks”). The long-term link with respiratory outcomes was strengthened by recent experimental and epidemiological studies, and the strongest evidence available is from studies of asthma development. Experimental studies have found that NO<sub>2</sub> exposures increase responsiveness of airways, pulmonary inflammation, and oxidative stress, and can lead to the development of allergic responses. These biological responses provide evidence of a plausible mechanism for NO<sub>2</sub> to cause asthma. Additionally, results from controlled exposure studies of asthmatics demonstrate an increase in the tendency of airways to contract in response to a chemical stimulus (airway responsiveness) or after inhaled allergens. Animal studies also provide evidence that NO<sub>2</sub> exposures have negative effects on the immune system, and therefore increase the host’s susceptibility to respiratory infections. Epidemiological studies showing associations between NO<sub>2</sub> levels and hospital admissions for respiratory infections support such a link, although the studies examining respiratory infections in children are less consistent.*

In summary, construction of the TSP would potentially contribute to local adverse health effects associated with exposure to NO<sub>2</sub>. The area of impact would occur on POLB property. The TSP would not contribute to local adverse health effects associated with exposure to SO<sub>2</sub>, CO, PM<sub>10</sub>, or PM<sub>2.5</sub>. Impacts would be temporary, occurring only during the construction period.

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## Appendix H4. Health Risk Evaluation

### H4.1. Introduction

This appendix describes the methods and results of a health risk evaluation of toxic air contaminant (TAC) emissions from construction activities associated with all Action Alternatives. The Action Alternatives are described in detail in Section 4 (Plan Formulation). The No Action Alternative is also described in detail in Section 4 (Plan Formulation), is assessed qualitatively in Sections 5.5 (Air Quality Environmental Consequences) and 5.6 (Greenhouse Gas Environmental Consequences) of the EIS/EIR, and therefore is not included in this appendix. TACs are compounds that are known or suspected to cause adverse carcinogenic or non-carcinogenic human health effects after short-term (acute) or long-term (chronic) exposure. This evaluation assesses the individual cancer risks and non-cancer chronic impacts associated with construction of the Action Alternatives to residential/sensitive receptors and offsite workers.<sup>1</sup>

Individual cancer risk represents the chance that a person would contract cancer resulting from long-term exposure to the TACs of concern. A non-cancer chronic hazard index represents the potential for non-cancer health impacts resulting from long-term exposure to TACs. An acute non-cancer hazard index represents the potential for non-cancer health impacts resulting from a short-term (i.e., one-hour) exposure to TACs. Population cancer burden is the potential increase in the number of cancer cases in the affected population.

### H4.2. Health Risk Estimation Approach

Since the Action Alternatives would produce TAC emissions only during temporary construction activities and because emissions would occur at a considerable distance from the nearest residential and sensitive receptors, a detailed health risk assessment was not performed. Instead, results of the PM<sub>10</sub> dispersion modeling, detailed in Appendix H2, and CARB's Hotspots Analysis and Reporting Program (HARP) were used to estimate maximum cancer risks. HARP's Risk Assessment Standalone Tool (RAST), which calculates potential health impacts using ground level TAC concentrations, was used to estimate health impacts (CARB 2019a).

TAC-related cancer risk in the Port area is dominated by emissions of diesel particulate matter (DPM), a TAC and component of diesel exhaust. This health risk evaluation used the annual PM<sub>10</sub> concentrations predicted by AERMOD (Appendix H2) during construction as a proxy for DPM. Although conservative, the approach is appropriate because more than 99 percent of PM<sub>10</sub> emissions associated with construction of the Action Alternatives would be from diesel exhaust. Non-exhaust PM<sub>10</sub> (i.e., fugitive dust, entrained road dust, tire wear, brake wear) would be limited to the project's minimal land-based construction activities.

Cancer risk at the maximally-impacted residential/sensitive receptor was calculated by HARP assuming the exposure period would start in the receptor's third trimester of gestation ("3TM") and continue for the duration of construction. Cancer risks were calculated separately for the period of the third trimester until just before the second birthday (referred to as "3TM < 2") and the period of the second birthday until just before the sixth birthday ("2 < 6") due to different risk sensitivity assumptions in HARP. The two resulting risk values were then added together to produce the final risk result. The receptor age period 3TM < 2 was conservatively modeled with the average PM<sub>10</sub> concentration during the two consecutive years with the greatest construction emissions because this age period has the greatest cancer risk sensitivity according to OEHHA guidelines (OEHHA 2015). The receptor age period 2 < 6 was modeled with the average PM<sub>10</sub> concentration during all other years of construction. The average PM<sub>10</sub> concentrations

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<sup>1</sup> Sensitive receptors were conservatively evaluated with residential exposure assumptions.



during these two exposure periods were estimated by scaling the PM<sub>10</sub> concentration during the year of maximum emissions (Appendix H2) by the ratio of DPM emissions from the respective periods. Residential cancer risk was calculated by HARP using the “RMP derived” option in accordance with SCAQMD's *AB 2588 and Rule 1402 Supplemental Guidelines* (SCAQMD 2018).

Cancer risk at the maximally-impacted occupational receptor was calculated by HARP assuming an average PM<sub>10</sub> concentration over the entire construction period. The average PM<sub>10</sub> concentration was estimated by scaling the PM<sub>10</sub> concentration during the year of maximum emissions (Appendix H2) by the ratio of DPM emissions from the respective periods. Occupational cancer risk was estimated using the “OEHHA derived” option in accordance with SCAQMD's *AB 2588 and Rule 1402 Supplemental Guidelines*.

Chronic hazard indices at the maximally-impacted residential/sensitive and occupational receptors were directly calculated by dividing the PM<sub>10</sub> concentration during the year of maximum emissions (Appendix H2) by the Chronic Reference Exposure Level of 5.0 ug/m3 as published in CARB's *Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values* (CARB 2019b).

Acute non-cancer impacts and population cancer burden are addressed qualitatively. Past Port projects have consistently shown that the non-cancer acute hazard index and population cancer burden would not exceed SCAQMD thresholds. For example, the residential cancer risk for the Port's recent Pier B On-Dock Rail Support Facility project (POLB 2016) was estimated to be 8.7 in a million with mitigation, and the associated population cancer burden was estimated to be only 0.27 (POLB 2016), about one-half of the significance threshold of 0.5.

Table H4-1 shows that the Action Alternatives would produce maximum cancer risks roughly similar to Pier B; however, most activities associated with the Action Alternatives would occur over water and further from population centers than the Pier B project. Therefore, the population cancer burden for the Action Alternatives would likely be lower than 0.27 calculated for Pier B. Similarly, acute non-cancer impacts would also likely be lower than the 0.07 acute hazard index calculated for Pier B and therefore below the SCAQMD threshold of 1.

### **H4.3. Predicted Air Quality Impacts**

Table **H4-1** presents the estimated residential cancer risk, off-site occupational cancer risk, residential chronic hazard index, and off-site occupational chronic hazard index associated with each Action Alternative using the methodology described above. The table shows that the cancer risk at the maximally-impacted residential/sensitive receptor would exceed the significance threshold for Alternative 4, both without and with mitigation. The residential/sensitive cancer risks associated with Alternatives 2, 3, and 5 would be below the threshold, both without and with mitigation. The occupational cancer risks and residential and occupational chronic hazard indices would be well below the thresholds for all Action Alternatives, both without and with mitigation.

**Table H4-1. Estimated Cancer Risks Associated with Construction of the Action Alternatives**

Alternative	Construction DPM Emissions <sup>a</sup>				Estimated DPM Concentration at the Maximum Residential Receptor			Estimated DPM Concentration at the Maximum Occupational Receptor		Estimated Individual Cancer Risk		Estimated Chronic Hazard Index <sup>m</sup>	
	Maximum Year (lb/yr) <sup>b</sup>	Average Years 1-2 (lb/yr) <sup>c</sup>	Average Years 3-6 (lb/yr) <sup>d</sup>	Average Years 1-6 (lb/yr) <sup>e</sup>	Maximum Year (ug/m3) <sup>f</sup>	Average Years 1-2 (ug/m3) <sup>g</sup>	Average Years 3-6 (ug/m3) <sup>h</sup>	Maximum Year (ug/m3) <sup>i</sup>	Average Years 1-6 (ug/m3) <sup>j</sup>	Maximum Residential Receptor <sup>k</sup>	Maximum Occupational Receptor <sup>l</sup>	Maximum Residential Receptor	Maximum Occupational Receptor
Alt 2 Unmitigated	12,645	9,405	107	3,207	2.3E-02	1.7E-02	1.9E-04	9.4E-02	2.4E-02	5.8E-06	3.7E-07	0.005	0.02
Alt 2 Mitigated	8,529	5,656	67	1,930	1.2E-02	7.7E-03	9.1E-05	4.6E-02	1.0E-02	2.6E-06	1.6E-07	0.002	0.009
Alt 3 Unmitigated	19,263	13,335	723	4,927	2.9E-02	2.0E-02	1.1E-03	1.1E-01	2.8E-02	6.9E-06	4.4E-07	0.006	0.02
Alt 3 Mitigated	15,108	9,225	344	3,305	2.0E-02	1.2E-02	4.6E-04	6.1E-02	1.3E-02	4.2E-06	2.1E-07	0.004	0.01
Alt 4 Unmitigated	27,035	19,484	5,077	9,879	5.0E-02	3.6E-02	9.4E-03	1.5E-01	5.4E-02	1.3E-05	8.4E-07	0.01	0.03
Alt 4 Mitigated	26,824	17,324	2,472	7,422	4.7E-02	3.0E-02	4.3E-03	1.0E-01	2.8E-02	1.1E-05	4.3E-07	0.009	0.02
Alt 5 Unmitigated	19,263	13,335	2,253	5,947	2.9E-02	2.0E-02	3.4E-03	1.1E-01	3.4E-02	7.2E-06	5.3E-07	0.006	0.02
Alt 5 Mitigated	15,108	9,225	1,035	3,765	2.0E-02	1.2E-02	1.4E-03	6.1E-02	1.5E-02	4.3E-06	2.4E-07	0.004	0.01
<b>Threshold</b>										<b>1.0E-05</b>	<b>1.0E-05</b>	<b>1</b>	<b>1</b>

Notes:

- DPM emissions are from the emission calculations for each alternative, as described in Appendix H1.
- This emission rate represents the maximum year of construction emissions, which occurs during dredging of the Approach Channel (hopper dredge). It is used in the chronic hazard index calculation.
- This emission rate includes the two consecutive years with the greatest construction emissions. It is used in the residential cancer risk calculation for receptor age 3TM < 2.
- This emission rate includes all remaining construction years except for the two consecutive years with the greatest emissions. It is used in the residential cancer risk calculation for receptor age 2 < 6.
- This emission rate equals total construction emissions averaged over 6 years, which is the exposure duration selected in the HARP analysis to cover the alternative with the longest duration (6 years for Alternative 4). It is used in the occupational cancer risk calculation.
- To be consistent with HARP HRA methodology, this concentration is the equivalent of the AERMOD "PERIOD" average using a 5-year meteorological data set; the emission rate modeled in AERMOD was the maximum annual PM<sub>10</sub> emissions converted to g/s. This concentration is used to determine the residential chronic hazard index. The dispersion modeling methodology is described in Appendix H2.
- The estimated Average Years 1-2 Concentration = Maximum Year Concentration x Average Years 1-2 Emissions / Maximum Year Emissions. This concentration is used in the residential cancer risk calculation for receptor age 3TM < 2.
- The estimated Average Years 3-6 Concentration = Maximum Year Concentration x Average Years 3-6 Emissions / Maximum Year Emissions. This concentration is used in the residential cancer risk calculation for receptor age 2 < 6.
- To be consistent with HARP HRA methodology, this concentration is the AERMOD "PERIOD" average using a 5-year meteorological data set; the emission rate modeled in AERMOD was the maximum annual PM<sub>10</sub> emissions converted to grams per second. This concentration is used to determine the occupational chronic hazard index. The dispersion modeling methodology is described in Appendix H2.
- The estimated Avg Years 1-6 Concentration = Maximum Year Concentration x Avg Years 1-6 Emissions / Maximum Year Emissions. This concentration is used in the occupational cancer risk calculation.



- k. Residential cancer risk was calculated using HARP Risk Assessment Standalone Tool (RAST) (run at a unit concentration of 1 ug/m<sup>3</sup> and scaled to the Project modeled concentration). The exposure period was assumed to start in the 3rd trimester of gestation (3TM) and continue for the duration of construction. The risks for receptor age 3TM < 2 and 2 < 6 were calculated separately due to different exposure parameters, and added together. Residential cancer risk was estimated using RMP derived methodology in accordance with SCAQMD's AB 2588 and Rule 1402 Supplemental Guidelines (September 2018). The HARP RAST residential cancer risk results at a DPM unit concentration of 1 ug/m<sup>3</sup> are 3.42E-04 for receptor age 3TM < 2 (2-year exposure) and 1.14E-04 for receptor age 2 < 6 (4-year exposure).
- l. Occupational cancer risk was calculated using HARP RAST (run at a unit concentration of 1 ug/m<sup>3</sup> and scaled to the Project modeled concentration). The exposure period was assumed to be for the duration of construction (up to 6 years depending on the alternative). Occupational cancer risk was estimated using OEHHA derived methodology in accordance with SCAQMD's AB 2588 and Rule 1402 Supplemental Guidelines (September 2018). The HARP RAST occupational cancer risk results at a DPM unit concentration of 1 ug/m<sup>3</sup> are 1.55E-05 (6-year exposure).
- m. The chronic hazard index was directly calculated by dividing the maximum year concentration by the Chronic Reference Exposure Level of 5.0 ug/m<sup>3</sup> as published in CARB's Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values. <https://www3.arb.ca.gov/toxics/healthval/contable.pdf>. (CARB, 2019b).

Table H4-2 presents locations of sensitive receptors in the project vicinity.

**Table H4-2. Sensitive Receptors**

Receptor No.	UTM X (m)	UTM Y (m)	Receptor Description	Category	Street Address	City
1	389912	3738586	12th Street Head Start	Child Care	1212 Long Beach Blvd	Long Beach
2	389883	3738053	8th Street Early Head Start	Child Care	820 Long Beach Blvd	Long Beach
3	390048	3737366	A Love 4 Learning Academy	Child Care	306 Elm Avenue	Long Beach
4	389599	3738178	ABC 123 Long Beach Learning Center	Child Care	909 Pine Ave	Long Beach
5	387995	3740853	Agu Family Child Care	Child Care	4400 Boyar Ave	Long Beach
6	389600	3738360	Aspiranet Foster Family Agency	Child Care	1043 Pine Ave	Long Beach
7	390314	3739617	Atlantic Headstart	Child Care	1862 Atlantic Ave	Long Beach
8	390224	3738014	Benford Family Child Care	Child Care	530 E 8th St	Long Beach
9	388691	3740431	Briggs Family Child Care	Child Care	Golden Ave	Long Beach
10	387340	3741495	Brown Family Child Care	Child Care	1831 W Jeanette Pl	Long Beach
11	386680	3739773	Cabrillo Child Development Center	Child Care	2205 San Gabriel Ave.	Long Beach
12	388011	3741615	Carol Daycare	Child Care	2842 Easy Ave	Long Beach
13	386767	3739844	Century Villages at Cabrillo Homeless Housing Community	Child Care	2001 River Ave	Long Beach
14	390062	3738250	Child Care Center At St Mary Medical Center	Child Care	930 Elm Ave	Long Beach
15	388899	3737062	Childtime Learning Center	Child Care	1 World Trade Ctr # 199	Long Beach
16	389481	3741039	Comprehensive Child Development	Child Care	2565 Pacific Ave.	Long Beach
17	387982	3740075	Costa Family Child Care	Child Care	2085 Easy Ave	Long Beach
18	388870	3737870	Edison Child Development Center	Child Care	640 W 7th St	Long Beach
19	389981	3738882	Elm Street Head Start	Child Care	1425 & 1429 Elm Ave	Long Beach
20	388635	3741379	Fords Family Day Care	Child Care	2726 San Francisco Ave	Long Beach
21	388088	3740588	Franklin Day Care Center	Child Care	2333 Fashion Ave	Carson
22	387556	3739981	Gallegos Family Child Care	Child Care	2024 Adriatic Ave	Long Beach
23	387670	3740411	Garfield Head Start	Child Care	2240 Baltic Ave	Long Beach
24	390403	3740229	Garibay Family Child Care	Child Care	2172 Lime Ave	Long Beach
25	388688	3740334	Hernandez Family Child Care	Child Care	2200 Golden Ave	Long Beach
26	388894	3740733	Hernandez Family Child Care	Child Care	5322 Elm Ave	Long Beach
27	388832	3740311	Herrera Family Child Care	Child Care	737 W Hill St	Long Beach
28	387501	3739748	Job Corp Head Start	Child Care	1903 Santa Fe Ave.	Long Beach
29	390444	3739033	Jones Family Child Care	Child Care	2275 Baltic Ave	Long Beach
30	390594	3738247	Kelly's Care	Child Care	943 N Washington Pl	Long Beach

Receptor No.	UTM X (m)	UTM Y (m)	Receptor Description	Category	Street Address	City
31	388725	3741155	Kelly's Kids Daycare Center	Child Care	855 W Willow St	Long Beach
32	390195	3739970	Kim Family Child Care	Child Care	2035 Linden Ave	Long Beach
33	388192	3740542	Lara Family Day Care	Child Care	1303 W 253rd St	Harbor City
34	383107	3737969	Lil Cowpoke Preschool	Child Care	445 N Avalon Blvd	Wilmington
35	389577	3738176	Little Lighthouse Educational Childcare Center	Child Care	911 Pine Avenue	Long Beach
36	389940	3740373	Long Beach Blvd Head Start	Child Care	2236 Long Beach Blvd	Long Beach
37	390373	3740260	Long Beach Center for Child Development	Child Care	622 E. Hill St	Long Beach
38	390533	3740347	Long Beach Child Development Center	Child Care	2222 Olive Ave	Long Beach
39	389282	3739139	Long Beach Day Nursery - West Branch	Child Care	1548 Chestnut Ave	Long Beach
40	388917	3737693	Loves Family Child Care	Child Care	527 Daisy Ave	Long Beach
41	388856	3738266	Lucy's Baby Care	Child Care	940 Maine Ave	Long Beach
42	390021	3738204	Montessori On Elm Preschool + Kindergarten	Child Care	930 Elm Ave	Long Beach
43	389217	3739222	N2 Lil Folkz	Child Care	1624 Chestnut Ave	Long Beach
44	389533	3741212	Oakwood Children's Center	Child Care	2650 Pacific Ave	Long Beach
45	389020	3739872	P.A.L. Family Day Care	Child Care	1980 Daisy Ave	Long Beach
46	389472	3740264	Pacific Head Start	Child Care	2179 Pacific Ave	Long Beach
47	387188	3740575	Patterson Family Child Care	Child Care	2133 Canal Ave	Long Beach
48	389579	3738221	Pine Head Start	Child Care	927 Pine Ave	Long Beach
49	390399	3739915	Poole Family Child Care	Child Care	2002 Lime Ave	Long Beach
50	389621	3738176	Progressive Steps Children Center	Child Care	911 Pine Ave	Long Beach
51	389036	3741241	Ruiz Family Daycare	Child Care	2670 Daisy Ave	Long Beach
52	389765	3740701	Sandford Family Child Care	Child Care	215 E Burnett St	Long Beach
53	390098	3740230	Sar Family Child Care	Child Care	2171 Pasadena Ave	Long Beach
54	390623	3740004	Smart & Manageable	Child Care	2054 Myrtle Ave	Long Beach
55	389894	3738960	Un Mundo De Amigos Preschool	Child Care	1480 Long Beach Blvd	Long Beach
56	389193	3738664	West Anaheim Child Care Center	Child Care	440 W. Anaheim St	Long Beach
57	387505	3740187	West Child Development Center/Westside Neighborhood Clinic	Child Care	2125 Santa Fe Ave.	Long Beach
58	384704	3739154	Wilmington Park Children's Center	Child Care	1419 E Young St	Wilmington
59	390296	3737362	YMCA GLB Fairfield 3rd Street Preschool	Child Care	607 E. 3rd St	Long Beach
60	389492	3740248	YMCA Play & Learn Preschool	Child Care	2179 Pacific Ave	Long Beach
61	389517	3739600	Young Horizons Child Development Center	Child Care	1840 Pacific Ave	Long Beach
62	389536	3740757	Young Horizons Child Development Center	Child Care	2418 Pacific Ave	Long Beach

Receptor No.	UTM X (m)	UTM Y (m)	Receptor Description	Category	Street Address	City
63	390248	3737686	Young Horizons Child Development Center	Child Care	501 Atlantic Ave	Long Beach
64	389459	3737689	Young Horizons/El Jardin de la Felicidad	Child Care	507 Pacific Ave	Long Beach
65	388854	3740055	Zarate Family Child Care	Child Care	2496 Oregon Ave	Long Beach
66	390353	3741373	Akin's Post Acute Rehab Hospital; Atlantic Memorial Healthcare Center	Elder Care	2750 Atlantic Ave	Long Beach
67	383100	3738224	American AAA Health Care Center	Elder Care	629 N Avalon Blvd	Wilmington
68	387401	3740832	Aquarius Home	Elder Care	1765 Aquarius St	Long Beach
69	387445	3739252	Bay Breeze Care	Elder Care	1653 Santa Fe Ave	Long Beach
70	389740	3736892	Breakers Of Long Beach, The	Elder Care	210 E Ocean Blvd	Long Beach
71	387440	3740697	Burnett Home Care	Elder Care	1740 West Burnett St.	Long Beach
72	390386	3740307	Caruthers Royale Care	Elder Care	2204 Lime Ave.	Long Beach
73	389587	3740686	Deluxe Guest Home	Elder Care	3260 Pine Ave	Long Beach
74	389586	3740722	Deluxe Guest Home II	Elder Care	3266 Pine Ave	Long Beach
75	389401	3740862	Garden, The	Elder Care	2485 Cedar Ave	Long Beach
76	389119	3738782	Harbor View Rehabilitation Center	Elder Care	490 W. 14th Street	Long Beach
77	387192	3740865	Hayes Home	Elder Care	2470 Hayes Ave	Long Beach
78	389645	3737994	Healthview Pine Villa Assisted Living	Elder Care	117 East 8th Street	Long Beach
79	389498	3740798	Heritage Board & Care #2	Elder Care	1509 E 4th St	Long Beach
80	387231	3740475	Loram Manor	Elder Care	1925 Gemini St	Long Beach
81	390455	3738345	Olive Tree Home	Elder Care	1035 Olive Street	Long Beach
82	390278	3738221	Padua House	Elder Care	940 Atlantic Ave	Long Beach
83	387154	3741415	Pioneer Homes Of California	Elder Care	2041 W Carolyn Pl	Long Beach
84	387349	3740831	Reliable Residential Care	Elder Care	1840 Aquarius St	Long Beach
85	390005	3740389	Right At Home	Elder Care	2245 Elm Ave	Long Beach
86	389478	3741347	Royal Care Skilled Nursing Center	Elder Care	2725 Pacific Avenue	Long Beach
87	390388	3740918	Serra Project Long Beach	Elder Care	1043 Elm Ave	Long Beach
88	390475	3738176	Villa Maria Care Center	Elder Care	723 E 9th St	Long Beach
89	389978	3741459	Earl & Lorraine Miller Children's Hospital; Long Beach Memorial Medical Center and Hospital	Hospital	2801 Atlantic Ave	Long Beach
90	389449	3739338	Long Beach Doctors Hospital	Hospital	1725 Pacific Ave	Long Beach
91	389539	3741329	Pacific Hospital of Long Beach (Hospital and Convalescent/Nursing Home)	Hospital	2776 Pacific Ave	Long Beach
92	390100	3738380	St Mary Medical Center	Hospital	1050 Linden Ave	Long Beach
93	389215	3739462	Tom Redgate Memorial Hospital	Hospital	1775 Chestnut Ave	Long Beach

Receptor No.	UTM X (m)	UTM Y (m)	Receptor Description	Category	Street Address	City
94	387362	3740183	Admiral Kidd Park	Recreational	2125 Santa Fe Ave	Long Beach
95	388669	3737500	Cesar Chavez Park	Recreational	401 Golden Avenue	Long Beach
96	388060	3738639	City of Long Beach Multi-Service Center	Recreational	1301 W. 12th Street	Long Beach
97	387306	3739448	Harbor Japanese Community Cultural Center	Recreational	1766 Seabright Ave	Long Beach
98	386955	3740430	Hudson Park	Recreational	2335 Webster Ave	Long Beach
99	387067	3741097	Khemara Buddhikaram Cambodian Buddhist Temple	Recreational	2100 W Willow Street	Long Beach
100	387129	3740300	Pramuan Simsriwatna Place of Worship	Recreational	2015 W Hill Street	Long Beach
101	386856	3739792	VA Long Beach Clinic and Veteran's Support Services	Recreational	2001 River Ave, Building 28	Long Beach
102	382237	3737492	Wilmington Waterfront Park	Recreational	S. C Street	Wilmington
103	383262	3736996	Wilmington Waterfront Promenade	Recreational	Water Street	Wilmington
104	384770	3739365	Apostolic Faith Center/Apostolic Faith Academy	School	1530 E Robidoux St	Wilmington
105	389454	3738592	Artesia Well Preparatory Academy	School	1235 Pacific Ave	Long Beach
106	386739	3740042	Bethune School/Program for the Homeless	School	2101 San Gabriel Ave	Long Beach
107	390228	3740326	Burnett Elementary	School	565 East Hill St.	Long Beach
108	387438	3739936	Cabrillo High School	School	2001 Santa Fe Ave.	Long Beach
109	389562	3740833	Cambodian Christian	School	2474 Pacific Ave	Long Beach
110	388744	3737296	Cesar Chavez Elementary	School	730 West Third St.	Long Beach
111	389879	3739303	Colegio New City	School	1637 Long Beach Blvd	Long Beach
112	390505	3737788	Constellation Community Charter Middle	School	620 Olive Ave.	Long Beach
113	388749	3737794	Edison Elementary	School	625 Maine Ave.	Long Beach
114	386969	3740593	Elizabeth Hudson Elementary School and Development Center Daycare	School	2335 Webster Ave	Long Beach
115	389624	3738317	First Baptist Church School	School	1000 Pine Ave	Long Beach
116	390180	3738228	First Lutheran Day Care, Preschool and Elementary School	School	946 Linden Ave	Long Beach
117	382757	3737606	Gang Alternative Program	School	231 Island Ave	Wilmington
118	382820	3738093	George de la Torre Jr. Elementary School	School	500 Island Ave	Wilmington
119	389389	3738887	George Washington Middle School	School	1450 Cedar Ave	Long Beach
120	384377	3739369	Holy Family Preschool and Elementary School	School	1122 E Robidoux St	Wilmington
121	389544	3740927	Holy Innocents Elementary School	School	2500 Pacific Ave	Long Beach
122	387067	3740604	Hudson Development Center Daycare and Elementary School	School	2335 Webster Ave	Long Beach
123	389714	3737893	International Elementary	School	700 Locust Ave	Long Beach
124	389686	3741436	Jackie Robinson Academy	School	2750 Pine Ave	Long Beach
125	387724	3740376	James Garfield Elementary School / LBUSD Child Development Center	School	2240 Baltic Ave	Long Beach

Receptor No.	UTM X (m)	UTM Y (m)	Receptor Description	Category	Street Address	City
126	387255	3739936	Juan Rodriguez Cabrillo High School	School	2001 Santa Fe Ave	Long Beach
127	389235	3740749	Lafayette Elementary School	School	2445 Chestnut Ave	Long Beach
128	390207	3737910	Long Beach Montessori School	School	525 E. 7th St	Long Beach
129	390337	3739143	Polytechnic High School	School	1600 Atlantic Ave.	Long Beach
130	389106	3738800	Regency High School	School	490 W. 14th Street	Long Beach
131	387111	3740236	Reid Continuation High School	School	2153 W Hill St	Long Beach
132	389785	3738088	Renaissance High School for the Arts	School	235 East 8th St.	Long Beach
133	390160	3739058	Roosevelt Elementary	School	1574 Linden Ave.	Long Beach
134	390534	3737794	Saint Anthony High School	School	620 Olive Ave.	Long Beach
135	390580	3737582	Saint Anthony Preschool / Elementary	School	855 East 5th St.	Long Beach
136	387406	3740569	Saint Lucy School	School	2320 Cota Ave.	Long Beach
137	387022	3740319	Savannah Academy	School	2152 Hill St.	Long Beach
138	390248	3737371	Select Community Day School	School	5869 Atlantic Ave.	Long Beach
139	390538	3737763	St. Anthony High School/Constellation Community Charter Middle	School	620 Olive Ave.	Long Beach
140	387420	3740551	St. Lucy School	School	2320 Cota Ave	Long Beach
141	387250	3741600	Stephens Middle School	School	1830 West Columbia Street	Long Beach
142	390365	3737647	Stevenson Elementary; Stevenson Child Development Centers/Preschool	School	515 Lime Ave.	Long Beach
143	389624	3738615	The New City School	School	1230 Pine Ave	Long Beach
144	390276	3738162	True Social Justice Academy	School	630 Magnolia Ave	Long Beach
145	387129	3741587	William Logan Stephens Middle School	School	1830 W Columbia St	Long Beach
146	384625	3739124	Wilmington Park Elementary School/Mahar House	School	1140 Mahar Ave	Wilmington

Note: Individual residences are not included in the table and accompanying figure.

The locations of sensitive receptors in Table H4-2 are shown on Figure 3-4 in Section 3.5.

#### **H4.4. References for Appendix H4**

CARB 2019a. Hotspots Analysis and Reporting Program (HARP). Risk Assessment Standalone Tool (RAST). Version 19044. <https://ww3.arb.ca.gov/toxics/harp/harp.htm>. February 13.

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OEHHA 2015. Office of Environmental Health Hazard Assessment. *Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*. March 2015.

POLB 2016. Port of Long Beach. *Pier B On-Dock Rail Support Facility Draft EIR*, Appendix A, Table A3-7. December 2016. Available: <http://www.polb.com/environment/docs.asp>. Accessed: September 2019.

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## **Appendix H5. General Conformity Determination**



Deep Draft Navigation Project  
Port of Long Beach, California  
Final General Conformity Determination

June 2021

US Army Corps of Engineers  
Los Angeles District

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# **1 Introduction**

Section 176 (c) of the Clean Air Act (42 U.S.C. § 7506(c)) requires any entity of the Federal government that engages in, supports, or in any way provides financial support for, licenses or permits, or approves any activity to demonstrate that the action conforms to the applicable State Implementation Plan (SIP) required under Section 110 (a) of the Clean Air Act (42 U.S.C. § 7410(a)) before the action is otherwise approved. In this context, conformity means that such Federal actions must be consistent with a SIP's purpose of eliminating or reducing the severity and number of violations of national ambient air quality standards (NAAQS) and achieving expeditious attainment of those standards. Each Federal agency (including the U.S. Army Corps of Engineers [USACE]) must determine that any action that is proposed by the agency and that is subject to the regulations implementing the conformity requirements will, in fact, conform to the applicable SIP before the action is taken.

This final general conformity determination documents the evaluation of the Federal actions with Section 176 (c) requirements of the Clean Air Act. The remainder of Section 1 discusses the background of the regulatory requirements. Section 2 discusses the USACE's Federal actions. Section 3 discusses the regulatory procedures for the conformity evaluation. Section 4 describes how applicability of the conformity requirements to the Federal actions were analyzed. Section 5 presents the methods and criteria that were used to evaluate the conformity of the Federal actions. Section 6 discusses the concepts of mitigation required under conformity regulations. Section 7 presents the reporting process to be followed to formalize the conformity determination. Section 8 offers the USACE's findings and conclusions. Section 9 provides references for the evaluation.

## **1.1 General Conformity Requirements**

On November 30, 1993, the U.S. Environmental Protection Agency (EPA) promulgated final general conformity regulations at 40 C.F.R. Part 93 Subpart B for all Federal activities except those covered under transportation conformity. The EPA issued final revised general conformity regulations on April 5, 2010. The general conformity regulations apply to a Federal action in a nonattainment or maintenance area if the total of direct and indirect emissions of the relevant criteria pollutants and precursor pollutants caused by the Federal action equal or exceed certain applicability rates (also known as de minimis levels), thus requiring the Federal agency to make a determination of general conformity. By requiring an analysis of direct and indirect emissions, EPA intended the regulating Federal agency to make sure that only those emissions that are reasonably foreseeable and that the Federal agency can practicably control subject to that agency's continuing program responsibility will be addressed.

The general conformity regulations incorporate a stepwise process, beginning with an applicability analysis. Before any approval is given for a Federal action to go forward,

the regulating Federal agency must apply the applicability requirements found at 40 C.F.R. § 93.153(b) to the Federal action(s) to evaluate whether, on a pollutant-by-pollutant basis, a determination of general conformity is required. The applicability analysis can be (but is not required to be) completed concurrently with any analysis required under the National Environmental Policy Act (NEPA). If the regulating Federal agency determines that the general conformity regulations do not apply to the Federal action, no further analysis or documentation is required. If the general conformity regulations do apply to the Federal action, the regulating Federal agency must next conduct a conformity evaluation in accord with the criteria and procedures in the implementing regulations, publish a draft determination of general conformity for public review, and then publish the final determination of general conformity.

## **2 Description of the Federal Action**

In accordance with applicable general conformity regulations and guidance when a general conformity determination is necessary, the USACE is only required to conduct a general conformity evaluation for a specific Federal action associated with the selected alternative for a project or program (EPA 1994), and the USACE must issue a positive conformity determination before the Federal action is approved.<sup>1</sup> Each Federal agency is responsible for determining conformity of those proposed actions over which it has jurisdiction. This final general conformity determination is related only to those activities included in the USACE's Federal action pertaining to the Project, which is more fully described in Section 2.1.

The general conformity requirements only apply to Federal actions proposed in nonattainment areas (i.e., areas where one or more NAAQS are not being achieved at the time of the proposed action and requiring SIP provisions to demonstrate how attainment will be achieved) and in maintenance areas (i.e., areas recently reclassified from nonattainment to attainment and requiring SIP provisions pursuant to Section 175A of the Clean Air Act to demonstrate how attainment will be maintained). The attainment status of the South Coast Air Basin (SCAB) in the vicinity of Port of Long Beach (POLB) is discussed in Section 4.1.

### **2.1 Navigation Improvements for Deep Draft Vessels**

The Federal actions related to the POLB Deep Draft Navigation Project (proposed Project) include the General Navigation Features and the Local Service Facilities (LSF) with the USACE's regulatory purview. As indicated in the Integrated Feasibility Report with Environmental Impact Statement/Environmental Impact Report (EIS/EIR), the preferred alternative is Alternative 3 which includes the following:

- Construction of navigation improvements at POLB to improve deep draft vessel operations. The Federal construction project includes management measures for container vessels (constructing the Pier J Approach Channel and Turning

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<sup>1</sup> Although General Conformity Regulations were revised in 2010, this guidance remains generally applicable.

Basin and deepening the West Basin Channel to a new depth of -55 feet mean lower low water (MLLW)), liquid bulk vessels (deepening the Approach Channel to -80 feet MLLW, and bend easing in portions of the Main Channel to match the currently authorized depth in the Main Channel of -76 feet MLLW).

- Issuance of a Department of the Army permit for construction of LSFs. LSFs are features not included in the Federal construction project but are improvements in adjoining areas that would be constructed by the POLB to account for the deepened Federal channels. These include berth dredging and potential wharf improvements to account for the deepened Federal channels. In particular, LSFs includes deepening of Pier J Basin and berths to a new depth of -55 feet MLLW, and Pier J breakwaters improvements at the entrance of the Pier J Slip. Though outside the Federal construction project, their construction is subject to the USACE's regulatory purview pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act.
- Dredged material from both the General Navigation Features and LSFs would be disposed via a combination of nearshore placement at the Surfside Borrow Site Nearshore Placement Area and ocean dredge material disposal site (LA-2 and LA -3).

Per 40 C.F.R. § 93.152, USACE's Federal authority would extend only to construction emissions associated with Alternative 3. The only reasonably foreseeable activities extending beyond the construction period and subject to USACE authority would be maintenance dredging, which is exempt from conformity applicability per 40 C.F.R. § 93.153(c). Hence, the USACE would have no continuing program responsibility for activities beyond construction.

### **3 Regulatory Procedures**

The general conformity regulations establish certain procedural requirements that must be followed when preparing a general conformity evaluation. This section addresses the major procedural issues and specifies how these requirements are met for the evaluation of the Federal actions. The procedures required for the general conformity evaluation are similar but not identical to those for conducting an air quality impact analysis under NEPA regulations.

#### **3.1 Use of Latest Planning Assumptions**

The general conformity regulations require the use of the latest planning assumptions for the area encompassing the Federal actions, derived from the estimates of population, employment, travel, and congestion most recently approved by the Metropolitan Planning Organization (MPO, 40 C.F.R. § 93.159(a)).

The Southern Association of Governments (SCAG) is the MPO for the region encompassing POLB. The SCAG region covers an area of over 38,000 square miles and includes the counties of Imperial, Los Angeles, Orange, Riverside, San Bernardino,

and Ventura. The applicable planning document encompassing the Federal actions is the Regional Transportation Plan (RTP). The most current RTP is the 2020 RTP which SCAG approved on May 7, 2020.

It should be noted that the latest planning assumptions available from the MPO at the time of this evaluation may differ from the planning assumptions used in establishing the applicable SIP emissions budgets. The South Coast Air Quality Management District's (SCAQMD) most current approved SIP incorporated estimates and projections from the 2016 RTP. Likewise, air quality analysis in the EIS/EIR for the proposed Project also incorporated estimates and projections from the 2016 RTP.

### **3.2 Use of Latest Emission Estimation Techniques**

The general conformity regulations require the use of the latest and most accurate emission estimation techniques available, unless such techniques are inappropriate (40 C.F.R. § 93.159(b)). Prior written approval from EPA is required to modify or substitute emission estimation techniques. It should be noted that the latest and most accurate emission estimation techniques available at the time of this evaluation may differ from the emission estimation techniques used in establishing the applicable SIP emissions budgets.

Air pollutant emissions for the proposed action were calculated using the most current emission factors and methods available at the time the calculations were performed including:

- **Dredging Equipment.** The Federal actions would use hopper and clamshell dredges. Hopper dredge engines are large marine engines used for propulsion and operation of the dredging equipment. Emission factors for hopper dredge propulsion and auxiliary engines therefore reflect existing EPA marine engine standards. Hopper dredge propulsion and auxiliary engines were assumed to be Tier 2 marine diesel engines.

Clamshell dredges are not self-propelled and emission factors for these engines reflect existing EPA non-road engine standards; clamshell dredge engines were assumed to be Tier 3 non-road diesel engines.

Both hopper dredge and clamshell dredge utilization, schedule, activity, engine size, and load factors were based on project-specific dredging requirements presented in Appendix A.

- **On-road Equipment:** Criteria pollutant emission factors reflect EPA on-road engine standards and California Air Resources Board (CARB) requirements. Emission factors were generated using CARB's on-road EMFAC2017 model for truck and passenger vehicle fleets representative of the South Coast region. Emissions include engine exhaust, entrained road dust, and brake and tire wear.

- Off-road Equipment: Criteria pollutant emission factors for off-road construction equipment reflect EPA non-road engine standards and CARB requirements. Emission factors were generated using CARB's 2017 OFFROAD Inventory Model for an average equipment fleet composition in the SCAB.
- Harbor Craft. Emission factors for harbor craft reflect EPA marine engine standards and harbor craft engine types common at the Port, as documented in the Port's Air Emissions Inventory. POLB's 2017 Air Emissions Inventory identifies that most harbor craft propulsion engines operating at the port in 2017 were EPA Tier 2 diesel engines and that approximately half of all harbor craft auxiliary engines were Tier 3. This analysis conservatively used EPA Tier 2 harbor craft emission standards for both propulsion and auxiliary engines.
- Fugitive Dust. PM<sub>10</sub> and PM<sub>2.5</sub> fugitive dust emissions from construction activities such as debris loading and materials handling were calculated using emission factors from EPA's AP-42 emission factor handbook and default parameters for soil and wind conditions from CalEEMod. PM<sub>10</sub> and PM<sub>2.5</sub> emissions from on- and off-site paved road dust were calculated using CARB's Miscellaneous Process Methodology.

The details of emissions estimating are described in Attachment C.

### 3.3 Emission Scenarios

The general conformity regulations require that the evaluation must reflect certain emission scenarios (40 C.F.R. §93.159(d)). Specifically, these scenarios must include emissions from the Federal actions for the following years: (1) the attainment year specified in the SIP, or if the SIP does not specify an attainment year, the latest attainment year possible under the Clean Air Act or the last year for which emissions are projected in the maintenance plan; (2) the year during which the total of direct and indirect emissions from the action is expected to be the greatest on an annual basis; and (3) any year for which the applicable SIP specifies an emissions budget. Table 1 specifies the years for which the general conformity evaluation was performed for comparison to the approved SIP.

**Table 1. Emission Scenarios**

<b>Pollutant</b>	<b>NAAQS Attainment Designation</b>	<b>Attainment/Maintenance Year</b>	<b>Greatest Emission Year</b>	<b>Emissions Budget Years</b>
Ozone	Nonattainment (Extreme)	2022 <sup>a</sup> , 2023 <sup>b</sup> , 2031 <sup>c</sup>	2025	2017-2030
CO	Attainment (Maintenance)	2030	2025	2017-2030
NO <sub>2</sub>	Attainment (Maintenance)	2030	2025	2017-2030
PM <sub>10</sub>	Attainment (Maintenance)	2030	2025	2017-2030
PM <sub>2.5</sub>	Nonattainment (Serious)	2019 <sup>d</sup> , 2021 <sup>e</sup> , 2025 <sup>f</sup>	2025	2017-2030

- a. 2016 AQMP, Table ES-1, 1979 1-hr ozone
- b. 2016 AQMP, Table ES-1, 1997 8-hr ozone
- c. 2016 AQMP, Table ES-1, 2008 8-hr ozone
- d. 2016 AQMP, Table ES-1, 2006 24-hr PM<sub>2.5</sub>
- e. 2016 AQMP, Table ES-1, 2021 annual PM<sub>2.5</sub> (moderate)
- f. 2016 AQMP, Table ES-1, 2021 annual PM<sub>2.5</sub> (serious)

## 4 Applicability Analysis

As stated previously, the first step in a general conformity evaluation is an analysis of whether the requirements apply to a Federal action proposed to be taken in a nonattainment or a maintenance area. Unless exempted by the regulations or otherwise presumed to conform, a Federal action requires a general conformity determination for each pollutant where the total of direct and indirect emissions caused by the Federal action would equal or exceed the applicability rate.



## 4.1 Attainment Status of South Coast Air Basin

POLB is located within Los Angeles County in the SCAB of southern California. The regulatory agencies with primary responsibility for air quality management in the SCAB include SCAQMD and CARB, with oversight by EPA. Pursuant to the Clean Air Act, EPA established NAAQS to protect the public health with an adequate margin of safety and secondary NAAQS to protect the public welfare for seven air pollutants. These pollutants are known as criteria pollutants: particulate matter with an equivalent aerodynamic diameter less than or equal to ten micrometers ( $\mu\text{m}$ ) in diameter ( $\text{PM}_{10}$ ), particulate matter with an equivalent aerodynamic diameter less than or equal to 2.5  $\mu\text{m}$  in diameter ( $\text{PM}_{2.5}$ ), sulfur dioxide ( $\text{SO}_2$ ), carbon monoxide ( $\text{CO}$ ), ozone ( $\text{O}_3$ ), nitrogen dioxide ( $\text{NO}_2$ ), and lead ( $\text{Pb}$ ). EPA has delegated authority to SCAQMD to implement and enforce the NAAQS in the SCAB.

That portion of the SCAB encompassing POLB is designated as an extreme non-attainment area for ozone; serious non-attainment for  $\text{PM}_{2.5}$ ; maintenance for  $\text{PM}_{10}$ , maintenance for  $\text{CO}$ , maintenance for  $\text{NO}_2$ , and attainment for  $\text{SO}_2$  and non-attainment for  $\text{Pb}$ .

Estimates of  $\text{Pb}$  emissions were not calculated.  $\text{Pb}$  emissions from mobile sources in have significantly decreased due to the near elimination of  $\text{Pb}$  in fuels. Thus, emission factors databases such as EMFAC2017 do not provide estimated emissions for  $\text{Pb}$ . Little to no quantifiable and foreseeable  $\text{Pb}$  emissions would be generated by the Federal actions.

Thus, for purposes of the general conformity requirements, this evaluation addresses  $\text{NO}_2$ ,  $\text{O}_3$ ,  $\text{CO}$ ,  $\text{PM}_{10}$ , and  $\text{PM}_{2.5}$ .

## 4.2 Exemptions from General Conformity Requirements

As noted previously, the general conformity requirements apply to a Federal action if the net project emissions equal or exceed certain applicability rates. The only exceptions to this applicability criterion are the topical exemptions summarized below. However, the emissions caused by the Federal action do not meet any of these exempt categories (except maintenance dredging and associated debris disposal pursuant to 40 C.F.R. § 93.153(c)(2)(ix)).

- Actions which would result in no emissions increase or an increase in emissions that is clearly below the de minimis levels (40 C.F.R. § 93.153(c)(2)). Examples include administrative actions and routine maintenance and repair.
- Actions where the emissions are not reasonably foreseeable (40 C.F.R. § 93.153(c)(3)).
- Actions which implement a decision to conduct or carry out a conforming program (40 C.F.R. § 93.153 (c)(4)).

- Actions which include major new or modified sources requiring a permit under the New Source Review (NSR) program (40 C.F.R. § 93.153(d)(1)).
- Actions in response to emergencies or natural disasters (40 C.F.R. § 93.153(d)(2)).
- Actions which include air quality research not harming the environment (40 C.F.R. § 93.153(d)(3)).
- Actions which include modifications to existing sources to enable compliance with applicable environmental requirements (40 C.F.R. § 93.153(d)(4)).
- Actions which include emissions from remedial measures carried out under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) that comply with other applicable requirements (40 C.F.R. § 93.153(d)(5)).

In addition to these topical exemptions, the general conformity regulations allow each Federal agency to establish a list of activities that are presumed to conform (40 C.F.R. § 93.153(f)). The USACE has not established a presumed-to-conform list of activities at the time of this evaluation.

### 4.3 Applicability Rates

The general conformity requirements will apply to a Federal action for each pollutant for which the total of direct and indirect emissions caused by the Federal action equal or exceed the applicability rates shown in Table 2. These emission rates are expressed in units of tons per year (tpy) and are compared to the total of direct and indirect emissions caused by Federal actions for the calendar year during which the net emissions are expected to be the greatest.

It should be noted that, because O<sub>3</sub> is a secondary pollutant (i.e., it is not emitted directly into the atmosphere but is formed in the atmosphere from the photochemical reactions of volatile organic compounds, VOC, and oxides of nitrogen, NO<sub>x</sub>, in the presence of sunlight), its applicability rate is based on primary emissions of its precursor pollutants - VOC and NO<sub>x</sub>. If the net emissions of either VOC or NO<sub>x</sub> equal or exceed the applicability rate for O<sub>3</sub> (EPA 1994), then the Federal actions are subject to a general conformity evaluation for O<sub>3</sub>.

**Table 2: SCAB Attainment Designations and General Conformity Applicability Rates**

<b>Pollutant</b>	<b>NAAQS Attainment Designation</b>	<b>General Conformity Applicability Rates (tpy)</b>
Ozone	Nonattainment (Extreme)	10
CO	Attainment (Maintenance)	100
NO <sub>2</sub>	Attainment (Maintenance)	100
PM <sub>10</sub>	Attainment (Maintenance)	100
PM <sub>2.5</sub>	Nonattainment (Serious)	70

### 4.4 Applicability for Federal Action

The applicability of the general conformity requirements to the Federal actions were evaluated by comparing the total of direct and indirect emissions (calculated as presented in Attachment C) for the calendar year of greatest emissions to the applicability rates specified in Table 2. Those pollutants that could not be excluded from applicability underwent a complete general conformity evaluation consistent with the procedures in Section 3 above using the methods in Attachment C and the criteria in Section 5 below.

## 4.4.1 Methodology

Attachment C presents the calculations used to estimate emissions associated with the proposed Federal actions. Equipment parameters and construction activities have been described in the Final EIS/EIR. This information has been incorporated into the emission calculations presented in Attachment C and summarized below.

## 4.4.2 Estimated Emissions and Comparison to Applicability Rates

### Unmitigated Emissions

Emissions were calculated for precursors of ozone (VOC and NO<sub>x</sub>), CO, NO<sub>2</sub>, PM<sub>10</sub>, and PM<sub>2.5</sub> for construction activities associated with the Federal actions. Results are summarized in Table 3 for each year of construction. These data show that annual emissions from construction year 2025 would exceed the applicability rates for ozone (NO<sub>x</sub> and VOC as precursors), NO<sub>2</sub> and CO, construction years 2026 and 2027 would exceed the applicability rates for ozone (NO<sub>x</sub> precursor). Therefore, a general conformity determination is required for precursors of ozone (VOC and NO<sub>x</sub>), NO<sub>2</sub> and CO.

**Table 3: Estimated Construction Emissions (Unmitigated)**

Construction Year	PM <sub>10</sub>	PM <sub>2.5</sub>	Ozone (NO <sub>x</sub> )	Ozone (VOC)	NO <sub>2</sub>	CO
2024	0.2	0.2	4.1	0.2	4.1	2.3
2025	9.6	8.7	<b>194.8</b>	<b>10.8</b>	<b>194.8</b>	<b>106.7</b>
2026	3.7	3.4	<b>84.2</b>	4.7	84.2	47.3
2027	1.2	1.1	<b>28.0</b>	1.6	28.0	15.7
GC Applicability Rates	100	70	10	10	100	100

### Mitigated Emissions

As part of a conformity evaluation, it may be necessary for the Federal agency to identify mitigation measures and mechanisms for their implementation and enforcement. For example, if a Federal action does not initially conform to the applicable SIP, mitigation measures could be pursued. If mitigation measures are used to support a positive conformity determination, the Federal agency must obtain a written commitment from the entity required to implement these measures and the Federal agency must include the mitigation measures as conditions in any permit or license granted for the Federal action (40 C.F.R. § 93.160). Mitigation measures may be used in combination with other criteria to demonstrate conformity.

The Federal actions, as evaluated herein, assume various air quality mitigation measures as described in the EIS/EIR. The measures were adapted from the POLB's

“Best Management Practices for Reducing Air Emissions from Construction Equipment” and were developed in conjunction with the 2010 Clean Air Action Plan. See Section 5.5.5 of the EIS/EIR. In particular, the mitigation measures include:

**MM-AQ-1: Electric clamshell dredge.** The use of an electric clamshell dredge shall be required for project clamshell dredging activities during the entire construction period of the project, and the construction of an electrical substation at Pier J is also required to provide electric power to the clamshell dredge.

**MM-AQ-2: Construction-Related Harbor Craft.** Construction-related harbor craft (tugboats, crew boats, and survey boats) with Category 1 or Category 2 marine engines shall meet EPA Tier 3 emission standards for marine engines. In addition, the construction contractor shall require all construction-related tugboats that home fleet in the San Pedro Bay Ports: 1) to shut down their main engines and 2) to refrain from using auxiliary engines while at dock and instead use electrical shore power, if feasible.

**MM-AQ-3: Off-Road Construction Equipment.** Self-propelled, diesel-fueled off-road construction equipment 25 hp or greater shall meet EPA/CARB Tier 4 Final emission standards for non-road equipment.

**MM-AQ-4: Additional Mitigation for Off-Road Construction Equipment.** Off-road diesel-powered construction equipment shall comply with the following:

- Construction equipment shall be maintained according to manufacturer’s specifications.
- Construction equipment shall not idle for more than 5 minutes when not in use.

With application of mitigation measures, estimated emissions are reduced to levels shown in Table 4. These data show that annual emissions from construction years 2025, 2026, and 2027 would exceed the applicability rate for NO<sub>x</sub> (ozone precursor), and construction year 2025 would exceed the applicability rate for NO<sub>2</sub>.

**Table 4: Estimated Construction Emissions (Mitigated)**

Construction Year	PM <sub>10</sub>	PM <sub>2.5</sub>	Ozone (NO <sub>x</sub> )	Ozone (VOC)	NO <sub>2</sub>	CO
2024	0.2	0.1	2.8	0.2	2.8	2.4
2025	7.6	6.7	145.5	8.1	145.5	86.9
2026	1.7	1.5	35.8	2.0	35.8	27.4
2027	0.6	0.5	11.9	0.7	11.9	9.1
GC Applicability Rates	100	70	10	10	100	100

### **4.4.3 Applicability Determination**

The General Conformity Determination thus far has reported unmitigated and mitigated emissions associated with the Federal actions for disclosure. Henceforth, the General Conformity Determination will solely use mitigated emissions since the Federal actions will fully implement air quality mitigation measures listed above. These measures will be included in the final plans and specifications and become part of USACE construction contracts for the General Navigation Features and any Department of the Army permit for the LSFs. USACE will be responsible for monitoring and enforcing these mitigation measures.

The total of mitigated direct and indirect emissions of PM<sub>10</sub>, PM<sub>2.5</sub>, VOC (ozone precursor), and CO associated with the Federal actions are less than the general conformity applicability rates.

Based on the above:

- General Conformity requirements do not apply to PM<sub>10</sub>, PM<sub>2.5</sub>, VOC (ozone precursor), and CO. These pollutants are not further evaluated.
- General Conformity requirements do apply to NO<sub>x</sub> (ozone precursor) and NO<sub>2</sub>.

## **5 General Conformity Evaluation**

For Federal actions subject to a general conformity evaluation, the regulations delineate several criteria that can be used to demonstrate conformity (40 C.F.R. § 93.158). In fact, a combination of these criteria may be used to support a positive general conformity determination (EPA 1994). The approach to be taken to evaluate the Federal actions relies on a combination of these available criteria, and the remainder of this section summarizes the findings to make the final determination.

### **5.1 Designation of Applicable SIP**

Section 110(a) of the Clean Air Act (42 U.S.C. § 7410(a)) requires each state to adopt and submit to EPA a plan which provides for the implementation, maintenance, and enforcement of each NAAQS. This plan is known as the SIP. Over time, states have made and continue to make many such submittals to EPA to address issues as they arise related to the various NAAQS. As EPA reviews these submittals, it can either approve or disapprove them in whole or in part. The compilation of a state's approved submittals constitutes that state's applicable SIP. In California, the state agency responsible for preparing and maintaining the SIP is CARB.

### 5.1.1 SIP Process in the South Coast Air Basin

CARB designates both air quality management districts and air pollution control districts within California for the purpose of implementing and enforcing ambient air quality standards on a regional or air shed basis. These district agencies must prepare regional plans (Air Quality Management Plans [AQMPs]) to support the broader SIP, as well as to meet the goals of the California Clean Air Act.

The Federal actions at POLB are located within the SCAB which is within the geographic jurisdiction of the SCAQMD. The approved SIP for the SCAB is the 2016 AQMP.

### 5.2 Comparison of Construction Emissions to Emission Budgets

To support the general conformity determination, the USACE demonstrates herein that the emissions of NO<sub>x</sub> (ozone precursor) and NO<sub>2</sub> caused by the Federal actions either will result in a level of emissions which, together with all other emissions in the nonattainment area, will not exceed the emissions budgets specified in the approved SIP (criterion at 40 C.F.R. § 93.158(a)(5)(i)(A)) or, in the alternative, will not exceed the emissions budgets specified in the 2016 AQMP.

The 2016 AQMP, which is the latest plan approved by EPA, established set-aside budgets to accommodate emissions subject to general conformity requirements. The set-aside accounts include 730 tpy of NO<sub>x</sub> and 182.5 tpy of VOC each year starting in 2017 through 2030, and 182.5 tpy of NO<sub>x</sub> and 73 tpy of VOC each year in 2031 and thereafter.

The 2016 AQMD does not establish set aside budgets for NO<sub>2</sub> as further explained below.

Table 7 below compares the construction emissions to the corresponding years from the 2016 AQMP budget for ozone precursor (NO<sub>x</sub>).

**Table 7: Comparison of NO<sub>x</sub> Emission to Approved SIP Budget**

Construction Year	Pollutant	Construction Emissions (tpy)	Approved SIP Emissions Budget (tpy) <sup>a</sup>
2025	NO <sub>x</sub>	145.5	730
2026	NO <sub>x</sub>	35.8	730
2027	NO <sub>x</sub>	11.9	730

a. 2016 AQMP III-2-87

By letter dated March 3, 2021 the USACE requested the SCAQMD accommodate the anticipated emissions in the 2016 AQMP emission budget (Attachment A). By letter dated April 12, 2021, the SCAQMD confirmed the following (Attachment B):

- NO<sub>x</sub> emissions would be accommodated into the set-aside emission budgets for 2025, 2026, and 2027.
- NO<sub>2</sub> emissions exceed the de minimis threshold in 2025. However, General Conformity requirements are not applicable to these emissions.

South Coast Air Basin was designated as a maintenance area for the 1971 annual NO<sub>2</sub> NAAQS on July 24, 1998. However, twenty years after the effective date of redesignation to attainment, general conformity no longer applies unless a maintenance plan approved under CAA Section 175A specifies that conformity requirements apply for a longer time period. The approved maintenance plan for the SCAB did not extend the maintenance plan period beyond 20 years from redesignation. Consequently, conformity requirements for NO<sub>2</sub> ceased to apply after September 22, 2018.

Based on the above, NO<sub>x</sub> emissions associated with the Federal actions conform with the 2016 AQMP, the approved SIP for the SCAB whereas conformity requirements are no longer applicable to NO<sub>2</sub>.

### **5.3 Consistency with Requirements and Milestones in Applicable SIP**

The general conformity regulations state that notwithstanding the other requirements of the rule, a Federal action may not be determined to conform unless the total of direct and indirect emissions from the Federal action is in compliance or consistent with all relevant requirements and milestones in the applicable SIP (40 C.F.R. § 93.158(c)). This includes but is not limited to such issues as reasonable further progress schedules, assumptions specified in the attainment or maintenance demonstration, prohibitions, numerical emission limits, and work practice standards. This section briefly addresses how the Federal action were assessed for SIP consistency for this evaluation.

#### **5.3.1 Applicable Requirements from EPA**

EPA has already promulgated, and will continue to promulgate, numerous requirements to support the goals of the Clean Air Act with respect to the NAAQS. Typically, these requirements take the form of rules regulating emissions from significant new sources, including emission standards for major stationary point sources and classes of mobile sources as well as permitting requirements for new major stationary point sources. Since states have the primary responsibility for implementation and enforcement of requirements under the Clean Air Act and can impose stricter limitations than EPA, the EPA requirements often serve as guidance to the states in formulating their air quality management strategies.



### **5.3.2 Applicable Requirements from CARB**

In California, to support the attainment and maintenance of the NAAQS, CARB is primarily responsible for regulating emissions from mobile sources. In fact, EPA has delegated authority to CARB to establish emission standards for on-road and some non-road vehicles separate from the EPA vehicle emission standards, although CARB is preempted by the Clean Air Act from regulating emissions from many non-road mobile sources, including marine craft. Emission standards for preempted equipment can only be set by EPA.

### **5.3.3 Applicable Requirements from SCAQMD**

To support the attainment and maintenance of the NAAQS in the SCAB, SCAQMD is primarily responsible for regulating emissions from stationary sources. As noted above, SCAQMD develops and updates its AQMP regularly to support the California SIP. While the AQMP contains rules and regulations geared to attain and maintain the NAAQS, these rules and regulations also have the much more difficult goal of attaining and maintaining the California ambient air quality standards.

### **5.3.4 Consistency with Applicable Requirements**

POLB already complies with, and will continue to comply with, a myriad of rules and regulations implemented and enforced by Federal, state, regional, and local agencies to protect and enhance ambient air quality in the SCAB. In particular, due to the long persistence of challenges to attain the ambient air quality standards in the SCAB, the rules and regulations promulgated by CARB and SCAQMD are among the most stringent in the U.S. POLB will continue to comply with all existing applicable air quality regulatory requirements for activities over which it has direct control and will meet in a timely manner all regulatory requirements that become applicable in the future. Likewise, POLB actively encourages all tenants and users of its facilities to comply with applicable air quality requirements.

The nature and extent of the requirements with which POLB complies and will continue to comply include, but are not limited to, the following.

- EPA Rule 40 C.F.R. Part 89, Control of Emissions from New and In-Use Non-road Compression-Ignition Engines: requires stringent emission standards for mobile non-road diesel engines of almost all types using a tiered phase in of standards.
- CARB Rule 13 C.C.R. § 1956.8, California Exhaust Emission Standards and Test Procedures for 1985 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles: requires significant reductions in emissions of NO<sub>x</sub>, particulate matter, and non-methane organic compounds using exhaust treatment on heavy-duty diesel engines manufactured in model year 2007 and later years.

- SCAQMD Rule 403, Fugitive Dust: identifies the minimum particulate controls for construction-related fugitive dust. For example, Rule 403 requires twice daily watering of all active grading or construction sites. Haul trucks leaving the facility must be covered and maintain at least two feet of freeboard (C.V.C. § 23114). Low emission street sweepers must be used at the end of each construction day if visible soil is carried onto adjacent public paved roads, as required by SCAQMD Rule 1186.1, Less-Polluting-Sweepers. Wheel washers must be used to clean off the trucks, particularly the tires, prior to them entering the public roadways.
- SCAQMD Rule 431.2, Sulfur Content of Liquid Fuels: requires that, after January 1, 2005, only low sulfur diesel fuel (containing 15 parts per million by weight sulfur) will be permitted for sale in the SCAB for any stationary- or mobile-source application.
- SCAQMD Rule 2202, On-Road Motor Vehicle Mitigation Options: requires employers in the SCAB with more than 250 employees to implement an approved rideshare program and attain an average vehicle ridership of at least 1.5.

## **6 Reporting**

To support a decision concerning the Federal actions, the USACE is making public this final general conformity determination for the proposed action.

### **6.1 Draft General Conformity Determination**

The USACE provided copies of the draft general conformity determination to the appropriate regional offices of EPA, CARB, SCAQMD, and Federally-recognized tribes, providing opportunity for a 30-day review. The USACE also placed a notice in the Long Beach Press-Telegram, a daily newspaper of general circulation in the Long Beach area, announcing the availability of this draft general conformity determination and requesting written public comments for a 30-day period. For any member of the public requesting a copy of this draft general conformity determination, the USACE provided a copy. No comments were received in response to the draft general conformity determination.

### **6.2 Final General Conformity Determination**

The USACE is providing copies of this final general conformity determination to the appropriate regional offices of EPA, CARB, SCAQMD, and Federally-recognized tribes, within 30 days of its promulgation. The USACE is also placing a notice in the Long Beach Press-Telegram, a daily newspaper of general circulation in Long Beach, announcing the availability of this final general conformity determination within 30 days of such determination. As part of the general conformity evaluation, the USACE will make the final general conformity determination available to the public as part of the Final EIS/ EIR.

## **6.3 Frequency of General Conformity Determinations**

The general conformity regulations state that the status of a specific conformity determination lapses five years after the date of public notification for the final general conformity determination, unless the action has been completed or a continuous program has been commenced to implement the action (40 C.F.R. § 93.157(a)).

This general conformity determination will lapse during the construction period. However, continuation of the Federal action is expected for the duration of the construction period. Thus, reevaluation of the general conformity determination prior to completion of the Federal action is not expected.

## **7 Findings and Conclusions**

The Federal actions conform to the SIP for NO<sub>x</sub> (as an ozone precursor) because the net emissions associated with the Federal actions, taken together with all other NO<sub>x</sub> emissions in the SCAB, would not exceed the emissions budgets in the approved SIP for the years subject to the general conformity evaluation.

General Conformity requirements are not applicable to emissions of NO<sub>2</sub> associated with the Federal actions. As noted by the SCAQMD, the SCAB was designated as a maintenance area for the 1971 annual NO<sub>2</sub> NAAQS on July 24, 1998. However, twenty years after the effective date of redesignation to attainment, general conformity no longer applies unless a maintenance plan approved under CAA Section 175A specifies that conformity requirements apply for a longer time period. The approved maintenance plan for the SCAB did not extend the maintenance plan period beyond 20 years from redesignation. Consequently, conformity requirements for NO<sub>2</sub> ceased to apply after September 22, 2018.

Therefore, USACE herewith concludes that the Federal actions have been determined to comply with the requirements of the general conformity regulations and conforms to applicable SIP based on the mitigation measures specified above and NO<sub>x</sub> emissions accommodated into the set-aside emission budgets for years 2025, 2026, and 2027..

## **8 References**

South Coast Air Quality Management District (SCAQMD). 2016. Final 2016 Air Quality Management Plan. November. Web site: <http://www.aqmd.gov/home/air-quality/clean-air-plans/air-quality-mgt-plan/final-2016-aqmp>.

U.S. Environmental Protection Agency (EPA). 1994. General Conformity Guidance: Questions and Answers. July 13. Web site: [http://www.epa.gov/ttn/oarpg/conform/gcggqa\\_71394.pdf](http://www.epa.gov/ttn/oarpg/conform/gcggqa_71394.pdf).

## Attachment A

March 3, 2021 USACE Letter to the SCAQMD



**DEPARTMENT OF THE ARMY  
U.S. ARMY CORPS OF ENGINEERS  
LOS ANGELES DISTRICT  
915 WILSHIRE BOULEVARD, SUITE 930  
LOS ANGELES, CALIFORNIA 90017-3489**

April 9, 2021

Ms. Sang-Mi Lee  
Program Supervisor  
Air Quality Modeling/Emissions Inventory  
South Coast Air Quality Management District  
21865 Copley Drive  
Diamond Bar, California 91765

Dear Ms. Lee:

This letter concerns the United States Army Corps of Engineers (USACE), Port of Long Beach Deep Draft Navigation Project (proposed project) as it relates to the general conformity rule. Established under the Clean Air Act (CAA) section 176(c) [42 USC 7506(c)], the purpose of the general conformity rule is to ensure that actions taken by Federal agencies do not interfere with a state's plan to attain and maintain National Ambient Air Quality Standards (NAAQS). Under the general conformity rule, federal agencies must work with state and local governments, in nonattainment or maintenance areas, to ensure that federal actions conform to the established, applicable State Implementation Plan (SIP). To do so, the federal agency must either determine that the action is exempt from general conformity regulations or make a conformity determination consistent with the general conformity requirements.

The USACE, in conjunction with the Port of Long Beach (POLB), intends to dredge specific areas in the POLB as discussed in detail in the Integrated Feasibility Report and Draft Environmental Impact Statement and Environmental Impact Report (IFR). Per 40 CFR 93.152, USACE's federal authority would extend only to construction emissions associated with the proposed project. There would be no net changes in operational air emissions expected following completion of project construction activities. The only reasonably foreseeable activities extending beyond the construction period and subject to USACE authority would be maintenance dredging, which is exempt from conformity applicability per 40 CFR 93.153(c)(2)(ix). Hence, the USACE would have no continuing program responsibility for activities beyond construction.

Alternative 3<sup>1</sup> is the USACE's preferred project alternative. The USACE's federal actions include the General Navigation Features and Local Service Facilities within the USACE's regulatory purview. Based on the USACE's applicability analysis in the IFR, the total of direct and indirect emissions caused by the federal actions would exceed the applicability rates specified in 40 CFR 93.153(b) for nitrogen dioxide (NO<sub>2</sub>), ozone (nitrogen oxides (NO<sub>x</sub>) and volatile organic compounds (VOC) precursors), and carbon monoxide (CO), in construction years 2025, 2026, and 2027. Therefore, the USACE is required to have a general conformity determination for these three criteria pollutants.

The USACE can use one of several methods to show that the federal actions conform to the SIP. For actions where the direct and indirect emissions exceed the rates in 40 CFR 93.153(b), the federal action can include mitigation measures to offset the emission increases from the federal action or can show that the action will conform by meeting any of the following requirements:

- Showing that the net emission increases caused by an action are included in the SIP,
- documenting that the state agrees to include the emission increases in the SIP,
- offsetting the action's emissions in the same or nearby area of equal or greater classification, or
- providing an air quality modeling demonstration in some circumstances.

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<sup>1</sup> Alternative 3 is composed of measures for liquid bulk vessels, container vessels, and the local service facilities, as identified below:

- General Navigation Features for Liquid Bulk Vessels
  - o Deepen the entrance to the Main Channel (the Approach Channel through Queens Gate) from a project depth of -76 feet to -80 feet mean lower low water (MLLW)
  - o Widen portions of the Main Channel (bend easing) to a depth of -76 feet MLLW
- General Navigation Features for Container Ships
  - o Construct an approach channel and turning basin to Pier J South to a depth of -55 feet MLLW.
  - o Deepen portions of the West Basin and West Basin Approach to a depth of -55 feet MLLW.
- Local Service Facilities to be constructed by the POLB
  - o Deepen two additional locations within the harbor to a depth of -55 feet MLLW – the Pier J Slip, including berths J266-J270, and berth T140 on Pier T
  - o Perform structural improvements on Pier J breakwaters at the entrance of the Pier J Slip to accommodate deepening of the Pier J Slip and Approach Channel to -55 feet MLLW.

Approximately 7.4 million cubic yards (mcy) of material would be dredged. Dredged material would be placed either at a nearshore placement site, a USEPA-designated ocean disposal site (LA-2 and/or LA-3), or a combination of the two. The nearshore placement site, approximately five miles from the project site, can accommodate about 2.5 mcy of dredged material. LA-2 and LA-3, approximately nine and 22 miles, respectively, from the project site, have an annual disposal volume limit of 1.0 and 2.5 mcy, respectively, from all sources. It is assumed that 0.9 mcy for LA-2 and 2.2 mcy for LA-3 is available for use by this proposed project each year.

As part of the USACE's analysis in the IFR, the USACE considered the following mitigation measures to reduce construction-related emissions:

- *MM-AQ-1. Electric clamshell dredge.* The use of an electric clamshell dredge shall be required for project clamshell dredging activities during the entire construction period of the project.
- *MM-AQ-2. Construction-Related Harbor Craft.* Construction-related harbor craft (tugboats, crew boats, and survey boats) with Category 1 or Category 2 marine engines shall meet USEPA Tier 3 emission standards for marine engines. In addition, the construction contractor shall require all construction-related tugboats that home fleet in the San Pedro Bay Ports: 1) to shut down their main engines; and 2) to refrain from using auxiliary engines while at dock and instead use electrical shore power, if feasible.
- *MM-AQ-3: Off-Road Construction Equipment.* Self-propelled, diesel-fueled off-road construction equipment 25 horsepower or greater shall meet United States Environmental Protection Agency (USEPA)/California Air Resources Board (CARB) Tier 4 emission standards for non-road equipment.

Table 1 presents the mitigated annual construction emissions associated with Alternative 3 (this information can be found in Section 5.5.5 and Table 5-19 in the Draft IFR). The table shows that NO<sub>2</sub> and ozone (NO<sub>x</sub> precursor) emissions would be reduced but would remain above the applicability rates. All other pollutants would be reduced to below the applicability rates. All methods, input/output data and emissions before and after the application of above mitigation measures were made available to public as part of the Draft IFR distributed publicly on October 21, 2019, and still available for download at:

<https://www.spl.usace.army.mil/Missions/Civil-Works/Projects-Studies/Port-of-Long-Beach-Deep-Draft-Navigation-Study/>.

**Table 1. Alternative 3 Emissions After Mitigation**

<b>Source Category</b>	<b>PM<sub>10</sub></b>	<b>PM<sub>2.5</sub></b>	<b>Ozone (NO<sub>x</sub> precursor)</b>	<b>NO<sub>2</sub></b>	<b>CO</b>	<b>Ozone (VOC precursor)</b>
2024						
Offroad Construction Equipment	0.0	0.0	0.1	0.1	0.2	0.0
Onroad Construction Vehicles	0.0	0.0	0.0	0.0	0.1	0.0
Fugitive Emissions	0.0	0.0	0.0	0.0	0.0	0.0
Marine Equipment	0.1	0.1	2.7	2.7	2.2	0.2
Total Construction Year 2024	0.2	0.1	2.8	2.8	2.4	0.2
Conformity Determination						
Applicability Rate	100	100	10	100	100	10
Equal or Exceed Applicability Rate?	No	No	No	No	No	No

Source Category	PM <sub>10</sub>	PM <sub>2.5</sub>	Ozone (NO <sub>x</sub> precursor)	NO <sub>2</sub>	CO	Ozone (VOC precursor)
<b>2025</b>						
Offroad Construction Equipment	0.0	0.0	0.0	0.0	0.0	0.0
Onroad Construction Vehicles	0.0	0.0	0.0	0.0	0.0	0.0
Fugitive Emissions	0.0	0.0	0.0	0.0	0.0	0.0
Marine Equipment	7.6	6.7	145.5	145.5	86.9	8.1
Total Construction Year 2025	7.6	6.7	145.5	145.5	86.9	8.1
Conformity Determination						
Applicability Rate	100	100	10	100	100	10
Equal or Exceed Applicability Rate?	No	No	Yes	Yes	No	No
<b>2026</b>						
Offroad Construction Equipment	0.0	0.0	0.0	0.0	0.0	0.0
Onroad Construction Vehicles	0.0	0.0	0.0	0.0	0.0	0.0
Fugitive Emissions	0.0	0.0	0.0	0.0	0.0	0.0
Marine Equipment	1.7	1.5	35.8	35.8	27.4	2.0
Total Construction Year 2026	1.7	1.5	35.8	35.8	27.4	2.0
Conformity Determination						
Applicability Rate	100	100	10	100	100	10
Equal or Exceed Applicability Rate?	No	No	Yes	No	No	No
<b>2027</b>						
Offroad Construction Equipment	0.0	0.0	0.0	0.0	0.0	0.0
Onroad Construction Vehicles	0.0	0.0	0.0	0.0	0.0	0.0
Fugitive Emissions	0.0	0.0	0.0	0.0	0.0	0.0
Marine Equipment	0.6	0.5	11.9	11.9	9.1	0.7
Total Construction Year 2027	0.6	0.5	11.9	11.9	9.1	0.7
Conformity Determination						
Applicability Rate	100	100	10	100	100	10
Equal or Exceed Applicability Rate?	No	No	Yes	No	No	No

**Notes:**

Tons per day for each year are based on the number of construction days in each year of the proposed project (i.e., 365 days in each year 2024 through 2026, and 113 days in year 2027), per Table 5-19 of IFR.

During a December 1, 2020, conference call, the South Coast Air Quality Management District (SCAQMD) raised a concern that the NO<sub>x</sub> and NO<sub>2</sub> emissions in Table 1 were the same and suggested that the USACE consider recalculating NO<sub>2</sub> emissions to account for the fraction of NO<sub>2</sub> in NO<sub>x</sub> exhaust. Although the USACE recognizes NO<sub>x</sub> consists of both NO and NO<sub>2</sub>, and that NO<sub>2</sub> emissions are initially low in exhaust at the tailpipe, it is conservative and common industry practice to assume that most NO in NO<sub>x</sub> exhaust is rapidly converted to NO<sub>2</sub>. The SCAQMD's Localized



Significance Threshold methodology assumes that although initially only 5 percent of the emitted NO<sub>x</sub> is NO<sub>2</sub>, within 500 meters downwind all NO is converted to NO<sub>2</sub>. During a December 15, 2020, conference call between the SCAQMD and iLanco Environmental, LLC, the POLB's air quality contractor, it is the USACE's understanding that the SCAQMD discussed amongst their groups whether it was appropriate to assume that NO<sub>x</sub> and NO<sub>2</sub> emissions are equal and decided that this approach is appropriate.

The USACE recognizes that the SCAQMD's NO<sub>x</sub> set-aside conformity budget was primarily established to streamline determinations for ozone conformity. Notwithstanding, NO<sub>2</sub> is the only component of NO<sub>x</sub> that directly drives tropospheric ozone formation. If the SCAQMD can find that a certain NO<sub>x</sub> budget would not interfere with reaching ozone attainment, it seems reasonable to assume that the same NO<sub>x</sub> budget would also not interfere with maintaining NO<sub>2</sub> attainment.

Additionally, the South Coast Air Basin (SCAB) has been in attainment of the NO<sub>2</sub> standard for many years and has been designated as "maintenance" since 1998. It is possible that the SCAB may be moved to "attainment" since it has been in maintenance status for over ten years. It is our understanding that USEPA's clarification is needed for this determination in which case there would be no need for a NO<sub>2</sub> demonstration of conformity. We respectfully request that the SCAQMD advise us on the SCAB's "maintenance" vs "attainment" designation for purposes of determining conformity.

During the December 1, 2020, conference call, the SCAQMD raised concerns regarding future operational emissions in the POLB and emissions levels associated with Tier 2 hopper dredges. Regarding future operational emissions, alternatives evaluated in the IFR would result only in construction activities (i.e., both land-based construction and dredging) that would affect air quality within the POLB and surrounding region. While the action alternatives may accommodate changes in the vessel fleet calling at the POLB, they would not increase cargo or liquid bulk throughput. Therefore, operational emissions have not been assessed in the IFR.

Reducing inefficiencies would allow current fleet vessels to arrive fully loaded and to avoid delays associated with tide riding, lightering, or traffic conflicts (for liquid bulk vessels). Throughput at the POLB is limited by backland storage areas, which are constrained and at capacity. While the proposed project would not result in larger vessels calling at the POLB beyond those that currently call at the POLB and those that have previously been forecasted, the efficiencies afforded by accommodating these larger vessels fully loaded with no operational restrictions would in turn reduce the total number of vessels calling at the POLB over time. The objective of the proposed project is to improve conditions for vessel operations and safety, and to accommodate the existing large vessels that call at the POLB with fewer restrictions as they come online. Appendix E of the IFR includes projected fleet forecasts for the POLB for all alternatives, including the no action alternative that were used for the economic evaluation of project benefits. Ship sizes and expected numbers calling on the POLB

are discussed in this appendix. Attention is called to Tables 4-8 and 4-9 for details. A summary table (Table 2) is provided here to illustrate the expected decrease in ship calls for the proposed project.

**Table 2. Expected Decrease in Ship Calls for the Proposed Project**

Year	Alternative	Container Vessel Calls	Tanker Calls
2021	Current	1,278	932
2030	No Action	1,494	916
2030	Proposed Project	1,444	908
2040	No Action	1,724	912
2040	Proposed Project	1,643	903

Container vessel calls are expected to go up for all alternatives from 2021 to 2030 and from 2030 to 2040. Tanker calls are expected to decrease slightly over the same time period, although there is a slight increase from 2030 to 2040. However, fewer container vessel calls are projected for the years 2030 and 2040 with the proposed project for the same years as the no action alternative. There are 50 fewer container vessels and 8 fewer tanker vessels projected to call at the POLB for the proposed project as compared to future without project conditions (no action alternative) for 2030. Furthermore, there are 81 fewer container vessels and 9 fewer tanker vessels projected to call at the POLB for the proposed project as compared to future without project conditions (no action alternative) for 2040.

Regarding hopper dredge emissions, the areas that are proposed for hopper dredges are unsuitable for dredging by the electric clamshell for two reasons. First, is the distance between the on-land transformer and the dredge location. The distance is impracticable for efficient operations and safety as this would require placing the electric power cable through the busy ship traffic lane at Queen's Gate. The tether to the shoreline would need to be at least 1 mile long at the closest point all the way up to 4 plus miles to dredge at the "daylight" location of the entrance channel, and this would be crossing the major thoroughfare through the Queen's Gate. The second reason is the depth of the dredge cut. Dredging from -70 feet MLLW to -80 feet MLLW is inefficient for a clamshell dredge due to the depth of water. A hopper dredge keeps its drag head continuously on the ocean floor while dredging while a clamshell must repeatedly go up and down through the water column leading to extended time for each cycle and increased loss of sediments from the clamshell while transiting the water column. The clamshell would also have a significantly lower production rate to the hopper due to the proposed dredging depths. It is about 1/3 of the hopper daily production rate in optimal conditions, and with the proposed depths, this would decrease even more. This would increase the proposed project timeline by 1-2 years.

Sediments in the Approach Channel (where the hopper dredge would operate) are sandy and thus suitable for nearshore placement. This allows the hopper dredge to

operate more efficiently by using a shortened transit from dredge site to the nearshore placement site, as opposed to a transit from the dredge site to the ocean disposal site. Reduced transit times results in a longer dredging period per day for the hopper dredge.

POLB staff reached out to their contacts in the U.S. dredging industry as well as conducted an on-line search to find information on hopper dredges with Tier 3 or better engines. There are only two USACE-owned dredges stationed on the west coast of the U.S. Both are Tier 2 equipped. The *Yaquina* is unable to reach the depths needed for the proposed project and is unsuitable. The *Essayons* could reach the required depths, if modified. There currently are no privately-owned hopper dredges stationed on the west coast. Regarding the international market, these are not available for operation in the U.S. market. There has not been any indication that changes will be made to the Jones Act, Public Law 66-261, to allow non-U.S. constructed, owned and crewed vessels to operate in U.S. waters.

We appreciate the SCAQMD staff's recommendation during our conference call on December 1, 2020, for the USACE to include a requirement for the hopper dredge to be equipped with Tier 3/4 engines as a mitigation measure for the proposed project. The use of Tier 3/4 engines is not a regulatory requirement in effect for the SCAB now or at the estimated time of construction. We are unable to accommodate such a mitigation measure under our current contracting standards. We may consider it in the future if available, feasible, and consistent with competition in contracting.

According to 40 CFR 93.161, the state or local agency responsible for implementing and enforcing the SIP can develop and adopt an emissions budget to be used for demonstrating conformity under 40 CFR 93.158(a)(1). The SCAQMD's 2016 Air Quality Management Plan (AQMP) addresses general conformity budgets beginning on page VI-D-1 of Appendix VI and on pages 111-2-85 through 11-2-88 of Appendix III. To streamline the general conformity process for federal projects and to facilitate general conformity determinations, the 2016 AQMP establishes VOC and NO<sub>x</sub> general conformity budgets of 2.0 tons per day (tpd) of NO<sub>x</sub> and 0.5 tpd of VOC on an annual basis from 2017 to 2030, and budgets of 0.5 tpd of NO<sub>x</sub> and 0.2 tpd VOC in 2031. These general conformity budgets are included in the "set-aside" account added to baseline emissions in tables 9, 10 and 11 in section 111.D.2.c of this document. The general conformity budgets in the 2016 AQMP are not set aside for specific facilities per se but were developed in the anticipation of the construction and operation of certain development projects in the South Coast Air Basin that are expected over the next decade. Under the 2016 AQMP, emissions from general conformity projects are tracked by the SCAQMD's tracking system and debited from this set-aside budget on a first-come-first-served basis until the budget has been exhausted. The USEPA approved the general conformity budgets in the 2016 AQMP on October 1, 2019.

Federal agencies can use these budgets to demonstrate that their federal actions conform to the SIP through a letter from the State and SCAQMD confirming that the federal actions emissions are accounted for in the SIP's general conformity

budgets. The USACE requests the SCAQMD provide written confirmation that the federal actions emissions of 146 tons NO<sub>x</sub>, 36 tons NO<sub>x</sub> and 12 tons NO<sub>x</sub> in years 2025, 2026, and 2027, respectively, are accounted for in the SIPs general conformity budget, which would be used by the USACE to demonstrate conformity under 40 CFR 93.158(a)(1).

If you have questions, please contact Mr. Larry Smith, Project Environmental Coordinator, at (213) 452-3846 or by email at [lawrence.j.smith@usace.army.mil](mailto:lawrence.j.smith@usace.army.mil).

Sincerely,

Eduardo T. De Mesa  
Chief, Planning Division

## Attachment B

April 12, 2021 SCAQMD Letter to the USACE

April 12, 2021

Eduardo T. De Mesa  
Chief, Planning Division  
U.S. Army Corps of Engineers  
Los Angeles District  
915 Wilshire boulevard, Suite 930  
Los Angeles, CA 90017-3489

Dear Mr. De Mesa,

This letter is in response to your letter dated March 3, 2021 requesting South Coast AQMD to accommodate the anticipated emissions from the Port of Long Beach Deep Draft Navigation Project in the Air Quality Management Plan (AQMP)/State Implementation Plan (SIP) emissions budget for general conformity purposes.

The general conformity determination process is intended to demonstrate that a proposed Federal action will not: (1) cause or contribute to new violations of a national ambient air quality standard (NAAQS); (2) interfere with provisions in the applicable SIP for maintenance of any NAAQS; (3) increase the frequency or severity of existing violations of any standard; or (4) delay the timely attainment of any standard. As such, for general conformity determination, the proposed federal action needs to conform to the latest approved SIP/AQMP.

The South Coast Air Basin (Basin) is designated as an extreme non-attainment area for ozone, serious non-attainment for PM<sub>2.5</sub> and maintenance area for Carbon Monoxide. In order to accommodate projects subject to general conformity requirements and to streamline the review process, general conformity budgets for NO<sub>x</sub> and VOC emissions are established in the AQMP. The 2016 AQMP (<https://www.aqmd.gov/home/air-quality/clean-air-plans/air-quality-mgt-plan/final-2016-aqmp>), which is the latest plan approved by U.E. EPA, established set aside accounts to accommodate emissions subject to general conformity requirements. The set-aside accounts include 2 tons per day (tpd) or 730 tons per year (tpy) of NO<sub>x</sub> and 0.5 tpd or 182.5 tpy of VOC each year starting in 2017 through 2030, and 0.5 tpd (182.5 tpy) of NO<sub>x</sub> and 0.2 tpd (73 tpy) of VOC each year in 2031 and thereafter.

The anticipated emissions from the proposed project exceed the General Conformity de minimis thresholds of NO<sub>x</sub> in the years 2025, 2026 and 2027 as indicated in Table 1, “Alternative 3 Emissions After Mitigation”, in your letter. These emissions are associated with construction

activities of Alternative 3 scenario, which is the preferred alternative scenario by U.S. Corps of Army Engineers. After the completion of project construction activities, no changes in net operational emissions are anticipated. Emissions from potential maintenance dredging in the future, if any, will be exempt from conformity applicability if the action has no emissions increase or the emissions increase is below de minimis threshold per 40 CFR 93.153(c)(2)(ix). Detailed method to calculate emissions included in the general conformity determination can be found at the Port of Long Beach Deep Draft Navigation Project<sup>1</sup>.

South Coast AQMD staff has reviewed the proposed project emissions based on the information provided in your letter. Based on our review, we have determined that NOx emissions above de minimis thresholds can be accommodated within the general conformity budgets established in the 2016 AQMP. The emissions accommodated in the general conformity budgets for 2025, 2026 and 2027 are listed in Table 1 below.

Table 1. Proposed Project Emissions Accommodated in 2016 AQMP General Conformity Budgets (tons per year)

<b>Pollutants</b>	<b>Emission Phase</b>	<b>2025</b>	<b>2026</b>	<b>2027</b>
NOx	Construction	145.5	35.8	11.9

In addition to NOx emissions, NO2 emissions exceed the de minimis threshold in 2025. South Coast Air Basin was designated as a maintenance area for the 1971 annual NO2 NAAQS on July 24, 1998. However, twenty years after the effective date of redesignation to attainment, general conformity no longer applies unless a maintenance plan approved under CAA Section 175A specifies that conformity requirements apply for a longer time period. The approved maintenance plan for the Basin did not extend the maintenance plan period beyond 20 years from redesignation. Consequently, conformity requirements for NO2 ceased to apply after September 22, 2018. Therefore, no conformity requirement applies to the NO2 emissions from the proposed project.

In summary, based on our evaluation, the proposed project will conform to the latest EPA approved AQMP as the emissions from the project are accommodated within the AQMP's emissions budgets, and the proposed project is not expected to result in any new or additional violations of the NAAQS or impede the projected attainment of the NAAQS.

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<sup>1</sup> Documents are available at <https://www.spl.usace.army.mil/Missions/Civil-Works/Projects-Studies/Port-of-Long-Beach-Deep-Draft-Navigation-Study>

Refer Table 5-19 for the amount of emissions subject to general conformity determination and Appendix for detailed methodology

If you have any questions, please contact me at (909) 396-2856 or [srees@aqmd.gov](mailto:srees@aqmd.gov) or Sang-Mi Lee, Program Supervisor at (909)-396-3169 or [slee@aqmd.gov](mailto:slee@aqmd.gov).

Sincerely,

*Sarah Rees*

Sarah L. Rees, Ph.D.  
Deputy Executive Officer  
Planning, Rule Development & Area Sources  
South Coast Air Quality Management District

Attachment:

Letter from U.S. Army Corps of Engineers dated March 3, 2021

cc: Tom Kelly, US EPA Region IX  
Barbara Baird, South Coast AQMD  
Zorik Pirveysian, South Coast AQMD  
Sang-Mi Lee, South Coast AQMD  
Jillian Wong, South Coast AQMD  
Lijin Sun, South Coast AQMD

ZP:SL



## Attachment C

### Emission Estimation Methodology and Calculations

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# DRAFT INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL IMPACT STATEMENT / ENVIRONMENTAL IMPACT REPORT (EIS/EIR)

## APPENDIX H: AIR QUALITY ANALYSIS

PORT OF LONG BEACH  
DEEP DRAFT NAVIGATION STUDY  
Los Angeles County, California

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October 2019



## **Appendix H1 Criteria Pollutant and GHG Emission Calculations**

### **H1.1 Introduction**

This appendix describes the methods and assumptions used to quantify criteria pollutant and greenhouse gas (GHG) emissions generated from construction of the Deep Draft Navigation Project and Alternatives. Section H1.2 defines the pollutants, averaging times, analysis years, emission sources, and geographical boundaries included in the emission calculations under NEPA and CEQA. Section H1.3 describes the methodology for the construction emission calculations. Detailed source activity and emission calculation tables for the Action Alternatives are included as attachments at the end of this appendix.

Implementation of the No Action and Action Alternatives would not result in operational activities and would therefore not result in operational impacts. Furthermore, the No Action Alternative would not construct an Approach Channel to Pier J South, deepen the West Basin Channel, deepen the Approach Channel, widen portions of the Main Channel, or construct the Local Service Facilities. However maintenance dredging of existing channel depths would continue, when and where needed. The No Action Alternative would not increase ship calls or throughput, and would not incrementally increase operational emissions within the study area. Future maintenance dredging and disposal of dredged material would be subject to separate detailed analysis under CEQA and/or NEPA. Emission calculations associated with maintenance dredging are not included in this appendix. Please refer to Chapter 2 and Chapter 4 for a detailed explanation of the No Action Alternative and Action Alternatives, respectively.

The Action Alternatives are described in detail in Section 4 (Plan Formulation). The No Action Alternative is also described in detail in Section 4 (Plan Formulation), is assessed qualitatively in Sections 5.5 (Air Quality Environmental Consequences) and 5.6 (Greenhouse Gas Environmental Consequences) of the DEIS/DEIR, and therefore is not included in this appendix.

### **H1.2 Emission Parameters**

#### **Pollutants**

The air quality analysis quantified emissions of the following criteria pollutants or precursors: volatile organic compounds (VOC), carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>), particulate matter less than 10 microns (PM<sub>10</sub>), particulate matter less than 2.5 microns (PM<sub>2.5</sub>), and sulfur oxides (SO<sub>x</sub>). Emissions of diesel particulate matter (DPM), a subset of PM<sub>10</sub>, were also quantified because DPM is the dominant toxic air contaminant in the health risk evaluation conducted for this EIS/EIR. Estimates of lead emissions were not calculated. Lead emissions from mobile sources in California have significantly decreased due to the near elimination of lead in fuels. Emission factors developed by the U.S. Environmental Protection Agency, the California Air Resources Board, and the South Coast Air Quality Management District (SCAQMD), including those in CalEEMod, the SCAQMD-approved emission modeling software, do not provide estimated emissions for lead. Little to no quantifiable and foreseeable lead emissions would be generated by the Action Alternatives.

The air quality analysis also quantified emissions of the following GHGs: carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), and methane (CH<sub>4</sub>), which are products of engine exhaust. Global warming potential (GWP) is the ability of a gas or aerosol to trap heat in the atmosphere. GHGs have varying amounts of GWP. By convention, CO<sub>2</sub> is assigned a GWP of 1. In comparison, CH<sub>4</sub> has a GWP of 25, which means that it has a global warming effect 25 times greater than CO<sub>2</sub> on an equal-mass basis. N<sub>2</sub>O has a GWP of 298 (IPCC, 2007). To account for their GWP, GHG emissions are reported in the emission tables as carbon dioxide

equivalent (CO<sub>2</sub>e). CO<sub>2</sub>e was calculated by multiplying each GHG emission by its GWP and adding the results together to produce a single, combined emission rate representing all GHGs. The GWPs used in the emission calculations are shown in tables at the end of this appendix.

#### Averaging Times

For criteria pollutants, annual emissions were calculated for comparison against the General Conformity applicability rates in nonattainment or maintenance areas (40 CFR Part 93). For CEQA impacts, peak daily (24-hour) emissions were calculated for comparison against the South Coast Air Quality Management District (SCAQMD) daily significance thresholds (SCAQMD 2019). Annual, peak 24-hour, peak 8-hour (for CO), and peak 1-hour criteria pollutant emissions were calculated to support the dispersion modeling analysis used to predict local ambient pollutant concentrations.

For GHG, annual and total construction emissions were calculated for presentation under NEPA. For CEQA impacts, total construction emissions were amortized over a 30-year period in accordance with SCAQMD guidance (SCAQMD 2008) for comparison against the SCAQMD CO<sub>2</sub>e annualized significant emissions threshold for industrial projects (SCAQMD 2019).

#### Analysis Years

Construction emissions were based on anticipated equipment utilization in each construction year. Tables detailing construction schedules for all Action Alternatives are included as attachments at the end of this appendix. The following general construction schedules were used for the Action Alternatives:

- All Action Alternatives include widening of the Main channel to the authorized depth of -76' mean lower low water (MLLW), construction of structural improvements to the Pier J breakwater as described in Section 4.6.5, deepening Pier J Basin, berth dredging at the Pier J South Slips in the Pier J Basin and along Pier T, and, with implementation of MM-AQ-1, use of electric clamshell dredges and construction of an electrical substation at Pier J. Dredged material would be disposed at the Surfside Borrow Area, LA-2, and/or LA-3.
- Alternative 2. In addition, Alternative 2 includes constructing an approach channel to Pier J South to -53 ft MLLW; constructing a turning basin outside of Pier J South to -53 ft MLLW; deepening the West Basin to -53 ft MLLW; and the deepening of the Approach Channel to -78' MLLW. Construction activities associated with Alternative 2 would occur over approximately 34 months, from January 2024 through October 2026.
- Alternative 3. In addition to activities common to all Action Alternatives, Alternative 3 includes constructing an approach channel to Pier J South to -55 ft MLLW; constructing a turning basin outside of Pier J South to -55 ft MLLW; deepening the West Basin to -55 ft MLLW; and deepening of the Approach Channel to -80' MLLW. Construction activities associated with Alternative 3 would occur over approximately 40 months, from January 2024 through April 2027.
- Alternative 4. In addition to activities common to all Action Alternatives, Alternative 4 includes constructing an approach channel to Pier J South to -57 ft MLLW; constructing a turning basin outside of Pier J South to -57 ft MLLW; deepening the West Basin to -57 ft MLLW; deepening of the Approach Channel to -82' MLLW, Pier T wharf upgrades, and Pier J wharf upgrades. Construction activities associated with Alternative 4 would take occur over approximately 62 months, from January 2024 through February 2029.
- Alternative 5. In addition to activities common to all Action Alternatives, Alternative 5 includes constructing an approach channel to Pier J South to -55 ft MLLW; constructing a turning basin outside of Pier J South to -55 ft MLLW; deepening the West Basin to -55 ft MLLW; the deepening of the Approach Channel to -80' MLLW (like Alternative 3), and the construction of a Standby Area adjacent

to the Main Channel dredged to -67' MLLW, with a 300-foot diameter center anchor placement with a depth of -73' MLLW. Construction activities associated with Alternative 5 would take occur over approximately 50 months, from January 2024 through February 2028.

For the purposes of the emission calculations, construction activities were assumed to occur in the earliest foreseeable years. Should construction be delayed beyond the assumed dates, emissions would be lower due to the gradual replacement of older construction equipment with newer equipment meeting the existing State and federal off-road engine emission standards.

## Emission Sources

Criteria pollutant and GHG emission sources associated with construction activities would include dredging equipment (hopper and clamshell dredges), harbor craft, off-road construction equipment, on-road vehicles, and worker vehicles. Earth-disturbance activities, such as grading, bulldozing, material handling, and driving over paved and unpaved surfaces, would be minimal and would generate particulate matter (PM) emissions in the form of fugitive dust. The same emission sources and utilization assumptions were analyzed under both NEPA (including General Conformity applicability) and CEQA. The emission calculation approach for each source category is described in Section H1.3 of this appendix.

## Geographical Boundaries

All activity and therefore all emissions would occur within the South Coast Air Basin (SCAB). Therefore, criteria pollutant and GHG construction emissions were calculated within the SCAB to align with the General Conformity applicability rates in nonattainment and maintenance areas and SCAQMD daily emission significance thresholds.

### H1.3 Methodology for Construction Emission Calculations

Air pollutant emissions from the proposed construction activities were calculated using the most current emission factors and methods available at the time the calculations were performed. Annual emissions, which were used for General Conformity applicability, GHG impacts, and dispersion modeling, were quantified based on the annual construction activity assumptions in each year of construction. To estimate peak daily construction emissions, emissions were first calculated for the individual construction activities and then summed for overlapping construction activities, per the anticipated construction schedule. The combination of construction activities producing the highest daily emissions was then selected as the peak day and compared to the SCAQMD emission thresholds for construction. The specific emission calculation approach for each construction source category is described below.

The Federal actions annual VOC, CO, NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> (including precursors) emission rates for each Action Alternative were first calculated for the applicable analysis years. For purposes of this evaluation, emissions of NO<sub>2</sub> are assumed to equal emissions of NO<sub>x</sub> since NO<sub>2</sub> is the predominant form of NO<sub>x</sub>. These emissions are associated with mobile and area sources expected to be used for on-site construction-related purposes. The annual emissions (tons per year) from each of the Action Alternatives were then compared to the General Conformity applicability rates, presented in Table 5.5-2, to assess General Conformity applicability under the Clean Air Act.

**Dredging Equipment.** As described in Section 4, hopper dredges would be used to dredge sediment in the Approach Channel and transport and place the dredged sediment at nearshore (primarily), LA-2, and/or LA-3 placement sites. Hopper dredge engines are large marine engines used for propulsion and operation of the dredging equipment. Emission factors for hopper dredge propulsion and auxiliary engines therefore

reflect existing USEPA marine engine standards (USEPA 2016a). Hopper dredge propulsion and auxiliary engines were assumed to be Tier 2 marine diesel engines, per USACE.

As described in Section 4, clamshell dredges would be used to dredge the Main Channel, West Basin, Pier J Basin (including berth dredging at Pier J South), Pier J Approach Channel and turning basin, Pier T Berths, and Standby Area (Alternative 5 only). Clamshell dredges are not self-propelled and emission factors for these engines reflect existing USEPA non-road engine standards; clamshell dredge engines were assumed to be Tier 3 non-road diesel engines, per USACE and the Port.

Both hopper dredge and clamshell dredge utilization, schedule, activity, engine size, and load factors were based on project-specific dredging requirements presented in tables at the end of this appendix.

**Harbor Craft.** Tugboats would be used to position clamshell dredges and transport sediment-laden barges to the nearshore, LA-2, and/or LA-3 placement sites. Crew boats and survey boats would also be used to support dredging activities. Harbor craft utilization, schedule, activity, and engine sizes, provided by the USACE and the Port, were used in the analysis. Harbor craft load factors were obtained from the Port 2013 Emissions Inventory (POLB 2013), which is consistent with the most recent Port emissions inventory (POLB 2017) available at the time the emission calculations were performed.

Emission factors for harbor craft reflect USEPA marine engine standards (USEPA 2016a) and harbor craft engine types common at the Port, as documented in the Port's Air Emissions Inventory (POLB 2017). The Port's 2017 Air Emissions Inventory identifies that most harbor craft propulsion engines operating at the Port in 2017 were USEPA Tier 2 diesel engines and that approximately half of all harbor craft auxiliary engines were Tier 3. This analysis conservatively used USEPA Tier 2 harbor craft emission standards for both propulsion and auxiliary engines.

**Off-road Construction Equipment.** Off-road construction equipment would be used during non-dredging activities such as construction of the electrical substation at Pier J (only for mitigated emissions), Pier J breakwater improvements, and wharf upgrades. Equipment type, utilization, schedule, activity, and engine sizes, provided by the Port, were used in the analysis, as shown in Table H1.6.

Criteria pollutant and GHG emission factors for off-road construction equipment reflect USEPA non-road engine standards (USEPA 2016b) and CARB requirements. Emission factors were generated using CARB's 2017 OFFROAD Inventory Model (CARB 2017a) for an average equipment fleet composition in the SCAB.

**On-Road Construction Vehicles and Worker Vehicles.** Construction vehicles would be used during non-dredging activities to deliver construction materials, such as sheetpiles (for wharf upgrades and Pier J breakwater improvements) and concrete (for the electrical substation), and haul away waste. Vehicle type, utilization, schedule, activity, and engine sizes, provided by the Port, were used in the analysis, as shown in Table H1.6.

Criteria pollutant and GHG emission factors reflect USEPA on-road engine standards and CARB requirements. Emission factors were generated using CARB's on-road EMFAC2017 model for truck and passenger vehicle fleets representative of the South Coast region (CARB 2017b). Emissions include engine exhaust, entrained road dust, and brake and tire wear.

**Fugitive Dust.** PM<sub>10</sub> and PM<sub>2.5</sub> fugitive dust emissions from construction activities, such as grading, bulldozing, and material and debris loading and handling were calculated using emission factors from EPA's AP-42 emission factor handbook (USEPA 2006) and default parameters for soil and wind conditions



from CalEEMod (CAPCOA 2016). PM<sub>10</sub> and PM<sub>2.5</sub> emissions from on- and off-site paved road dust were calculated using CARB's Miscellaneous Process Methodology (CARB 2016).

#### **H1.4 Quantified Regulations for Construction**

The following regulations were incorporated into the unmitigated emission calculations for the Action Alternatives, as applicable. These regulations are described in greater detail in the Air Quality Regulatory Setting and GHG Regulatory Setting of the EIS/EIR.

- Dredging Equipment: USEPA Emission Standards for Nonroad Diesel Engines; USEPA Emission Standards for Marine Diesel Engines; CARB In-Use Off-Road Diesel-Fleets Regulation; CARB Portable Diesel-Fueled Engines Air Toxic Control Measure (ATCM).
- Harbor Craft: USEPA Emission Standards for Marine Diesel Engines; CARB Commercial Harbor Craft Regulation.
- Off-Road Construction Equipment: USEPA Emission Standards for Nonroad Diesel Engines; California Diesel Fuel Regulations (Ultra Low Sulfur Diesel [ULSD] fuel); CARB In-Use Off-Road Diesel-Fleets Regulation; CARB Portable Diesel-Fueled Engines ATCM; Statewide Portable Equipment Registration Program.
- On-Road Construction Vehicles and Worker Vehicles: USEPA Emission Standards for On-Road Trucks; California Diesel Fuel Regulations (ULSD fuel); Heavy Duty Vehicle National Program to reduce fuel consumption and GHG; State Standards for Light-Duty Vehicle GHG Emissions and Corporate Average Fuel Economy Standards.
- Fugitive Dust: SCAQMD Rule 403 Compliance.

#### **H1.5 Quantified Mitigation Measures for Construction**

The EIS/EIR identifies mitigation measures designed to reduce construction emissions. The following three measures were quantified in the mitigated emission calculations for the Action Alternatives. The remaining mitigation measures were assessed qualitatively in the EIS/EIR.

**MM-AQ-1:** Electric clamshell dredge. This mitigation measure requires the use of an electric clamshell dredge and requires the construction of an electrical substation at Pier J to provide electric power to the clamshell dredge. The analysis assumes that it would not be possible to electrify all equipment on a clamshell dredge. Therefore, per communication with Dutra Group, a dredging contractor, the analysis conservatively assumes that 90 percent of clamshell dredge horsepower-hours would be electric (Dutra Group 2019). Criteria pollutant and GHG emissions associated with construction of the electrical substation, and indirect GHG emissions associated with clamshell dredge electricity consumption, were quantified for all mitigated Action Alternatives.

**MM-AQ-2:** Fleet Modernization of Harbor Craft. Harbor craft (tugboats, crew boats, and survey boats) with Category 1 or Category 2 marine engines shall meet USEPA Tier 3 emission standards for marine engines. In addition, the construction contractor shall require all construction tugboats that home fleet in the San Pedro Bay Ports: 1) to shut down their main engines and 2) to refrain from using auxiliary engines while at dock and instead to use electrical shore power, if feasible.

**MM-AQ-3:** Fleet Modernization of Construction Equipment. Self-propelled, diesel-fueled off-road construction equipment 25 hp or greater shall meet USEPA/CARB Tier 4 emission standards for non-road equipment.

## H1.6 References for Appendix H1

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## **Appendix H1. Tables**

H1.1	Construction Schedule: Alternative 2. (-53 and -78 MLLW)
H1.2	Construction Schedule: Alternative 3 NED (-55 and -80 MLLW)
H1.3	Construction Schedule: Alternative 4: (-57 and -83 MLLW)
H1.4	Construction Schedule: Alternative 5 and Standby Area (-55 and -80 MLLW)
H1.5	Dredging Activity
H1.6	Landside Construction Equipment Activity
H1.7	Soil Handling - Electrical Substation Construction
H1.8	Wharf Upgrades: Pier J, Berths 266-270
H1.9	Wharf Upgrades: Pier T, Berths 134-140
H1.10	Offroad Engine Emission Factors - USEPA Standards
H1.11	Harbor Craft Emission Factors - USEPA Standards
H1.12	SOx Emission Factor - Harbor Craft
H1.13	Habor Craft Load Factor
H1.14	Paved Road Dust Emission Factor Derivation
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H1.16	Asphalt Paving
H1.17	OFFROAD 2017 Output
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H1.19	EMFAC2017 Output Onsite Transit
H1.20	EMFAC2017 Output Offsite Transit
H1.21	Vehicle Idling Exhaust Onsite
H1.22	Construction Equipment Load Factors
H1.23	GHG Emission Factors
H1.24	Global Warming Potentials (GWP)
H1.25	SOx Emission Factor - Offroad Construction Equipment
H1.26	Alternative 2 Emissions by Task
H1.27	Alternative 3 Emissions by Task
H1.28	Alternative 4 Emissions by Task
H1.29	Alternative 5 Emissions by Task

**Table H1.1**

**Construction Schedule: Alternative 2. (-53 and -78 MLLW)**

Task ID	Alternative 2	Start Date	End Date	Duration (days)
1	Electrical Substation Construction at Pier J (mitigation only)	1/1/2024	12/31/2024	60
2	Pier J Breakwater Construction	1/1/2024	3/2/2024	54
3	Approach Channel (hopper dredge 1,144,000 CY)	1/1/2025	3/8/2025	66
4	Main Channel Widening (clam shell dredge 1,065,000 CY)	1/1/2025	6/28/2025	178
5	West Basin (clam shell dredge 501,000 CY)	6/29/2025	9/21/2025	84
6	Pier J Basin (clam shell dredge 202,000 CY)	9/22/2025	10/26/2025	34
7	Pier J Approach (clam shell dredge 270,000 CY)	10/27/2025	12/11/2025	45
8	Pier J Approach (clam shell dredge 1,699,000 CY)	1/1/2026	10/11/2026	283

Source:

*Dredging Alternative 2: POLB Channel Deepening - 53 and 78 Rev4.xlsx.*

Substation and Pier J Breakwater - Email From: Khan, Naser <naser.khan@aecom.com>, Sent: Friday, May 31, 2019 10:54 PM, To: Barrera, Baron <baron.barrera@polb.com>.

**Table H1.2**

**Construction Schedule: Alternative 3 NED (-55 and -80 MLLW)**

Task ID	Alternative 3	Start Date	End Date	Duration (days)
1	Electrical Substation Construction at Pier J (mitigation only)	1/1/2024	12/31/2024	60
2	Pier J Breakwater Construction	1/1/2024	3/2/2024	54
3	Approach Channel (hopper dredge 2,600,000 CY)	1/1/2025	5/31/2025	150
4	Main Channel Widening (clam shell dredge 1,065,000 CY)	1/1/2025	6/27/2025	177
5	West Basin (clam shell dredge 717,000 CY)	6/28/2025	10/26/2025	120
6	Pier J Basin (clam shell dredge 258,000 CY)	10/27/2025	12/9/2025	43
7	Pier J Basin (clam shell dredge 46,000 CY)	1/1/2026	1/9/2026	8
8	Pier J Approach (clam shell dredge 1,994,000 CY)	1/10/2026	12/8/2026	332
9	Pier J Approach (clam shell dredge 679,000 CY)	1/1/2027	4/24/2027	113

Source:

*Dredging Alternative 3: POLB Channel Deepening - NED 55 and 80 Rev4.xlsx.*

Substation and Pier J Breakwater - Email From: Khan, Naser <naser.khan@aecom.com>, Sent: Friday, May 31, 2019 10:54 PM, To: Barrera, Baron <baron.barrera@polb.com>.

**Table H1.3**

**Construction Schedule: Alternative 4: (-57 and -83 MLLW)**

Task ID	Alternative 4	Start Date	End Date	Duration (days)
1	Electrical Substation Construction at Pier J (mitigation only)	1/1/2024	12/31/2024	60
2	Pier J Breakwater Construction	1/1/2024	3/2/2024	54
3	Pier J Wharf Upgrade	1/1/2024	6/24/2024	175
4	Pier T Wharf Upgrade	1/1/2024	11/16/2024	320
5	Approach Channel (hopper dredge 5,447,000 CY)	1/1/2025	2/4/2026	399
6	Main Channel Widening (clam shell dredge 1,065,000 CY)	1/1/2026	6/28/2026	178
7	West Basin (clam shell dredge 975,000 CY)	6/29/2026	12/9/2026	163
8	West Basin (clam shell dredge 513,000 CY)	1/1/2027	3/28/2027	86
9	Pier T Berths (clam shell dredge Berths T132 to T140, 44,000 CY)	3/29/2027	4/5/2027	7
10	Pier J Basin (clam shell dredge 408,000 CY)	4/6/2027	6/13/2027	68
11	Pier J Approach (clam shell dredge 1,066,000 CY)	6/14/2027	12/9/2027	178
12	Pier J Approach (clam shell dredge 2,040,000 CY)	1/1/2028	12/6/2028	340
13	Pier J Approach (clam shell dredge 297,000 CY)	1/1/2029	2/20/2029	50

Source:

*Dredging Alternative 4: POLB Channel Deepening - 57 and 83 Rev4.xlsx.*

Substation and Pier J Breakwater - Email From: Khan, Naser <naser.khan@aecom.com>, Sent: Friday, May 31, 2019 10:54 PM, To: Barrera, Baron <baron.barrera@polb.com>.

**Table H1.4**

**Construction Schedule: Alternative 5 and Standby Area (-55 and -80 MLLW)**

Task ID	Alternative 5	Start Date	End Date	Duration (days)
1	Electrical Substation Construction at Pier J (mitigation only)	1/1/2024	12/31/2024	60
2	Pier J Breakwater Construction	1/1/2024	3/2/2024	54
3	Approach Channel (hopper dredge 2,600,000 CY)	1/1/2025	5/31/2025	150
4	Main Channel Widening (clam shell dredge 1,065,000 CY)	1/1/2025	6/27/2025	177
5	West Basin (clam shell dredge 717,000 CY)	6/28/2025	10/26/2025	120
6	Pier J Basin (clam shell dredge 258,000 CY)	10/27/2025	12/9/2025	43
7	Pier J Basin (clam shell dredge 46,000 CY)	1/1/2026	1/9/2026	8
8	Pier J Approach (clam shell dredge 1,994,000 CY)	1/10/2026	12/8/2026	332
9	Pier J Approach (clam shell dredge 679,000 CY)	1/1/2027	4/24/2027	113
10	Standby Area (clam shell dredge 921,000 CY)	4/25/2027	12/8/2027	227
11	Standby Area (clam shell dredge 118,000 CY)	1/1/2028	2/24/2028	54

Source:

*Dredging Alternative 5: POLB Channel Deepening - NED and Standby Area Rev4.xlsx.*

Substation and Pier J Breakwater - Email From: Khan, Naser <naser.khan@aecom.com>, Sent: Friday, May 31, 2019 10:54 PM, To: Barrera, Baron <baron.barrera@polb.com>.

**Table H1.5**  
**Dredging Activity**

		Activity			Load	Rating		Engine Tier
		Quantity	Number of Engines	(hr/day)		(hp)	(kw)	
Hopper Dredging								
Hopper propulsion engine	dredging	1	2	18	10%	9,000	6,711	Marine Tier 2
Hopper propulsion engine	transit	1	2	4	85%	9,000	6,711	Marine Tier 2
Hopper auxiliary engine	disposal	1	2	1.5	25%	600	447	Marine Tier 2
Hopper Crew boat propulsion engine	support	1	2	2	38%	325	242	Marine Tier 2
Hopper Crew boat auxiliary engine	support	1	1	2	32%	80	60	Marine Tier 2
Hopper Survey boat propulsion engine	dredging	1	1	8	38%	580	433	Marine Tier 2
Clamshell Dredging								
Clamshell Dredge hoist	dredging	1	1	22	50%	1,200	895	Offroad Tier 3
Clamshell Dredge generator	dredging	1	1	22	50%	900	671	Offroad Tier 3
Clamshell Barge dump scow	disposal	1	1	1	80%	175	130	Offroad Tier 3
Clamshell Tugboat propulsion engine	dredging	1	2	4	31%	300	224	Marine Tier 2
Clamshell Tugboat auxiliary engine	dredging	1	1	4	43%	78	58	Marine Tier 2
Clamshell Tugboat propulsion engine	transit	2	2	18	31%	600	447	Marine Tier 2
Clamshell Tugboat auxiliary engine	transit	2	2	18	43%	78	58	Marine Tier 2
Clamshell Crew boat propulsion engine	support	1	2	2	38%	325	242	Marine Tier 2
Clamshell Crew boat auxiliary engine	support	1	1	2	32%	80	60	Marine Tier 2
Clamshell Survey boat propulsion engine	dredging	1	1	2	38%	580	433	Marine Tier 2
Pier J Breakwater Construction								
Pier J Breakwater Tugboat propulsion engine		2	2	12	31%	475	354	Marine Tier 2
Pier J Breakwater Tugboat auxiliary engine		2	2	12	43%	78	58	Marine Tier 2
Pier J Breakwater Crew boat propulsion engine		1	2	2	38%	325	242	Marine Tier 2
Pier J Breakwater Crew boat auxiliary engine		1	1	2	32%	80	60	Marine Tier 2
Pier J Breakwater Survey boat propulsion engine		1	1	2	38%	580	433	Marine Tier 2
Pier J Wharf Upgrade								
Pier J Wharf Tugboat propulsion engine		1	2	12	31%	1000	746	Marine Tier 2
Pier J Wharf Tugboat auxiliary engine		1	2	12	43%	78	58	Marine Tier 2
Pier J Wharf Crew boat propulsion engine		1	2	2	38%	400	298	Marine Tier 2
Pier J Wharf Crew boat auxiliary engine		1	1	2	32%	80	60	Marine Tier 2
Pier J Wharf Survey boat propulsion engine		1	1	2	38%	400	298	Marine Tier 2
Pier T Wharf Upgrade								
Pier T Wharf Tugboat propulsion engine		1	2	12	31%	1000	746	Marine Tier 2
Pier T Wharf Tugboat auxiliary engine		1	2	12	43%	78	58	Marine Tier 2
Pier T Wharf Crew boat propulsion engine		1	2	2	38%	400	298	Marine Tier 2
Pier T Wharf Crew boat auxiliary engine		1	1	2	32%	80	60	Marine Tier 2
Pier T Wharf Survey boat propulsion engine		1	1	2	38%	400	298	Marine Tier 2
Notes:								
Hopper dredge is used only during dredging of Approach Channel.								
Dutra's hopper ship Stuyvensant has 2 aux engines (used for jet pumps which are only active during disposal events). These engines are scheduled to be upgraded to Tier 3 in a couple of years. Analysis conservatively assumed Tier 2 auxiliary engines.								
Dutra's dredge pumps are electric and are powered via main engines.								
Hopper auxiliary engine is only used during disposal events. 15 min per event and 6 events per day.								
Survey boats have outboard propulsion. If there is hopper and clamshells working concurrently then one survey boat can support both operations.								
Dutra's biggest clamshell dredge generator is 895bhp.								
Barge dump scow engine only runs for about 15 min while disposal event occurs; assumed 4 loads per day.								
Dutra's anchor tug fleet has typical twin 300 hp tier II configuration.								
Tugboats used for disposal - Dutra uses 1200 hp on the low end. Used this conservatively in lieu of 2017 POLB EI.								
Dutra survey boats don't have aux engines. Equipment is run off of inverters.								
Source:								
Dredging: KeyAssumptionsSummary Dutra revision.xlsx e-mailed 4/3/2019. Provided by USACE and Dutra								
Pier J Breakwater:								
E-mail from: Khan, Naser <naser.khan@aecom.com> Sent: Tuesday, May 21, 2019 10:51 PM To: Barrera, Baron <baron.barrera@polb.com>; Paulsen, Eric <eric.paulsen@polb.com>								
E-mail from: Khan, Naser <naser.khan@aecom.com> Sent: Thursday, May 30, 2019 11:56 AM To: Barrera, Baron <baron.barrera@polb.com>; Paulsen, Eric <eric.paulsen@polb.com>								
E-mail from: Khan, Naser <naser.khan@aecom.com> Sent: Friday, May 31, 2019 10:54 PM To: Barrera, Baron <baron.barrera@polb.com>								

Table H1.6  
Landside Construction Equipment Activity

Equipment	Number of Pieces (peak day)	Number of Active Days	Utilization (hr/day)	HP (each) or other info	Transit Distance Offsite (mi)	Transit Distance Onsite (mi)
<b>Electrical Substation Construction at Pier J</b>						
Offroad Equipment						
Caterpillar 320 excavator	1	20	8	164		
Small asphalt roller	1	26	8	33		
Water truck	1	20	8	300		
Forklift	1	22	2	50		
Mobile crane (35 ton)	1	2	8	282		
Onroad Equipment						
Dump trucks	3	5	8	600	11	1
Concrete trucks	7	5	8	335	20	1
Workers	20	60			30	
<b>Pier J Breakwater Construction</b>						
Offroad Equipment						
Piling crane	1	54	10	250		
Long arm excavator	1	54	10	315		
Onroad Equipment						
Pile delivery truck	5	5			200	1
Workers	21	54			30	
<b>Pier J Wharf Upgrade</b>						
Offroad Equipment						
Const Barge - piling crane	1	170	10	250		
Cong Barge - long arm excavator	1	170	10	315		
Const barge - deck equipment	1	170	10	100		
Sheet pile barge - deck equipment	1	170	10	100		
Onroad Equipment						
Workers	19	175			30	
<b>Pier T Wharf Upgrade</b>						
Offroad Equipment						
Const Barge - piling crane	1	310	10	250		
Cong Barge - long arm excavator	1	310	10	315		
Const barge - deck equipment	1	310	10	100		
Sheet pile barge - deck equipment	1	310	10	100		
Onroad Equipment						
Workers	19	320			30	
<b>Notes:</b>						
1-way transit distance multiplied by 2 for total transit distance. Telephone conversation with Naser Khan (AECOM) 5/21/19.						
<b>Source:</b>						
Telephone conversation with Naser Khan (AECOM) 5/21/19.						
E-mail from: Khan, Naser <naser.khan@aecom.com> Sent: Tuesday, May 21, 2019 10:51 PM To: Barrera, Baron <baron.barrera@polb.com>; Paulsen, Eric <eric.paulsen@polb.com>						
E-mail from: Khan, Naser <naser.khan@aecom.com> Sent: Thursday, May 30, 2019 11:56 AM To: Barrera, Baron <baron.barrera@polb.com>; Paulsen, Eric <eric.paulsen@polb.com>						
E-mail from: Khan, Naser <naser.khan@aecom.com> Sent: Friday, May 31, 2019 10:54 PM To: Barrera, Baron <baron.barrera@polb.com>						

Table H1.7

Soil Handling - Electrical Substation Construction

Task	Peak Day Volume of Soil Handled (cyd/day)	Total Volume of Soil Handled (cyd)	Peak Day Volume of Soil Handled (ton/day)	Total Volume of Soil Handled (ton)
Electrical Substation Construction at Pier J	72	1500	91.8	1912.5

Table H1.8

Wharf Upgrades: Pier J, Berths 266-270

Activity No.	Description	No. of Working Days	Equipment	Horsepower	No. of People	Notes
1	Mobilize/Demobilize	5	Construction Barge with piling crane and long arm excavator. Tug boat	Piling Crane: 250 HP	8	Assume piling frame is constructed off site and placed onto barge at contractors' yard
		5		Long Arm Excavator: 315 HP		
		5		Tugboat: 2,000 HP		
2	Sheet Pile Delivery	10	As Activity No. 1	Construction Barge Deck Equipment: 100 HP	As above	Assume sheet piles are delivered onsite via a small barge as needed. Sheet piles will be loaded onto the small barge at the contractors' yard and delivered onsite from the waterside.
		10	Small barge for sheet piles	Sheet pile Barge Deck Equipment: 100 HP		
		10	Tug Boat	Survey Boat: 400 HP		
3	Clearing of seabed of any obstruction prior to pile driving	20	As Activity No. 1	Crew Boat: 400 HP	As above	Any debris will be cleared using the long arm excavator mounted on the construction barge, includes team of four divers
		20	Survey boat		7	
4	Driving of bulkhead wall	135	As Activity No. 3		19	Assumes driving rate of 20 LF per day
		135	Crew Boat		2	
5	Installation of anti-scour rock in front of new bulkhead wall	130	Small barge for storage of rock		4	Long arm excavator on construction barge used to place rock. Overlaps with activity No. 4, finish at probably the same time.
		130	Tug Boat			
6	Survey of installed bulkhead wall	5	Survey boat		3	Survey team

Source:

E-mail: From: Barrera, Baron <baron.barrera@polb.com>, Sent: Thursday, June 6, 2019 1:13 PM, To: Lora Granovsky <lora.granovsky@ilancoenvironmental.com>, Subject: FW: LB Deep Draft Nav Study - Construction Schedule for Pier J and T Sheet Pile Wall.

Duration: 175 working days for Pier J, Berths 266-270

Wharf upgrades apply to Alternative 4 only.

Table H1.9

Wharf Upgrades: Pier T, Berths 134-140

Activity No.	Description	No. of Working Days	Equipment	Horsepower	No. of People	Notes
1	Mobilize/Demobilize	5	Construction Barge with piling crane and long arm excavator. Tug boat	Piling Crane: 250 HP	8	Assume piling frame is constructed off site and placed onto barge at contractors' yard
		5		Long Arm Excavator: 315 HP		
		5		Tugboat: 2,000 HP		
2	Sheet Pile Delivery	20	As Activity No. 1	Construction Barge Deck Equipment: 100 HP	As above	Assume sheet piles are delivered onsite via a small barge as needed. Sheet piles will be loaded onto the small barge at the contractors' yard and delivered onsite from the waterside.
		20	Small barge for sheet piles	Sheet pile Barge Deck Equipment: 100 HP		
		20	Tug Boat	Survey Boat: 400 HP		
3	Clearing of seabed of any obstruction prior to pile driving	35	As Activity No. 1	Crew Boat: 400 HP	As above	Any debris will be cleared using the long arm excavator mounted on the construction barge, includes team of four divers
		35	Survey boat		7	
4	Driving of bulkhead wall	250	As Activity No. 3		19	Assumes driving rate of 20 LF per day
		250	Crew Boat		2	
5	Installation of anti-scour rock in front of new bulkhead wall	245	Small barge for storage of rock		4	Long arm excavator on construction barge used to place rock. Overlaps with activity No. 4, finish at probably the same time.
		245	Tug Boat			
6	Survey of installed bulkhead wall	10	Survey boat		3	Survey team

Source:

E-mail: From: Barrera, Baron <baron.barrera@polb.com>, Sent: Thursday, June 6, 2019 1:13 PM, To: Lora Granovsky <lora.granovsky@ilancoenvironmental.com>, Subject: FW: LB Deep Draft Nav Study - Construction Schedule for Pier J and T Sheet Pile Wall.

Duration: 320 working days for Pier T, Berths 134-140

Wharf upgrades apply to Alternative 4 only.



Table H1.10

Offroad Engine Emission Factors - USEPA Standards

Emission Factor (g/hp-hr)								
	High HP	PM10	PM2.5	DPM	NOX	SOX	CO	VOC
Tier 1	50	0.6	0.6	0.6	6.745	0.005552	4.1	
	100	0.6	0.6	0.6	6.9	0.005552	4.1	
	175	0.6	0.6	0.6	6.9	0.004994	4.1	
	300	0.4	0.4	0.4	6.9	0.004994	8.5	1.053
	600	0.4	0.4	0.4	6.9	0.004994	8.5	1.053
	750	0.4	0.4	0.4	6.9	0.004994	8.5	1.053
	>750	0.4	0.4	0.4	6.9	0.004994	8.5	1.053
Tier 2	50	0.45	0.45	0.45	5.32	0.005552	4.1	0.29484
	100	0.3	0.3	0.3	5.32	0.005552	3.7	0.29484
	175	0.22	0.22	0.22	4.655	0.004994	3.7	0.257985
	300	0.15	0.15	0.15	4.655	0.004994	2.6	0.257985
	600	0.15	0.15	0.15	4.56	0.004994	2.6	0.25272
	750	0.15	0.15	0.15	4.56	0.004994	2.6	0.25272
	>750	0.15	0.15	0.15	4.56	0.004994	2.6	0.25272
Tier 3	50	0.45	0.45	0.45	5.32	0.005552	4.1	0.29484
	100	0.3	0.3	0.3	3.325	0.005552	3.7	0.184275
	175	0.22	0.22	0.22	2.85	0.004994	3.7	0.15795
	300	0.15	0.15	0.15	2.85	0.004994	2.6	0.15795
	600	0.15	0.15	0.15	2.85	0.004994	2.6	0.15795
	750	0.15	0.15	0.15	2.85	0.004994	2.6	0.15795
	>750	0.15	0.15	0.15	4.56	0.004994	2.6	0.25272
Tier 4 Interim	50	0.22	0.22	0.22	5.32	0.005552	4.1	0.29484
	75	0.22	0.22	0.22	3.325	0.005552	3.7	0.184275
	175	0.015	0.015	0.015	0.3	0.004994	3.7	0.14742
	750	0.015	0.015	0.015	0.3	0.004994	2.6	0.14742
	>750	0.075	0.075	0.075	2.6	0.004994	2.6	0.3159
Tier 4 Final	50	0.022	0.022	0.022	3.325	0.005552	4.1	0.184275
	75	0.022	0.022	0.022	3.325	0.005552	3.7	0.184275
	175	0.015	0.015	0.015	0.3	0.004994	3.7	0.14742
	750	0.015	0.015	0.015	0.3	0.004994	2.6	0.14742
	>750	0.03	0.03	0.03	2.6	0.004994	2.6	0.3159

Source:

USEPA Engine Standards. DieselNet: <https://www.dieselnet.com/standards/us/nonroad.php#tier3>

NMHC+NOx Pollutant Fractions (2017 Carl Moyer Program Guidelines, Table D-25):

NOx = 0.95

HC 0.05

SOx is a function of fuel sulfur content and does not change with Tier.

Used for Marine Offroad Equipment: Tier 3

Used for Mitigation: Tier 4 offroad equipment

Table H1.11  
Harbor Craft Emission Factors - USEPA Standards

Engine Displacement	(kW)	EPA Tier	MY	g/kw-hr											
				NMHC+NOx	PM10	PM2.5	DPM	NOx	SOX	CO	HC	VOC	CO2	CH4	N2O
Category 1 HC auxiliary engines															
>2.5	>37	Tier 1	2004		0.54	0.4806	0.54	17	0.00552	11.4	1.3	1.3689	652	0.026	0.031
<0.9	≥37	Tier 2	2005	7.5	0.4	0.356	0.4	7.125	0.00552	5	0.375	0.394875	652	0.0075	0.031
0.9 < displ < 1.2	75-130	Tier 2	2004	7.2	0.3	0.267	0.3	6.84	0.00552	5	0.36	0.37908	652	0.0072	0.031
1.2 < displ < 2.5	130-560	Tier 2	2004	7.2	0.3	0.267	0.3	6.84	0.00552	5	0.36	0.37908	652	0.0072	0.031
2.5 < displ < 5	>560	Tier 2	2007	7.2	0.2	0.178	0.2	6.84	0.00552	5	0.36	0.37908	652	0.0072	0.031
<0.9	<19	Tier 3	2009	7.5	0.4	0.356	0.4	7.125	0.00552	6.6	0.375	0.394875	652	0.0075	0.031
<0.9	19-75	Tier 3	2009-2013	7.5	0.3	0.267	0.3	7.125	0.00552	5.5	0.375	0.394875	652	0.0075	0.031
<0.9	19-75	Tier 3	2014+	4.7	0.3	0.267	0.3	4.465	0.00552	5.5	0.235	0.247455	652	0.0047	0.031
<0.9	>75	Tier 3	2012+	5.4	0.14	0.1246	0.14	5.13	0.00552	5.5	0.27	0.28431	652	0.0054	0.031
0.9 < displ < 1.2	all	Tier 3	2013+	5.4	0.14	0.1246	0.14	5.13	0.00552	5	0.27	0.28431	652	0.0054	0.031
1.2 < displ < 2.5	<600	Tier 3	2014-2017	5.6	0.11	0.0979	0.11	5.32	0.00552	5	0.28	0.29484	652	0.0056	0.031
1.2 < displ < 2.5	<600	Tier 3	2018+	5.6	0.1	0.089	0.1	5.32	0.00552	5	0.28	0.29484	652	0.0056	0.031
1.2 < displ < 2.5	≥600	Tier 3	2014+	5.6	0.11	0.0979	0.11	5.32	0.00552	5	0.28	0.29484	652	0.0056	0.031
2.5 < displ < 3.5	<600	Tier 3	2013-2017	5.6	0.11	0.0979	0.11	5.32	0.00552	5	0.28	0.29484	652	0.0056	0.031
2.5 < displ < 3.5	<600	Tier 3	2018+	5.6	0.1	0.089	0.1	5.32	0.00552	5	0.28	0.29484	652	0.0056	0.031
2.5 < displ < 3.5	≥600	Tier 3	2013+	5.6	0.11	0.0979	0.11	5.32	0.00552	5	0.28	0.29484	652	0.0056	0.031
3.5 ≤ D < 7	<600	Tier 3	2012-2017	5.8	0.11	0.0979	0.11	5.51	0.00552	5	0.29	0.30537	652	0.0058	0.031
3.5 ≤ D < 7	<600	Tier 3	2018+	5.8	0.1	0.089	0.1	5.51	0.00552	5	0.29	0.30537	652	0.0058	0.031
3.5 ≤ D < 7	≥600	Tier 3	2012+	5.8	0.11	0.0979	0.11	5.51	0.00552	5	0.29	0.30537	652	0.0058	0.031
	600-1400	Tier 4	2017+		0.04	0.0356	0.04	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
	1400-2000	Tier 4	2016+		0.04	0.0356	0.04	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
	2000-3700	Tier 4	2014+		0.04	0.0356	0.04	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
<15.0	>3700	Tier 4	2014-2015		0.12	0.1068	0.12	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
15 < displ < 30	>3700	Tier 4	2014-2015		0.25	0.2225	0.25	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
all	>3700	Tier 4	2016+		0.06	0.0534	0.06	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
Category 2 HC propulsion engines															
>2.5	>37	Tier 1	2004		0.54	0.4806	0.54	17	0.00552	11.4	1.3	1.3689	652	0.026	0.031
5.0 ≤ D < 15	all	Tier 2	2007	7.8	0.27	0.2403	0.27	7.41	0.00552	5	0.39	0.41067	652	0.0078	0.031
15 ≤ D < 20	< 3300 kW	Tier 2	2007	8.7	0.5	0.445	0.5	8.265	0.00552	5	0.435	0.458055	652	0.0087	0.031
15 ≤ D < 20	≥ 3300 kW	Tier 2	2007	9.8	0.5	0.445	0.5	9.31	0.00552	5	0.49	0.51597	652	0.0098	0.031
20 ≤ D < 25	all	Tier 2	2007	9.8	0.5	0.445	0.5	9.31	0.00552	5	0.49	0.51597	652	0.0098	0.031
25 ≤ D < 30	all	Tier 2	2007	11	0.5	0.445	0.5	10.45	0.00552	5	0.55	0.57915	652	0.011	0.031
7 ≤ D < 15	<2000	Tier 3	2013+	6.2	0.14	0.1246	0.14	5.89	0.00552	5	0.31	0.32643	652	0.0062	0.031
7 ≤ D < 15	2000-3700	Tier 3	2013+	7.8	0.14	0.1246	0.14	7.41	0.00552	5	0.39	0.41067	652	0.0078	0.031
15 ≤ D < 20	<2000	Tier 3	2014+	7	0.34	0.3026	0.34	6.65	0.00552	5	0.35	0.36855	652	0.007	0.031
20 ≤ D < 25	<2000	Tier 3	2014+	9.8	0.27	0.2403	0.27	9.31	0.00552	5	0.49	0.51597	652	0.0098	0.031
25 ≤ D < 30	<2000	Tier 3	2014+	11	0.27	0.2403	0.27	10.45	0.00552	5	0.55	0.57915	652	0.011	0.031
all	2000-3700	Tier 4	2014		0.04	0.0356	0.04	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
<15	>3700	Tier 4	2014		0.12	0.1068	0.12	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
15 ≤ D < 30	>3700	Tier 4	2014		0.25	0.2225	0.25	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
all	>3700	Tier 4	2016		0.06	0.0534	0.06	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
all	1400-2000	Tier 4	2016		0.04	0.0356	0.04	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
all	600-1400	Tier 4	2017		0.04	0.0356	0.04	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
	600-1400	Tier 4	2017+		0.04	0.0356	0.04	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
	1400-2000	Tier 4	2016+		0.04	0.0356	0.04	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
	2000-3700	Tier 4	2014+		0.04	0.0356	0.04	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
<15.0	>3700	Tier 4	2014-2015		0.12	0.1068	0.12	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
15 < displ < 30	>3700	Tier 4	2014-2015		0.25	0.2225	0.25	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031
all	>3700	Tier 4	2016+		0.06	0.0534	0.06	1.8	0.00552	5	0.19	0.20007	652	0.0038	0.031

**Source:**

Federal Marine Compression-Ignition Engines - Exhaust Emission Standards Reference Guide, <http://epa.gov/OMS/standards/nonroad/marineci.htm>

Tier 1 and Tier 2 standards: 40CFR Part 94.8

Tier 3 and Tier 4 standards: 40CFR Part 1042.101

EPA Tier 1 emissions standards for marine engines do not specify restrictions to PM, SOx, CO, or VOC. NOx reflects Marpol Annex VI (17 g/kw-hr). PM10, SOx, CO and VOC emissions factors were obtained from EPA offroad emission engine standards for Tier 1 engines.

EPA Tier 2 and Tier 3 emission standards are reported as NOx+THC. 5% is HC per Carl Moyer Program guidelines. 95% is NOx.

SOx emission factor is based on 15 ppm fuel sulfur content.

PM2.5 is 89% of PM10, per SCAQMD 2006 Final Methodology to Calculate PM2.5 and PM 2.5 Significance Thresholds, Table 5.

CO2 and N2O emission factors are from IVL: Methodology for Calculating Emissions from Ships: Update on Emission Factors, 2004, also summarized in POLA 2009 Emissions Inventory, Appendix B. CH4 is 2% of HC, per IVL study.

**Table H1.12**

**SOx Emission Factor - Harbor Craft**

Harbor Craft	0.00552 g/hp-hr
Dredging Equipment	use OFFROAD BSFC and convert to g SOx /hp-hr
SOx (gms/hp-hr) = (S content in X/1,000,000) x (MW SO <sub>2</sub> / MW S) x BSF =	
Where:	
X = S content in parts per million (ppm)	15 ppm
S MW = Molecular Weight	32
SO <sub>2</sub> MW = Molecular Weight	64
BSFC for harbor craft = Brake Specific Fuel Consumption (per CARB 2007 Harbor Craft Methodology)	184 (g/hp-hr)

**Table H1.13**

**Harbor Craft Load Factor**

Type	Main Engine	Auxiliary Engine
Assist tugboat	0.31	0.43
Commercial fishing	0.27	0.43
Crew boat	0.38	0.32
Excursion	0.42	0.43
Ferry	0.42	0.43
Government	0.51	0.43
Ocean tug	0.68	0.43
Tugboat	0.31	0.43
Workboat      Diveboat	0.38	0.32
<b>Source:</b>		
2013 POLB Emissions Inventory, Table 3.4.		

Table H1.14

Paved Road Dust Emission Factor Derivation							
Emission Source	(sL) Silt Loading (g/m2)	(K) Particle Size Multiplier - PM10 (g/VMT)	(K) Particle Size Multiplier - PM2.5 (g/VMT)	(W) Average Vehicle Weight on Road (tons)	(E) Uncontrol- led PM10 Emission Factor (g/VMT)	(E) Uncontrol- led PM2.5 Emission Factor (g/VMT)	
Onsite Trucks	0.6	1.00	0.25	20.0	13.34	3.34	
Offsite Roadway (all vehicles) - CARB 2016							
Freeway							
Statewide	0.015	1.00	0.25	2.4	0.05	0.01	
Major LA County	0.013	1.00	0.25	2.4	0.05	0.01	
Collector LA County	0.013	1.00	0.25	2.4	0.05	0.01	
Local LA County	0.135	1.00	0.25	2.4	0.39	0.10	
Notes:							
1. Emission factors are calculated using CARB's Miscellaneous Process Methodology 7.9, Entrained Road Travel, Paved Road Dust.							
November 2016. Available: <a href="https://ww3.arb.ca.gov/ei/areasrc/fullpdf/full7-9_2016.pdf">https://ww3.arb.ca.gov/ei/areasrc/fullpdf/full7-9_2016.pdf</a> . Accessed 7/2019. Because the emissions are primarily used for peak day or peak hour calculations, downward adjustment due to annual precipitation was not made.							
2. Emission factors exclude engine exhaust, tire wear, and brake wear, which are accounted for in EMFAC calculations.							
3. The equation is: $E = k (sL)^{0.91} \times (W)^{1.02}$							
Summary of Daily VMT by Roadway Type							
Los Angeles - Long Beach - Santa Ana Metro Area							
Metropolitan Area	Interstate/ Other Fwy/ Exprwy	Other Principal Arterial	Minor Arterial	Collector	Local		
Daily Vehicle-Miles Travelled (Thousands)	132,796	67,118	49,528	15,304	14,481		
Travel Fraction	0.48	0.24	0.18	0.05	0.05		
Source: Federal Highway Administration. Highway Statistics 2016 - Urbanized Areas - 2016 Miles and Daily Last accessed February 2019. <a href="https://www.fhwa.dot.gov/policyinformation/statistics/2016/">https://www.fhwa.dot.gov/policyinformation/statistics/2016/</a>							
Composite Paved Road Dust Emission Factors for Project Trips							
Road Type	Fraction of Travel by Roadway Type					Composite EF	
	Interstate/ Other Fwy/ Exprwy	Other Principal Arterial	Minor Arterial	Collector	Local	PM10 (g/VMT)	PM2.5 (g/VMT)
Vehicle Trips in Los Angeles - Long Beach - Santa Ana Metro Area	0.48	0.24	0.18	0.05	0.05	0.068	0.017

**Table H1.15**

**Material Loading/Handling Dust Emission Factors**

PM10 (lb/ton)	0.0560274
PM2.5 (lb/ton)	0.0084841
$EF = (k)(0.0032)[(U/5)^{-1.3}]/[(M/2)^{-1.4}]$ EF = lb/ton k = Particle Size Constant (0.35 for PM10 and 0.053 for PM2.5) U = average wind speed = 2.2 m/s (CalEEMod), 4.9 mph M = moisture content = 12% (CalEEMod)	
Soil density (ton/cyd):	1.26
Truck capacity (cyd)	20
Truck capacity (ton)	25.28
Source: AP-42, p. 13.2.4 & CalEEMod	

**Table H1.16**

**Asphalt Paving**

VOC (lb/acre)	2.62	(lb/ft <sup>2</sup> )	6.015E-05
Source: CalEEMod, Appendix A, Section 4.8.			

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Port of Long Beach Deep Draft Navigation Study  
Los Angeles County, California

Appendix H1 - Tables  
October 2019

Table H1.17  
OFFROAD 2017 Output

OFFROAD2017 (v1.0.1) Emissions Inventory

Region Type: Air District

Region: South Coast AQMD

Calendar Year: 2024

Scenario: All Adopted Rules - Exhaust

Vehicle Classification: OFFROAD2017 Equipment Types

Units: Emissions: tons/day, Fuel Consumption: gallons/year, Activity: hours/year, HP-Hours: HP-hours/year

Region	CalYr	VehClass	MdYr	HP_Bin	Fuel	HC tpd	ROG tpd	TOG tpd	CO tpd	NOx tpd	CO2 tpd	PM10 tpd	PM2.5 tpd	PM tpd	SOx tpd	NH3 tpd	Fuel gpy	Total_Acty hry	Total_Pop ulation	Horsepower_ Hours hpwy
South Coast	2024	Industrial - Aerial Lifts	Aggregated	25	Diesel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
South Coast	2024	Industrial - Aerial Lifts	Aggregated	50	Diesel	0.003326937	0.004025594	0.004790789	0.079014703	0.073312641	14.908399	0.000549907	0.000505915	0.000549907	0.000137736	0.00012168	483686.6	591600.15	1911.1402	27291100
South Coast	2024	Industrial - Aerial Lifts	Aggregated	75	Diesel	0.00196584	0.002378667	0.00283081	0.068456702	0.035496583	11.411501	0.000789221	0.000726084	0.000789221	0.000105446	9.31391E-05	370233.6	332424.62	1079.5822	23226784.67
South Coast	2024	Industrial - Aerial Lifts	Aggregated	100	Diesel	0.002124473	0.002570612	0.003059241	0.087821283	0.039766347	14.601892	0.000515682	0.000474427	0.000515682	0.000134938	0.000119179	473742.3	382664.21	1235.6121	29712613.35
South Coast	2024	Industrial - Aerial Lifts	Aggregated	175	Diesel	0.000214867	0.000259899	0.000309409	0.008606927	0.001722874	1.589384	7.29618E-05	6.71248E-05	7.29618E-05	1.46924E-05	1.2976E-05	51580.414	24809.443	80769691	3236722.847
South Coast	2024	Industrial - Aerial Lifts	Aggregated	300	Diesel	1.20506E-05	1.45812E-05	1.73529E-05	0.000174235	0.000123207	0.095005	1.66541E-06	1.53218E-06	1.66541E-06	7.75418E-07	3082.3312	840.96234	2.7057199	193421.3391	
South Coast	2024	Industrial - Aerial Lifts	Aggregated	600	Diesel	6.889E-06	8.33569E-06	9.92015E-06	0.000122497	3.36709E-05	0.0674673	1.17545E-06	1.08141E-06	1.17545E-06	6.23562E-07	5.50659E-07	2188.9019	280.32078	0.9019066	137357.1828
South Coast	2024	OFF - ConstMin - Plate Compactors	Aggregated	25	Diesel	0.00057186	0.000680561	0.000823478	0.004319479	0.005156935	0.7074236	0.000201509	0.000185389	0.000201509	1.10081E-05	5.93633E-06	23597.25	119822.2	199.52	958577.6
South Coast	2024	OFF - Light Commercial - Air Compressors	Aggregated	25	Diesel	0.000876803	0.001043468	0.001262597	0.004623625	0.00778996	1.0040399	0.000324279	0.000298337	0.000324279	1.33207E-05	8.40727E-06	33419.4	61002.45	74.88	1218428.4
South Coast	2024	OFF - Light Commercial - Air Compressors	Aggregated	50	Diesel	0.009822428	0.011689501	0.014144297	0.09693465	0.076597813	11.231237	0.002732976	0.002514338	0.002732976	0.000145192	9.4613E-06	376092.35	368463.85	452.64	13633162.45
South Coast	2024	ConstMin - Cranes	Aggregated	25	Diesel	2.0286E-05	2.4546E-05	2.9218E-05	0.000113714	9.66561E-05	0.0116572	7.59123E-06	6.98393E-06	7.59123E-06	1.07168E-07	9.51442E-08	378.20384	913.58918	1.8645734	22839.72944
South Coast	2024	ConstMin - Cranes	Aggregated	50	Diesel	0.000533764	0.000645855	0.000768621	0.00240237	0.001906914	0.1888651	0.000192194	0.000176818	0.000192194	1.73014E-06	1.54149E-06	6127.5216	8886.7971	19.888783	366338.4637
South Coast	2024	ConstMin - Cranes	Aggregated	75	Diesel	0.000150058	0.000181571	0.000216084	0.0006252	0.001360003	0.0724763	0.000128061	0.000117816	0.000128061	6.65577E-07	5.91542E-07	2351.413	2336.9873	6.2152447	156830.8722
South Coast	2024	ConstMin - Cranes	Aggregated	100	Diesel	0.00341141	0.004127807	0.004912431	0.033268294	0.03700243	4.5468204	0.002322333	0.002136547	0.002322333	4.19353E-05	3.71105E-05	147516.58	111966.96	244.88064	9930003.218
South Coast	2024	ConstMin - Cranes	Aggregated	175	Diesel	0.007878513	0.009533001	0.011345059	0.082290973	0.091768248	12.794175	0.004960442	0.004563606	0.004960442	0.000118052	0.000104424	415092.91	188449.19	404.61243	27828778.99
South Coast	2024	ConstMin - Cranes	Aggregated	300	Diesel	0.010227738	0.012374837	0.014727078	0.070919069	0.13264119	22.212489	0.005532029	0.005089647	0.005532029	0.000205059	0.000181295	720659.73	220360.18	456.82048	48391095.85
South Coast	2024	ConstMin - Cranes	Aggregated	600	Diesel	0.013079131	0.015825749	0.018833949	0.126470765	0.160367746	39.707163	0.006453087	0.006453087	0.00036672	0.000328855	235911.53	465.52183	86509887	86509887	
South Coast	2024	ConstMin - Cranes	Aggregated	750	Diesel	0.000414325	0.000501334	0.000596629	0.003739171	0.005075816	0.683406	0.000251319	0.000231319	0.000251319	6.306E-06	5.57787E-06	22172.354	2334.8086	5.9937022	1489529.811
South Coast	2024	ConstMin - Cranes	Aggregated	9999	Diesel	0.001949465	0.002358853	0.00280723	0.020123424	0.028121534	2.1695011	0.00124691	0.001417157	0.00124691	1.99955E-05	1.77035E-05	70372.473	5039.9912	9.9443915	4725395.503
South Coast	2024	ConstMin - Bore/Drill Rigs	Aggregated	25	Diesel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
South Coast	2024	ConstMin - Bore/Drill Rigs	Aggregated	50	Diesel	0.00051222	0.000619786	0.000737597	0.004409124	0.004234062	0.6033835	0.000223061	0.000205216	0.000223061	5.56321E-06	4.92474E-06	19576.114	17120.573	47.013303	664158.3093
South Coast	2024	ConstMin - Bore/Drill Rigs	Aggregated	75	Diesel	0.000263062	0.000318305	0.000378809	0.004716774	0.004288804	0.7420077	0.000228886	0.000210575	0.000228886	6.85234E-06	6.05617E-06	24073.619	12982.677	26.228474	943030.4836
South Coast	2024	ConstMin - Bore/Drill Rigs	Aggregated	100	Diesel	0.00093599	0.000960255	0.001142782	0.019037587	0.01339025	3.029392	0.000420387	0.000420387	0.000420387	2.79844E-05	2.47255E-05	98285.289	45684.545	117.28582	3828325.45
South Coast	2024	ConstMin - Bore/Drill Rigs	Aggregated	175	Diesel	0.000864172	0.001045468	0.001244408	0.024581837	0.008641458	4.4183065	0.000395182	0.000395182	0.000395182	4.08235E-05	3.60616E-05	143347.09	36690.577	113.3268	5472037.01
South Coast	2024	ConstMin - Bore/Drill Rigs	Aggregated	300	Diesel	0.001173139	0.001414948	0.00168932	0.012973941	0.013711353	6.437411	0.000444948	0.000439352	0.000444948	5.94819E-05	5.25413E-05	208854.71	116.79094	8081075.955	8081075.955
South Coast	2024	ConstMin - Bore/Drill Rigs	Aggregated	600	Diesel	0.001554492	0.001880935	0.002238468	0.018645424	0.014595768	9.166594	0.00052562	0.00048357	0.00052562	9.16372E-05	8.09379E-05	321733.02	12470.72	52.541974	12510630.99
South Coast	2024	ConstMin - Bore/Drill Rigs	Aggregated	750	Diesel	0.000781732	0.000948585	0.001125694	0.011646979	0.006753384	6.4171702	0.000260066	0.000239621	0.000260066	5.93065E-05	5.23761E-05	208198.02	12460.525	20.784828	7940119.213
South Coast	2024	ConstMin - Bore/Drill Rigs	Aggregated	9999	Diesel	0.000874856	0.001058576	0.001259793	0.0061952	0.024104296	3.295717	0.000556735	0.000512196	0.000556735	3.04443E-05	2.68992E-05	106925.91	2215.243	2.9692612	4121374.97
South Coast	2024	ConstMin - Excavators	Aggregated	25	Diesel	2.61182E-05	3.16031E-05	3.76103E-05	8.87472E-05	6.0281E-05	0.0046697	8.40136E-06	7.72925E-06	8.40136E-06	4.23906E-06	3.81139E-06	151.50483	275.77022	1.1054457	6894.255522
South Coast	2024	ConstMin - Excavators	Aggregated	50	Diesel	0.014304132	0.017304733	0.020594062	0.174964361	0.14597322	24.486123	0.004967812	0.004570387	0.004967812	0.000225957	0.000199852	794425.29	1003998	1349.1965	36148196.64
South Coast	2024	ConstMin - Excavators	Aggregated	75	Diesel	0.000507738	0.000614363	0.000731143	0.003570783	0.005562328	0.459396	0.000486584	0.000476537	0.000486584	4.23211E-06	3.74953E-06	14904.596	10331.373	17.687131	754837.4229
South Coast	2024	ConstMin - Excavators	Aggregated	100	Diesel	0.010208364	0.01235212	0.014700044	0.205627234	0.129200323	31.273571	0.005594634	0.005594634	0.000288833	0.000255251	1014636.6	633591.45	954.55236	1513820.79	
South Coast	2024	ConstMin - Excavators	Aggregated	175	Diesel	0.018032642	0.021819497	0.025967005	0.391556344	0.169853816	67.036141	0.008413443	0.007140668	0.008413443	0.000619241	0.00054714	2174913.8	735439.12	1245.348	110081748.9
South Coast	2024	ConstMin - Excavators	Aggregated	300	Diesel	0.018873432	0.022837941	0.027179038	0.179374516	0.13938627	85.411425	0.006010834	0.005529967	0.006010834	0.000789105	0.000697117	2771079.6	640988.81	1072.835	140136243.1
South Coast	2024	ConstMin - Excavators	Aggregated	600	Diesel	0.028770215	0.03481196	0.041429109	0.301095489	0.23734104	151.63337	0.008158568	0.007305182	0.008158568	0.001401063	0.001237611	4919577.8	73809.91	1125.347	24947153.67
South Coast	2024	ConstMin - Excavators	Aggregated	750	Diesel	0.00057652	0.000695789	0.000830189	0.005593627	0.007306292	1.8945769	0.000289998	0.000267968	0.000289998	1.7499E-05	1.54633E-05	61467.46	5041.3638	8.8435656	3094568.773
South Coast	2024	ConstMin - Excavators	Aggregated	9999	Diesel	0.000527283	0.000638013	0.000759288	0.007852624	0.0186676	4.2238993	0.000168585	0.000155098	0.000168585	3.90362E-05	3.44749E-05	137039.76	5756.9455	8.2908427	6862542.808
South Coast	2024	Industrial - Forklifts	Aggregated	25	Diesel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
South Coast	2024	Industrial - Forklifts	Aggregated	50	Diesel	0.009766457	0.011817413	0.014063699	0.086864408	0.06895685	10.033952	0.003465042	0.003187838	0.003465042	9.24759E-05	8.18958E-05	325540.51	663567.5	885.96181	28152589.38
South Coast	2024	Industrial - Forklifts	Aggregated	75	Diesel	0.001763312	0.002133608	0.002539169	0.007030789	0.016791477	0.6530002	0.001308283	0.001203652	0.001308283	5.98441E-06	5.3297E-06	21185.873	28130.245	62.969187	2050942.214
South Coast	2024	Industrial - Forklifts	Aggregated	100	Diesel	0.054981773	0.066527946	0.079173754	0.824370118	0.622737742	120.20099	0.03587931	0.033008965	0.03587931	0.001109668	0.000981064	3899788.7	4558134.9	5848.8124	37513959.6
South Coast	2024	Industrial - Forklifts	Aggregated	175	Diesel	0.013475249	0.016305051	0.019404358	0.229756629	0.135380414	38.198857	0.006967114	0.006409745	0.006967114	0.000352763	0.000311774	1239319.9	844249.29	1101.2286	119291770.4
South Coast	2024	Industrial - Forklifts	Aggregated	300	Diesel	0.002488849	0.003011508	0.003583943	0.019027699	0.024884209	8.3200432	0.000939482	0.000864323	0.000939482	7.68483E-05	6.79071E-05	269934.6	123583.15	161.08397	25946

Port of Long Beach Deep Draft Navigation Study  
Los Angeles County, California

Appendix H1 - Tables  
October 2019

Table H1.17  
OFFROAD 2017 Output

OFFROAD2017 (v1.0.1) Emissions Inventory

Region Type: Air District

Region: South Coast AQMD

Calendar Year: 2024

Scenario: All Adopted Rules - Exhaust

Vehicle Classification: OFFROAD2017 Equipment Types

Units: Emissions: tons/day, Fuel Consumption: gallons/year, Activity: hours/year, HP-Hours: HP-hours/year

Region	CalYr	VehClass	MdYr	HP_Bin	Fuel	HC_tpd	ROG_tpd	TOG_tpd	CO_tpd	NOx_tpd	CO2_tpd	PM10_tpd	PM2_5_tpd	PM_tpd	SOx_tpd	NH3_tpd	Fuel_gpy	Total_Acti vity_hpy	Total_Pop ulation	Horsepower_ Hours_hhpy	
South Coast	2024	ConstMin - Rollers	Aggregated	25	Diesel	1.23124E-05	1.4898E-05	1.77299E-05	4.09387E-05	2.81896E-05	0.0021541	3.87551E-06	3.56547E-06	3.87551E-06	1.95467E-08	1.75818E-08	69.888498	129.65933	0.5548322	3241.483206	
South Coast	2024	ConstMin - Rollers	Aggregated	50	Diesel	0.011992489	0.014510912	0.017269184	0.098438392	0.0895041	13.770478	0.00450214	0.004141969	0.00450214	0.000126955	0.000112393	446767.98	579437.17	1636.2003	20710298.11	
South Coast	2024	ConstMin - Rollers	Aggregated	75	Diesel	0.000421644	0.00051019	0.000607168	0.001676968	0.004108178	0.1440202	0.000292348	0.00026896	0.000292348	0.000292348	0.000292348	1.17547E-06	4672.576	3397.0744	14.425638	
South Coast	2024	ConstMin - Rollers	Aggregated	100	Diesel	0.008695146	0.010521127	0.012521011	0.138388178	0.11129523	21.378227	0.005815078	0.005349871	0.005815078	0.000197391	0.000174486	693593.04	409397.38	1206.2053	35725253.04	
South Coast	2024	ConstMin - Rollers	Aggregated	175	Diesel	0.004923844	0.005957852	0.007090336	0.122822641	0.055812137	22.25171	0.002550065	0.00234606	0.002550065	0.00020558	0.000181615	721932.22	258909.58	705.74662	37231225.07	
South Coast	2024	ConstMin - Rollers	Aggregated	300	Diesel	0.001262148	0.001527199	0.001817493	0.010840604	0.01678491	3.7610907	0.000644822	0.000593237	0.000644822	0.000644822	3.47353E-05	3.06975E-05	122024.44	28939.962	91.547321	6285112.896
South Coast	2024	ConstMin - Rollers	Aggregated	600	Diesel	0.00458011	0.000554193	0.000659535	0.005551711	0.005568297	2.0783996	0.000192721	0.000177303	0.000192721	1.93021E-05	1.69636E-05	67431.385	9829.4737	31.625438	3457290.353	
South Coast	2024	OFF - ConstMin - Concrete/Industrial Saws	Aggregated	25	Diesel	2.77468E-05	3.3021E-05	3.99554E-05	0.000136373	0.000252486	0.0331201	9.43423E-06	8.6795E-06	9.43423E-06	4.20231E-07	2.74549E-07	1091.35	1460	2.47	26280	
South Coast	2024	OFF - ConstMin - Concrete/Industrial Saws	Aggregated	50	Diesel	0.000357428	0.000425369	0.000514696	0.003966817	0.003389996	0.5205313	0.000106107	9.76183E-05	0.000106107	6.72917E-06	4.37259E-06	17381.3	12574.25	21.69	414950.25	
South Coast	2024	ConstMin - Sweepers/Scrubbers	Aggregated	25	Diesel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
South Coast	2024	ConstMin - Sweepers/Scrubbers	Aggregated	50	Diesel	0.006662172	0.008061228	0.009593528	0.05406046	0.044072078	6.3492579	0.0025773	0.002371116	0.0025773	5.85022E-05	5.18218E-05	205994.68	220674.69	305.16729	7861115.123	
South Coast	2024	ConstMin - Sweepers/Scrubbers	Aggregated	75	Diesel	0.001452469	0.001757487	0.002091555	0.008058636	0.012884958	0.9662441	0.001160007	0.001067206	0.001160007	8.88983E-06	7.88635E-06	31348.724	18620.121	37.808336	1339585.937	
South Coast	2024	ConstMin - Sweepers/Scrubbers	Aggregated	100	Diesel	0.003624851	0.004386069	0.005219785	0.060272849	0.044447771	8.8467446	0.002327824	0.002141598	0.002327824	8.16838E-05	7.22059E-05	287022.89	154842.87	210.64644	12174024.85	
South Coast	2024	ConstMin - Sweepers/Scrubbers	Aggregated	175	Diesel	0.001017612	0.00123131	0.001465361	0.014956776	0.010422026	2.4477513	0.000495738	0.000456079	0.000495738	2.26001E-05	1.99782E-05	79414.597	21078.906	28.626312	3369090.779	
South Coast	2024	ConstMin - Sweepers/Scrubbers	Aggregated	300	Diesel	0.000432949	0.000523869	0.000623447	0.003152671	0.005546099	1.4699861	0.000178266	0.000164005	0.000178266	1.35778E-05	1.19978E-05	47692.079	9648.3328	12.962858	2023292.245	
South Coast	2024	ConstMin - Sweepers/Scrubbers	Aggregated	600	Diesel	2.29474E-05	2.77664E-05	3.30443E-05	0.000366227	0.000100205	0.1985199	3.56024E-06	3.27542E-06	3.56024E-06	1.83473E-06	1.62029E-06	6440.7599	828.00972	1.0802382	273243.2084	
South Coast	2024	ConstMin - Sweepers/Scrubbers	Aggregated	9999	Diesel	2.27293E-05	2.75024E-05	3.27301E-05	0.000455952	0.00019877	0.255068	8.77137E-06	8.06966E-06	8.77137E-06	2.35755E-06	2.08183E-06	8275.4006	414.00486	0.5401191	351076.1223	
South Coast	2024	ConstMin - Off-Highway Trucks	Aggregated	25	Diesel	0.000128867	0.000155929	0.000185568	0.000546659	0.000360918	0.0371849	0.04906E-05	3.72513E-05	0.04906E-05	3.39926E-07	3.03498E-07	1206.4216	2198.4654	1.6210636	54961.63618	
South Coast	2024	ConstMin - Off-Highway Trucks	Aggregated	50	Diesel	0.000791984	0.0009583	0.001140456	0.008510279	0.006412569	0.944039	0.000285524	0.000262682	0.000285524	8.70435E-06	7.70512E-06	30628.306	48486.833	29.179145	1406479.035	
South Coast	2024	ConstMin - Off-Highway Trucks	Aggregated	75	Diesel	0.000119463	0.00014455	0.000172027	0.002441878	0.001010142	0.3278079	1.57444E-05	1.44848E-05	1.57444E-05	3.02716E-06	2.67552E-06	10635.365	7435.1319	4.8631908	536120.823	
South Coast	2024	ConstMin - Off-Highway Trucks	Aggregated	100	Diesel	0.000367415	0.000444572	0.000529077	0.004878728	0.003805187	0.6478043	0.000249476	0.000229518	0.000249476	5.97825E-06	5.28729E-06	21017.297	12066.305	9.1860271	1061262.052	
South Coast	2024	ConstMin - Off-Highway Trucks	Aggregated	175	Diesel	0.008357059	0.010112041	0.012034165	0.1477215904	0.067944933	23.215059	0.003228043	0.002969799	0.003228043	0.000214384	0.000189478	753187.01	242050.29	168.59062	38211388.35	
South Coast	2024	ConstMin - Off-Highway Trucks	Aggregated	300	Diesel	0.015129065	0.018306168	0.021785853	0.114997517	0.123528153	47.238543	0.004959633	0.004562862	0.004959633	0.00043629	0.000385555	1532602.5	370015.88	284.76684	77867725.97	
South Coast	2024	ConstMin - Off-Highway Trucks	Aggregated	600	Diesel	0.058236141	0.07046573	0.083860042	0.459017571	0.474739913	202.75199	0.017019359	0.01565781	0.017019359	0.001872796	0.001654835	6578065.1	884662.62	634.37623	333092899.3	
South Coast	2024	ConstMin - Off-Highway Trucks	Aggregated	750	Diesel	0.027894111	0.033751875	0.04016752	0.215852461	0.269766929	68.782433	0.010317412	0.009492019	0.010317412	0.000635091	0.000561393	2231570.3	170543.3	136.7097	113065982.5	
South Coast	2024	ConstMin - Off-Highway Trucks	Aggregated	9999	Diesel	0.036383424	0.044023943	0.05239213	0.277142358	0.743397735	121.84398	0.013918208	0.012804751	0.013918208	0.001125417	0.000994474	3953093.8	157171.97	108.61126	199864257.2	
South Coast	2024	Portable Equipment - Non-Rental Generator	Aggregated	9999	Diesel	0.054834837	0.066350153	0.078962166	0.364390609	0.860047669	173.40668	0.022422232	0.020628453	0.022422232	0.001601586	0.001415322	5625988.8	287460.91	209.54657	355674068.2	
South Coast	2024	ConstMin - Other Construction Equipment	Aggregated	175	Diesel	0.003873866	0.004687378	0.005578367	0.05614685	0.045236761	9.3493624	0.0023471	0.002159332	0.0023471	8.63233E-05	7.63082E-05	303329.77	93141.719	220.48396	14171966.91	
South Coast	2024	ConstMin - Other Construction Equipment	Aggregated	300	Diesel	0.004011354	0.004853739	0.00577635	0.030878801	0.051786757	12.214429	0.002006795	0.001846252	0.002006795	0.000112808	9.96925E-05	396283.68	84034.967	201.66216	18414850.18	
South Coast	2024	ConstMin - Other Construction Equipment	Aggregated	600	Diesel	0.01221304	0.014777778	0.017586777	0.118138309	0.141507367	47.820916	0.005305875	0.004881405	0.005305875	0.000441762	0.000390308	1551496.9	188946.41	411.92856	72164310.34	
South Coast	2024	ConstMin - Other Construction Equipment	Aggregated	750	Diesel	0.002402639	0.002907193	0.0034598	0.018556932	0.030189068	8.9145077	0.001049856	0.000965868	0.001049856	0.000082347	0.000072759	289221.38	21884.983	44.634557	13442495.18	
South Coast	2024	ConstMin - Other Construction Equipment	Aggregated	9999	Diesel	0.000651657	0.000788505	0.000938386	0.005748044	0.016643808	3.0263327	0.000306163	0.00028167	0.000306163	2.79604E-05	2.47005E-05	98186.033	4977.8299	10.217549	4572752.526	



**Table H1.18**  
**Onroad Vehicles Emission Factors**

	Year	Vehicle Type	Units	PM10 brake wear	PM10 tire wear	PM2.5 brake wear	PM2.5 tire wear	PM10	PM2.5	DPM	NOX	SOX	CO	HC	VOC	CO2	CH4	N2O
Onsite Transit																		
	2024	Construction Trucks	g/mi					0.0138088	0.0132114	0.01380879	7.1482981	0.0222671	0.8332295		0.0954593	2356.9337	0.0044338	0.3704772
	2024	Worker Vehicles	g/mi					0.0094329	0.0086791	0.000157774	0.0773779	0.0062548	1.2481561		0.0622942	632.26873	0.0159141	0.0087178
	2025	Construction Trucks	g/mi					0.0125616	0.0120182	0.012561611	7.2105688	0.0220306	0.8408242		0.0902488	2331.8994	0.0041918	0.3665421
	2025	Worker Vehicles	g/mi					0.009093	0.0083658	0.000134133	0.0698737	0.0060653	1.1723031		0.0552776	613.11787	0.0142835	0.008216
	2026	Construction Trucks	g/mi					0.0114689	0.0109728	0.011468947	7.2869609	0.0218538	0.8488409		0.0855193	2313.1788	0.0039721	0.3635995
	2026	Worker Vehicles	g/mi					0.0087032	0.0080066	0.000111355	0.0637728	0.0058973	1.1099064		0.0494789	596.14033	0.0129276	0.0078087
Offsite Transit																		
	2024	Construction Trucks	g/mi	0.13034	0.012	0.05586	0.003	0.0100878	0.0096514	0.010087792	1.4591341	0.0086835	0.0838267		0.0115988	919.13301	0.0005387	0.1444749
	2024	Worker Vehicles	g/mi	0.03675	0.008	0.01575	0.002	0.0016106	0.0014829	5.21621E-05	0.0419133	0.0026543	0.6905881		0.0107865	268.3068	0.002754	0.0047139
	2025	Construction Trucks	g/mi	0.13034	0.012	0.05586	0.003	0.0099871	0.0095551	0.009987136	1.446922	0.0085844	0.0832898		0.0110903	908.64595	0.0005151	0.1428265
	2025	Worker Vehicles	g/mi	0.03675	0.008	0.01575	0.002	0.0015419	0.0014195	4.56363E-05	0.0376355	0.0025626	0.6460573		0.0094866	259.03839	0.0024539	0.004419
	2026	Construction Trucks	g/mi	0.13034	0.012	0.05586	0.003	0.00992	0.0094909	0.009920032	1.4390438	0.008509	0.0828843		0.0106317	900.66095	0.0004938	0.1415714
	2026	Worker Vehicles	g/mi	0.03675	0.008	0.01575	0.002	0.0014682	0.0013515	3.93525E-05	0.0342168	0.0024832	0.6098724		0.0084219	251.01696	0.0022067	0.0041838
Source: EMFAC2017																		
Notes: Refer to Table H1.19 for onsite and offsite transit vehicles speeds and worker vehicle fleet mix.																		

**Table H1.19**

**EMFAC2017 Output Onsite Transit**

Fleet Mix Exhaust

EMFAC2017 (v1.0.2) Emission Rates

Region Type: Air District

Region: SOUTH COAST AQMD

Calendar Year: 2024, 2025, 2026

Season: Annual

Vehicle Classification: EMFAC2011 Categories

Units: miles/day for VMT, g/mile for RUNEX, PMBW and PMTW

Region	CalYr	VehClass	MdlYr	Speed	Fuel	VMT	ROG_RUN EX	TOG_RUN EX	CO_RUNEX	NOx_RUNE X	SOx_RUNE X	CO2_RUNE X	CH4_RUNE X	PM10_RU NEX	PM2_5_RU NEX	N2O_RUN EX	DPM
SOUTH COAST	2024	LDA	Aggregated	5	GAS	720460.97	0.0470391	0.0686394	1.05892149	0.0546265	0.0058733	593.51674	0.01285	0.0090214	0.0082949	0.0068814	0
SOUTH COAST	2024	LDA	Aggregated	5	DSL	7337.2646	0.1570907	0.1788373	3.091287246	0.1141596	0.0045594	482.29097	0.007297	0.018095	0.0173122	0.0758094	0.018095
SOUTH COAST	2024	LDT1	Aggregated	5	GAS	81952.175	0.1245176	0.1816814	2.038238071	0.1624728	0.0068432	691.52653	0.029136	0.0120593	0.0110882	0.0127061	0
SOUTH COAST	2024	LDT1	Aggregated	5	DSL	23.045112	0.7094762	0.8076915	3.723673086	0.7190657	0.0097987	1036.5024	0.032954	0.4710287	0.4506522	0.1629237	0.4710287
SOUTH COAST	2024	LDT2	Aggregated	5	GAS	247273.33	0.0816633	0.1191576	1.473764265	0.1137081	0.0072224	729.84822	0.020747	0.0094428	0.0086823	0.009991	0
SOUTH COAST	2024	LDT2	Aggregated	5	DSL	2002.5419	0.257779	0.2934642	2.356618059	0.1521124	0.0060967	644.90278	0.011973	0.0117186	0.0112117	0.1013697	0.0117186
SOUTH COAST	2024	T6 instate c	Aggregated	5	DSL	517.83259	0.0954593	0.1086731	0.833229494	7.1482981	0.0222671	2356.9337	0.004434	0.0138088	0.0132114	0.3704772	0.0138088
SOUTH COAST	2025	LDA	Aggregated	5	GAS	719865.83	0.041315	0.0602867	0.998863317	0.049705	0.005702	576.20675	0.011485	0.0087325	0.0080292	0.0065106	0
SOUTH COAST	2025	LDA	Aggregated	5	DSL	7572.0712	0.1468369	0.167164	3.043218836	0.102991	0.0044332	468.94706	0.00682	0.0150433	0.0143925	0.0737119	0.0150433
SOUTH COAST	2025	LDT1	Aggregated	5	GAS	83153.597	0.1087688	0.1587152	1.84570184	0.1435799	0.0066594	672.95289	0.025701	0.0113458	0.0104321	0.0116068	0
SOUTH COAST	2025	LDT1	Aggregated	5	DSL	21.61003	0.6745385	0.7679173	3.643948927	0.6755583	0.009606	1016.1174	0.031331	0.4350876	0.4162659	0.1597195	0.4350876
SOUTH COAST	2025	LDT2	Aggregated	5	GAS	248475.98	0.0732723	0.1069188	1.381806608	0.1018897	0.0069694	704.27494	0.018816	0.0091508	0.0084138	0.0092515	0
SOUTH COAST	2025	LDT2	Aggregated	5	DSL	2096.776	0.2581362	0.2938709	2.403328973	0.1513147	0.0059232	626.55562	0.01199	0.0108116	0.0103439	0.0984858	0.0108116
SOUTH COAST	2025	T6 instate c	Aggregated	5	DSL	513.877	0.0902488	0.1027414	0.840824192	7.2105688	0.0220306	2331.8994	0.004192	0.0125616	0.0120182	0.3665421	0.0125616
SOUTH COAST	2026	LDA	Aggregated	5	GAS	718112.77	0.0366883	0.0535355	0.950427358	0.0458416	0.0055499	560.82858	0.010369	0.0083858	0.0077104	0.0062177	0
SOUTH COAST	2026	LDA	Aggregated	5	DSL	7761.4934	0.137457	0.1564857	3.000891738	0.0931671	0.0043236	457.35359	0.006385	0.0120555	0.011534	0.0718896	0.0120555
SOUTH COAST	2026	LDT1	Aggregated	5	GAS	84093.411	0.0954301	0.1392514	1.681728688	0.1276488	0.0064961	656.44567	0.022784	0.0106604	0.0098018	0.0106829	0
SOUTH COAST	2026	LDT1	Aggregated	5	DSL	19.63734	0.6135771	0.6985168	3.546443567	0.6100648	0.0093765	991.84897	0.028499	0.3720013	0.3559087	0.1559048	0.3720013
SOUTH COAST	2026	LDT2	Aggregated	5	GAS	249304.65	0.0662088	0.0966117	1.30564874	0.0921561	0.0067457	681.67186	0.017184	0.0088093	0.0080998	0.0086447	0
SOUTH COAST	2026	LDT2	Aggregated	5	DSL	2177.4535	0.2589294	0.2947739	2.447840667	0.1510853	0.005777	611.08714	0.012027	0.0104381	0.0099865	0.0960544	0.0104381
SOUTH COAST	2026	T6 instate c	Aggregated	5	DSL	512.39198	0.0855193	0.0973572	0.848840877	7.2869609	0.0218538	2313.1788	0.003972	0.0114689	0.0109728	0.3635995	0.0114689

Table H1.20

EMFAC2017 Output Offsite Transit

Fleet Mix Exhaust

EMFAC2017 (v1.0.2) Emission Rates

Region Type: Air District

Region: SOUTH COAST AQMD

Calendar Year: 2024, 2025, 2026

Season: Annual

Vehicle Classification: EMFAC2011 Categories

Units: miles/day for VMT, trips/day for Trips, g/mile for RUNEX, PMBW and PMTW, g/trip for STREX, HTSK and RUNLS, g/vehicle/day for IDLEX, RESTL and DIURN

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	Population	VMT	Trips	ROG_RUNE X	ROG_IDLEX	ROG_STRE X	ROG_HOTS OAK	ROG_RUNL OSS	ROG_REST LOSS	ROG_DIUR N	TOG_RUNE X	TOG_IDLEX	TOG_STRE X	TOG_HOTS OAK	TOG_RUNL OSS	TOG_RESTL OSS	TOG_DIUR N
SOUTH COA	2024	LDA	Aggregated	Aggregated	GAS	6543321.5	247047080	30912773	0.0082219	0	0.1888817	0.0900536	0.1997274	0.2074037	0.2191751	0.0119974	0	0.2068017	0.0900536	0.1997274	0.2074037	0.2191751
SOUTH COA	2024	LDA	Aggregated	Aggregated	DSL	63999.088	2508733.2	304606.89	0.0145786	0	0	0	0	0	0.0165967	0	0	0	0	0	0	0
SOUTH COA	2024	LDA	Aggregated	Aggregated	ELEC	172307.13	7265020	857849.63	0	0	0	0.004888	0	0.0079037	0.023477	0	0	0	0.004888	0	0.0079037	0.023477
SOUTH COA	2024	LDT1	Aggregated	Aggregated	GAS	758038.32	27517267	3506784.4	0.0241292	0	0.2935381	0.1753748	0.6117487	0.4403211	0.5238993	0.0352054	0	0.3213871	0.1753748	0.6117487	0.4403211	0.5238993
SOUTH COA	2024	LDT1	Aggregated	Aggregated	DSL	328.77854	7657.7325	1149.5715	0.1708218	0	0	0	0	0	0.1944693	0	0	0	0	0	0	0
SOUTH COA	2024	LDT1	Aggregated	Aggregated	ELEC	8873.8766	385871.85	44565.445	0	0	0	0.004888	0	0.0078613	0.0233652	0	0	0	0.004888	0	0.0078613	0.0233652
SOUTH COA	2024	LDT2	Aggregated	Aggregated	GAS	2256847	83361536	10593017	0.0149087	0	0.2669594	0.1136523	0.3879008	0.3356143	0.332401	0.0217534	0	0.2922868	0.1136523	0.3879008	0.3356143	0.332401
SOUTH COA	2024	LDT2	Aggregated	Aggregated	DSL	16402.997	669969.53	80362.135	0.020122	0	0	0	0	0	0.0229076	0	0	0	0	0	0	0
SOUTH COA	2024	LDT2	Aggregated	Aggregated	ELEC	34685.637	1081895.4	174560.97	0	0	0	0.004888	0	0.0078852	0.0234323	0	0	0	0.004888	0	0.0078852	0.0234323
SOUTH COA	2024	T6 instate cd	Aggregated	Aggregated	DSL	4467.8956	291328.11	20199.182	0.0115988	0.0497707	0	0	0	0	0.0132043	0.0566602	0	0	0	0	0	0
SOUTH COA	2025	LDA	Aggregated	Aggregated	GAS	6623932.9	247134863	31282323	0.0072078	0	0.1730799	0.0857858	0.1949939	0.1971446	0.2069079	0.0105176	0	0.1895006	0.0857858	0.1949939	0.1971446	0.2069079
SOUTH COA	2025	LDA	Aggregated	Aggregated	DSL	66922.32	2593390.4	318755.57	0.0131775	0	0	0	0	0	0	0.0150017	0	0	0	0	0	0
SOUTH COA	2025	LDA	Aggregated	Aggregated	ELEC	200007.11	8588255.8	994212.63	0	0	0	0.004888	0	0.0079137	0.0235063	0	0	0	0.004888	0	0.0079137	0.0235063
SOUTH COA	2025	LDT1	Aggregated	Aggregated	GAS	778181.88	27926963	3602142.6	0.0209762	0	0.2647065	0.1625491	0.5727636	0.4114373	0.4829739	0.0306084	0	0.2898203	0.1625491	0.5727636	0.4114373	0.4829739
SOUTH COA	2025	LDT1	Aggregated	Aggregated	DSL	306.69855	7182.2408	1077.0936	0.1589987	0	0	0	0	0	0	0.1810095	0	0	0	0	0	0
SOUTH COA	2025	LDT1	Aggregated	Aggregated	ELEC	10974.675	485559.29	55032.388	0	0	0	0.004888	0	0.0078683	0.0233853	0	0	0	0.004888	0	0.0078683	0.0233853
SOUTH COA	2025	LDT2	Aggregated	Aggregated	GAS	2295149.4	83832765	10772144	0.0133343	0	0.2461323	0.1083691	0.376717	0.3261566	0.3205227	0.0194574	0	0.2694839	0.1083691	0.376717	0.3261566	0.3205227
SOUTH COA	2025	LDT2	Aggregated	Aggregated	DSL	17587.778	702822.89	85874.295	0.0198868	0	0	0	0	0	0	0.0226398	0	0	0	0	0	0
SOUTH COA	2025	LDT2	Aggregated	Aggregated	ELEC	41917.383	1280277.3	210324.6	0	0	0	0.004888	0	0.0078902	0.0234468	0	0	0	0.004888	0	0.0078902	0.0234468
SOUTH COA	2025	T6 instate cd	Aggregated	Aggregated	DSL	4547.4396	289102.73	20558.798	0.0110903	0.0496598	0	0	0	0	0.0126254	0.0565339	0	0	0	0	0	0
SOUTH COA	2026	LDA	Aggregated	Aggregated	GAS	6704944.2	246806990	31652207	0.006388	0	0.1593916	0.0819021	0.1906985	0.187688	0.1957856	0.0093213	0	0.1745138	0.0819021	0.1906985	0.187688	0.1957856
SOUTH COA	2026	LDA	Aggregated	Aggregated	DSL	69486.663	2662198.2	331542.63	0.0118584	0	0	0	0	0	0	0.0135	0	0	0	0	0	0
SOUTH COA	2026	LDA	Aggregated	Aggregated	ELEC	226692.73	9539586.4	1124278.2	0	0	0	0.004888	0	0.0079235	0.0235345	0	0	0	0.004888	0	0.0079235	0.0235345
SOUTH COA	2026	LDT1	Aggregated	Aggregated	GAS	797971.55	28250579	3694973.3	0.0183022	0	0.2394362	0.1509449	0.5377018	0.3845134	0.4455651	0.0267065	0	0.2621525	0.1509449	0.5377018	0.3845134	0.4455651
SOUTH COA	2026	LDT1	Aggregated	Aggregated	DSL	270.69602	6522.8307	971.57155	0.1391271	0	0	0	0	0	0	0.1583869	0	0	0	0	0	0
SOUTH COA	2026	LDT1	Aggregated	Aggregated	ELEC	13055.319	564811.17	65291.34	0	0	0	0.004888	0	0.0078739	0.0234014	0	0	0	0.004888	0	0.0078739	0.0234014
SOUTH COA	2026	LDT2	Aggregated	Aggregated	GAS	2335277.2	84175951	10957538	0.012009	0	0.2278263	0.1034755	0.3655973	0.3166753	0.3090774	0.0175236	0	0.2494411	0.1034755	0.3655973	0.3166753	0.3090774
SOUTH COA	2026	LDT2	Aggregated	Aggregated	DSL	18735.824	731082.45	91136.642	0.0198152	0	0	0	0	0	0	0.0225583	0	0	0	0	0	0
SOUTH COA	2026	LDT2	Aggregated	Aggregated	ELEC	48997.68	1464375.6	244977.96	0	0	0	0.004888	0	0.0078949	0.0234608	0	0	0	0.004888	0	0.0078949	0.0234608
SOUTH COA	2026	T6 instate cd	Aggregated	Aggregated	DSL	4614.6301	288267.27	20862.563	0.0106317	0.0495653	0	0	0	0	0	0.0121033	0.0564263	0	0	0	0	0

Port of Long Beach Deep Draft Navigation Study  
Los Angeles County, California

Appendix H1 - Tables  
October 2019

Table H1.20

EMFAC2017 Output Offsite Transit

Fleet Mix Exhaust

EMFAC2017 (v1.0.2) Emission Rates

Region Type: Air District

Region: SOUTH COAST AQMD

Calendar Year: 2024, 2025, 2026

Season: Annual

Vehicle Classification: EMFAC2011 Categories

Units: miles/day for VMT, trips/day for Trips, g/mile for RUNEX, PMBW and NEX

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	CO_RUNEX	CO_IDLEX	CO_STREX	NOx_RUNEX X	NOx_IDLEX	NOx_STREX X	CO2_RUNEX X	CO2_IDLEX	CO2_STREX	CH4_RUNEX X	CH4_IDLEX	CH4_STREX	PM10_RUN EX	PM10_IDLE X	PM10_STR EX	PM10_PM TW	PM10_PM BW	PM2_5_NEX
SOUTH COA	2024	LDA	Aggregated	Aggregated	GAS	0.6170464	0	2.0207049	0.0309611	0	0.1642574	258.07942	0	51.791051	0.0022311	0	0.0436026	0.0015408	0	0.0017461	0.008	0.03675	0.0014167
SOUTH COA	2024	LDA	Aggregated	Aggregated	DSL	0.2478206	0	0	0.0491271	0	0	199.32668	0	0	0.0006771	0	0	0.0059574	0	0	0.008	0.03675	0.0056997
SOUTH COA	2024	LDA	Aggregated	Aggregated	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.008	0.03675	0
SOUTH COA	2024	LDT1	Aggregated	Aggregated	GAS	1.1388644	0	2.1397201	0.0881606	0	0.2238707	301.4961	0	60.692708	0.0055697	0	0.0603888	0.002162	0	0.0023056	0.008	0.03675	0.0019879
SOUTH COA	2024	LDT1	Aggregated	Aggregated	DSL	1.0129839	0	0	0.9123372	0	0	439.67457	0	0	0.0079343	0	0	0.1275098	0	0	0.008	0.03675	0.1219938
SOUTH COA	2024	LDT1	Aggregated	Aggregated	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.008	0.03675	0
SOUTH COA	2024	LDT2	Aggregated	Aggregated	GAS	0.8502923	0	2.5178682	0.0632094	0	0.2371036	317.80192	0	65.105601	0.0037395	0	0.0589011	0.0016344	0	0.0017692	0.008	0.03675	0.0015027
SOUTH COA	2024	LDT2	Aggregated	Aggregated	DSL	0.1813322	0	0	0.0405709	0	0	271.56232	0	0	0.0009346	0	0	0.0050299	0	0	0.008	0.03675	0.0048123
SOUTH COA	2024	LDT2	Aggregated	Aggregated	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.008	0.03675	0
SOUTH COA	2024	T6 instate cd	Aggregated	Aggregated	DSL	0.0838267	2.065668	0	1.4591341	2.9858499	2.608719	919.13301	611.50258	0	0.0005387	0.0023117	0	0.0100878	0.0010908	0	0.012	0.13034	0.0096514
SOUTH COA	2025	LDA	Aggregated	Aggregated	GAS	0.5828174	0	1.9420882	0.0281874	0	0.1548852	250.52752	0	50.2837	0.0019906	0	0.0404113	0.0014892	0	0.0016933	0.008	0.03675	0.0013692
SOUTH COA	2025	LDA	Aggregated	Aggregated	DSL	0.23993	0	0	0.0413241	0	0	193.81353	0	0	0.0006121	0	0	0.0050812	0	0	0.008	0.03675	0.0048614
SOUTH COA	2025	LDA	Aggregated	Aggregated	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.008	0.03675	0
SOUTH COA	2025	LDT1	Aggregated	Aggregated	GAS	1.0361128	0	2.0545514	0.0777812	0	0.2079147	293.35819	0	59.006598	0.0048877	0	0.0552078	0.0020231	0	0.0021721	0.008	0.03675	0.0018602
SOUTH COA	2025	LDT1	Aggregated	Aggregated	DSL	0.9514419	0	0	0.8441278	0	0	430.90778	0	0	0.0073852	0	0	0.1178524	0	0	0.008	0.03675	0.1127542
SOUTH COA	2025	LDT1	Aggregated	Aggregated	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.008	0.03675	0
SOUTH COA	2025	LDT2	Aggregated	Aggregated	GAS	0.7987576	0	2.4329096	0.0565713	0	0.2188839	306.65172	0	62.854964	0.0033811	0	0.0548503	0.0015807	0	0.0017244	0.008	0.03675	0.0014534
SOUTH COA	2025	LDT2	Aggregated	Aggregated	DSL	0.1833707	0	0	0.0385982	0	0	263.81093	0	0	0.0009237	0	0	0.0048189	0	0	0.008	0.03675	0.0046105
SOUTH COA	2025	LDT2	Aggregated	Aggregated	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.008	0.03675	0
SOUTH COA	2025	T6 instate cd	Aggregated	Aggregated	DSL	0.0832898	2.0686502	0	1.446922	2.9691191	2.614563	908.64595	606.79401	0	0.0005151	0.0023066	0	0.0099871	0.0010229	0	0.012	0.13034	0.0095551
SOUTH COA	2026	LDA	Aggregated	Aggregated	GAS	0.5551503	0	1.8711474	0.026021	0	0.1470536	243.80237	0	48.911179	0.0017939	0	0.0376081	0.0014287	0	0.001636	0.008	0.03675	0.0013136
SOUTH COA	2026	LDA	Aggregated	Aggregated	DSL	0.2328975	0	0	0.0343627	0	0	189.00964	0	0	0.0005508	0	0	0.0042255	0	0	0.008	0.03675	0.0040427
SOUTH COA	2026	LDA	Aggregated	Aggregated	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.008	0.03675	0
SOUTH COA	2026	LDT1	Aggregated	Aggregated	GAS	0.9485731	0	1.9744754	0.0691259	0	0.1943035	286.11364	0	57.468364	0.004308	0	0.0506358	0.001893	0	0.0020461	0.008	0.03675	0.0017405
SOUTH COA	2026	LDT1	Aggregated	Aggregated	DSL	0.8707018	0	0	0.7424044	0	0	420.343	0	0	0.0064622	0	0	0.1007983	0	0	0.008	0.03675	0.0964378
SOUTH COA	2026	LDT1	Aggregated	Aggregated	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.008	0.03675	0
SOUTH COA	2026	LDT2	Aggregated	Aggregated	GAS	0.7560499	0	2.3573407	0.0511453	0	0.2035334	296.78376	0	60.814875	0.0030782	0	0.0512609	0.0015198	0	0.001672	0.008	0.03675	0.0013974
SOUTH COA	2026	LDT2	Aggregated	Aggregated	DSL	0.1858674	0	0	0.0375382	0	0	257.27608	0	0	0.0009204	0	0	0.0047493	0	0	0.008	0.03675	0.0045438
SOUTH COA	2026	LDT2	Aggregated	Aggregated	ELEC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.008	0.03675	0
SOUTH COA	2026	T6 instate cd	Aggregated	Aggregated	DSL	0.0828843	2.0712518	0	1.4390438	2.9545035	2.6200331	900.66095	602.4448	0	0.0004938	0.0023022	0	0.00992	0.0009645	0	0.012	0.13034	0.0094909

Port of Long Beach Deep Draft Navigation Study  
Los Angeles County, California

Appendix H1 - Tables  
October 2019

Table H1.20

EMFAC2017 Output Offsite Transit

Fleet Mix Exhaust

EMFAC2017 (v1.0.2) Emission Rates

Region Type: Air District

Region: SOUTH COAST AQMD

Calendar Year: 2024, 2025, 2026

Season: Annual

Vehicle Classification: EMFAC2011 Categories

Units: miles/day for VMT, trips/day for Trips, g/mile for RUNEX, PMBW an

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	PM2_5_IDL EX	PM2_5_ST REX	PM2_5_P MTW	PM2_5_P MBW	SOx_RUNE X	SOx_IDLEX	SOx_STREX	N2O_RUNE X	N2O_IDLEX	N2O_STREX
SOUTH COA	2024	LDA	Aggregated	Aggregated	GAS	0	0.0016055	0.002	0.01575	0.0025539	0	0.0005125	0.0039333	0	0.0237369
SOUTH COA	2024	LDA	Aggregated	Aggregated	DSL	0	0	0.002	0.01575	0.0018844	0	0	0.0313314	0	0
SOUTH COA	2024	LDA	Aggregated	Aggregated	ELEC	0	0	0.002	0.01575	0	0	0	0	0	0
SOUTH COA	2024	LDT1	Aggregated	Aggregated	GAS	0	0.0021199	0.002	0.01575	0.0029835	0	0.0006006	0.0070454	0	0.0264144
SOUTH COA	2024	LDT1	Aggregated	Aggregated	DSL	0	0	0.002	0.01575	0.0041565	0	0	0.0691107	0	0
SOUTH COA	2024	LDT1	Aggregated	Aggregated	ELEC	0	0	0.002	0.01575	0	0	0	0	0	0
SOUTH COA	2024	LDT2	Aggregated	Aggregated	GAS	0	0.0016267	0.002	0.01575	0.0031449	0	0.0006443	0.0056392	0	0.0288227
SOUTH COA	2024	LDT2	Aggregated	Aggregated	DSL	0	0	0.002	0.01575	0.0025672	0	0	0.0426858	0	0
SOUTH COA	2024	LDT2	Aggregated	Aggregated	ELEC	0	0	0.002	0.01575	0	0	0	0	0	0
SOUTH COA	2024	T6 instate cd	Aggregated	Aggregated	DSL	0.0010436	0	0.003	0.05586	0.0086835	0.0057772	0	0.1444749	0.0961197	0
SOUTH COA	2025	LDA	Aggregated	Aggregated	GAS	0	0.0015569	0.002	0.01575	0.0024792	0	0.0004976	0.0037231	0	0.0227572
SOUTH COA	2025	LDA	Aggregated	Aggregated	DSL	0	0	0.002	0.01575	0.0018322	0	0	0.0304648	0	0
SOUTH COA	2025	LDA	Aggregated	Aggregated	ELEC	0	0	0.002	0.01575	0	0	0	0	0	0
SOUTH COA	2025	LDT1	Aggregated	Aggregated	GAS	0	0.0019972	0.002	0.01575	0.002903	0	0.0005839	0.0064378	0	0.0252484
SOUTH COA	2025	LDT1	Aggregated	Aggregated	DSL	0	0	0.002	0.01575	0.0040736	0	0	0.0677327	0	0
SOUTH COA	2025	LDT1	Aggregated	Aggregated	ELEC	0	0	0.002	0.01575	0	0	0	0	0	0
SOUTH COA	2025	LDT2	Aggregated	Aggregated	GAS	0	0.0015855	0.002	0.01575	0.0030346	0	0.000622	0.0052221	0	0.0273272
SOUTH COA	2025	LDT2	Aggregated	Aggregated	DSL	0	0	0.002	0.01575	0.002494	0	0	0.0414674	0	0
SOUTH COA	2025	LDT2	Aggregated	Aggregated	ELEC	0	0	0.002	0.01575	0	0	0	0	0	0
SOUTH COA	2025	T6 instate cd	Aggregated	Aggregated	DSL	0.0009786	0	0.003	0.05586	0.0085844	0.0057327	0	0.1428265	0.0953796	0
SOUTH COA	2026	LDA	Aggregated	Aggregated	GAS	0	0.0015042	0.002	0.01575	0.0024126	0	0.000484	0.0035575	0	0.0219275
SOUTH COA	2026	LDA	Aggregated	Aggregated	DSL	0	0	0.002	0.01575	0.0017868	0	0	0.0297097	0	0
SOUTH COA	2026	LDA	Aggregated	Aggregated	ELEC	0	0	0.002	0.01575	0	0	0	0	0	0
SOUTH COA	2026	LDT1	Aggregated	Aggregated	GAS	0	0.0018813	0.002	0.01575	0.0028313	0	0.0005687	0.0059312	0	0.0242542
SOUTH COA	2026	LDT1	Aggregated	Aggregated	DSL	0	0	0.002	0.01575	0.0039738	0	0	0.0660721	0	0
SOUTH COA	2026	LDT1	Aggregated	Aggregated	ELEC	0	0	0.002	0.01575	0	0	0	0	0	0
SOUTH COA	2026	LDT2	Aggregated	Aggregated	GAS	0	0.0015373	0.002	0.01575	0.0029369	0	0.0006018	0.0048815	0	0.0260461
SOUTH COA	2026	LDT2	Aggregated	Aggregated	DSL	0	0	0.002	0.01575	0.0024322	0	0	0.0404402	0	0
SOUTH COA	2026	LDT2	Aggregated	Aggregated	ELEC	0	0	0.002	0.01575	0	0	0	0	0	0
SOUTH COA	2026	T6 instate cd	Aggregated	Aggregated	DSL	0.0009228	0	0.003	0.05586	0.008509	0.0056916	0	0.1415714	0.0946959	0

Table H1.21

Vehicle Idling Exhaust Onsite

Fleet Mix

EMFAC2011 Vehicle Category used in calculations	CY	EMFAC2007 Vehicle Category	Fuel_Type	air_basin	season	HC (g/hr- veh)	CO (g/hr- veh)	NOX (g/hr- veh)	PM10 (g/hr- veh)	PM2.5 (g/hr-veh)	CO2 (g/hr- veh)	CO2 (with Pavley+LCF S) (g/hr- veh)	TOG (g/hr- veh)	ROG (g/hr- veh)	Sox (g/hr- veh)
T6	2024	HHDT	D	SC	a	5.7674343	41.174525	39.594888	0.1098485	0.1010606	7034.4313	6330.9882	8.31491	7.3038788	0.0671118
MDV	2024	MHDT	D	SC	a	1.6687434	24.958118	40.456694	0.0924351	0.0850403	7631.5418	6868.3876	2.4058274	2.1132967	0.0728085
T6	2025	HHDT	D	SC	a	5.7741329	41.226754	39.487118	0.1095804	0.100814	7034.5905	6331.1314	8.3245674	7.3123619	0.0671133
MDV	2025	MHDT	D	SC	a	1.6722817	25.016612	40.203586	0.0921005	0.0847325	7632.6786	6869.4107	2.4109285	2.1177775	0.0728193
T6	2026	HHDT	D	SC	a	5.7806792	41.277289	39.381355	0.1093443	0.1005968	7034.7179	6331.2461	8.3340052	7.3206522	0.0671145
MDV	2026	MHDT	D	SC	a	1.6757603	25.073503	39.955666	0.0917989	0.084455	7633.684	6870.3156	2.4159437	2.1221829	0.0728289
Source: EMFAC2011 Idling Emission Rates - Idling rates for combined model year: HD_Idle_ER worksheet															

**Table H1.22**

**Construction Equipment Load Factors**

Equipment	CalEEMod HP	CalEEMod LF
Aerial Lifts	63	0.31
Air Compressors	78	0.48
Bore/Drill Rigs	221	0.5
Cement and Mortar Mixers	9	0.56
Concrete/Industrial Saws	81	0.73
Cranes	231	0.29
Crawler Tractors	212	0.43
Crushing/Proc. Equipment	85	0.78
Dumpers/Tenders	16	0.38
Excavators	158	0.38
Forklifts	89	0.2
Generator Sets	84	0.74
Graders	187	0.41
Off-Highway Tractors	124	0.44
Off-Highway Trucks	402	0.38
Other Construction Equipment	172	0.42
Other General Industrial Equipment	88	0.34
Other Material Handling Equipment	168	0.4
Pavers	130	0.42
Paving Equipment	132	0.36
Plate Compactors	8	0.43
Pressure Washers	13	0.3
Pumps	84	0.74
Rollers	80	0.38
Rough Terrain Forklifts	100	0.4
Rubber Tired Dozers	247	0.4
Rubber Tired Loaders	203	0.36
Scrapers	367	0.48
Signal Boards	6	0.82
Skid Steer Loaders	65	0.37
Surfacing Equipment	263	0.3
Sweepers/Scrubbers	64	0.46
Tractors/Loaders/Backhoes	97	0.37
Trenchers	78	0.5
Welders	46	0.45

**Source:**

CalEEMod, Appendix D.

**Table H1.23**

**GHG Emission Factors**

	CO2 (lb CO2/MW hr)	CH4 (lb CO2/GW hr)	N2O (lb CO2/GW hr)
Electricity generation	527.9	33	4
<b>Source:</b> 2019 Climate Registry Default Emission Factors, Table 3.1, Default Factors for Calculating Emissions from Grid Electricity by eGrid Subregion. CAMX subregion.			

**Table H1.24**

**Global Warming Potentials (GWP)**

CO2	CH4	N2O
1	25	298
<b>Source:</b> IPCC 2007. Intergovernmental Panel on Climate Change. 4th Assessment Report, Climate Change 2007: The Physical Science Basis, Chapter 2, Table 2.14. June, 4th Assessment Report was chosen to maintain consistency with the U.S. EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2015, April 2017.		

**Table H1.25**

**SOx Emission Factor - Offroad Construction Equipment**

Offroad Construction Equipment less	0.005552064 g/hp-hr
Offroad Construction Equipment grea	0.004994136 g/hp-hr
$SO_x \text{ (gms/hp-hr)} = (S \text{ content in } X/1,000,000) \times (MW \text{ } SO_2 / MW \text{ } S) \times BSF =$	
Where:	
X = S content in parts per million (ppm)	15 ppm
S MW = Molecular Weight	32
SO2 MW = Molecular Weight	64
BSFC for offroad construction equipment less than 100 hp (per CARB OFFROAD 2017 Diesel Emission Factors excel spreadsheet)	0.408 (lb/hp-hr)
BSFC for offroad construction equipment greater than 100 hp (per CARB OFFROAD 2017 Diesel Emission Factors excel spreadsheet)	0.367 (lb/hp-hr)
BSFC for offroad construction equipment less than 100 hp	185.0688 (g/hp-hr)
BSFC for offroad construction equipment greater than 100 hp	166.4712 (g/hp-hr)



Table H1.26  
Alternative 2 Emissions by Task

						Unmitigated Emissions										
						Peak Day										
						PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
1	Electrical Substation Construction at Pier J (mitigation only)															
1	Off-Road Equipment															
1	Caterpillar 320 excavator	Offroad Construction Equipment		onsite	20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Small asphalt roller	Offroad Construction Equipment		onsite	26	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Water truck	Offroad Construction Equipment		onsite	20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Forklift	Offroad Construction Equipment		onsite	22	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Mobile crane (35 ton)	Offroad Construction Equipment		onsite	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	On-Road Vehicles															
1	Haul trucks	Onroad Construction Vehicles		onsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Supply trucks	Onroad Construction Vehicles		onsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Haul trucks	Onroad Construction Vehicles		offsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Supply trucks	Onroad Construction Vehicles		offsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Workers	Onroad Construction Vehicles		offsite	60	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Fugitive Dust															
1	Soil handling	Fugitive Emissions		onsite	20	n/a	n/a									
1	Asphalting	Fugitive Emissions		onsite												
2	Pier J Breakwater Construction															
2	Marine Activities															
2	Pier J Breakwater Tugboat propulsion engine	Marine Equipment		onsite	54	5.81	5.17	5.81	108.18	0.06	58.10	6.00	3.44	0.00	0.00	3.4864
2	Pier J Breakwater Tugboat auxiliary engine	Marine Equipment		onsite	54	1.06	0.94	1.06	18.86	0.01	13.23	1.05	0.78	0.00	0.00	0.7941
2	Pier J Breakwater Crew boat propulsion engine	Marine Equipment		onsite	54	0.41	0.36	0.41	8.02	0.00	4.06	0.44	0.24	0.00	0.00	0.2437
2	Pier J Breakwater Crew boat auxiliary engine	Marine Equipment		onsite	54	0.03	0.03	0.03	0.60	0.00	0.42	0.03	0.02	0.00	0.00	0.0253
2	Pier J Breakwater Survey boat propulsion engine	Marine Equipment		onsite	54	0.36	0.32	0.36	7.16	0.00	3.62	0.40	0.21	0.00	0.00	0.2174
2	Off-Road Equipment															
2	Piling crane	Offroad Construction Equipment		onsite	54	0.21	0.19	0.21	5.00	0.01	2.67	0.47	0.38	0.00	0.00	0.3800
2	Long arm excavator	Offroad Construction Equipment		onsite	54	0.08	0.07	0.08	2.19	0.01	2.78	0.32	0.63	0.00	0.00	0.6340
2	On-Road Vehicles															
2	Delivery Trucks	Onroad Construction Vehicles		onsite	5	0.15	0.04	0.00	0.08	0.00	0.01	0.00	0.01	0.00	0.00	0.0123
2	Delivery Trucks	Onroad Construction Vehicles		offsite	5	0.49	0.19	0.02	3.22	0.02	0.18	0.03	0.92	0.00	0.00	0.9622
2	Workers	Onroad Construction Vehicles		offsite	54	0.16	0.05	0.00	0.06	0.00	0.96	0.01	0.17	0.00	0.00	0.1700

Table H1.26  
Alternative 2 Emissions by Task

			Unmitigated Emissions											
			Total											
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e	
Task ID	Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	
1 Electrical Substation Construction at Pier J (mitigation only)														
1	Off-Road Equipment													
1	Caterpillar 320 excavator	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
1	Small asphalt roller	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
1	Water truck	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
1	Forklift	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
1	Mobile crane (35 ton)	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
1	On-Road Vehicles													
1	Haul trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
1	Supply trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
1	Haul trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
1	Supply trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
1	Workers	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
1	Fugitive Dust													
1	Soil handling	Fugitive Emissions	n/a	n/a										
1	Asphalting	Fugitive Emissions												
2 Pier J Breakwater Construction														
2	Marine Activities													
2	Pier J Breakwater Tugboat propulsion engine	Marine Equipment	313.73	279.22	313.73	5841.59	3.46	3137.27	323.75	185.57	0.00	0.01	188.27	
2	Pier J Breakwater Tugboat auxiliary engine	Marine Equipment	57.17	50.88	57.17	1018.30	0.79	714.59	56.44	42.27	0.00	0.00	42.88	
2	Pier J Breakwater Crew boat propulsion engine	Marine Equipment	21.93	19.52	21.93	433.28	0.24	219.27	24.01	12.97	0.00	0.00	13.16	
2	Pier J Breakwater Crew boat auxiliary engine	Marine Equipment	1.82	1.62	1.82	32.38	0.03	22.73	1.79	1.34	0.00	0.00	1.36	
2	Pier J Breakwater Survey boat propulsion engine	Marine Equipment	19.57	17.41	19.57	386.62	0.22	195.66	21.43	11.57	0.00	0.00	11.74	
2	Off-Road Equipment													
2	Piling crane	Offroad Construction Equipment	11.27	10.36	11.27	270.12	0.42	144.43	25.20	20.52	0.00	0.00	20.52	
2	Long arm excavator	Offroad Construction Equipment	4.06	3.74	4.06	118.13	0.70	149.87	17.33	34.23	0.00	0.00	34.23	
2	On-Road Vehicles													
2	Delivery Trucks	Onroad Construction Vehicles	0.74	0.18	0.00	0.39	0.00	0.05	0.01	0.06	0.00	0.00	0.06	
2	Delivery Trucks	Onroad Construction Vehicles	2.43	0.94	0.11	16.08	0.10	0.92	0.13	4.60	0.00	0.00	4.81	
2	Workers	Onroad Construction Vehicles	8.58	2.72	0.00	3.14	0.20	51.79	0.81	9.13	0.00	0.00	9.18	

Table H1.26

Alternative 2 Emissions by Task

			Mitigated										
			Peak Day										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	Source Type 1	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
1 Electrical Substation Construction at Pier J (mitigation only)													
1	Off-Road Equipment												
1	Caterpillar 320 excavator	Offroad Construction Equipment	0.02	0.02	0.02	0.33	0.01	1.23	0.16	0.26	0.00	0.00	0.2648
1	Small asphalt roller	Offroad Construction Equipment	0.00	0.00	0.00	0.74	0.00	0.91	0.04	0.06	0.00	0.00	0.0581
1	Water truck	Offroad Construction Equipment	0.03	0.03	0.03	0.60	0.01	2.59	0.30	0.00	0.00	0.00	0.0000
1	Forklift	Offroad Construction Equipment	0.00	0.00	0.00	0.15	0.00	0.16	0.01	0.00	0.00	0.00	0.0000
1	Mobile crane (35 ton)	Offroad Construction Equipment	0.02	0.02	0.02	0.43	0.01	2.41	0.21	0.00	0.00	0.00	0.0000
1	On-Road Vehicles												
1	Haul trucks	Onroad Construction Vehicles	0.09	0.02	0.00	0.05	0.00	0.01	0.00	0.01	0.00	0.00	0.0074
1	Supply trucks	Onroad Construction Vehicles	0.21	0.05	0.00	0.11	0.00	0.01	0.00	0.02	0.00	0.00	0.0173
1	Haul trucks	Onroad Construction Vehicles	0.02	0.01	0.00	0.11	0.00	0.01	0.00	0.03	0.00	0.00	0.0318
1	Supply trucks	Onroad Construction Vehicles	0.07	0.03	0.00	0.45	0.00	0.03	0.00	0.13	0.00	0.00	0.1347
1	Workers	Onroad Construction Vehicles	0.15	0.05	0.00	0.06	0.00	0.91	0.01	0.16	0.00	0.00	0.1619
1	Fugitive Dust												
1	Soil handling	Fugitive Emissions	2.01	0.30									
1	Asphalting	Fugitive Emissions											
2 Pier J Breakwater Construction													
2	Marine Activities												
2	Pier J Breakwater Tugboat propulsion engine	Marine Equipment	3.95	3.52	3.95	77.27	0.06	58.10	4.28	3.44	0.00	0.00	3.4860
2	Pier J Breakwater Tugboat auxiliary engine	Marine Equipment	0.37	0.33	0.37	13.58	0.01	14.56	0.75	0.78	0.00	0.00	0.7940
2	Pier J Breakwater Crew boat propulsion engine	Marine Equipment	0.28	0.25	0.28	5.40	0.00	4.06	0.30	0.24	0.00	0.00	0.2436
2	Pier J Breakwater Crew boat auxiliary engine	Marine Equipment	0.01	0.01	0.01	0.43	0.00	0.46	0.02	0.02	0.00	0.00	0.0253
2	Pier J Breakwater Survey boat propulsion engine	Marine Equipment	0.25	0.22	0.25	4.82	0.00	3.62	0.27	0.21	0.00	0.00	0.2174
2	Off-Road Equipment												
2	Piling crane	Offroad Construction Equipment	0.02	0.02	0.02	0.48	0.01	2.67	0.24	0.38	0.00	0.00	0.3800
2	Long arm excavator	Offroad Construction Equipment	0.04	0.04	0.04	0.79	0.01	2.78	0.32	0.63	0.00	0.00	0.6340
2	On-Road Vehicles												
2	Delivery Trucks	Onroad Construction Vehicles	0.15	0.04	0.00	0.08	0.00	0.01	0.00	0.01	0.00	0.00	0.0123
2	Delivery Trucks	Onroad Construction Vehicles	0.49	0.19	0.02	3.22	0.02	0.18	0.03	0.92	0.00	0.00	0.9622
2	Workers	Onroad Construction Vehicles	0.16	0.05	0.00	0.06	0.00	0.96	0.01	0.17	0.00	0.00	0.1700

Table H1.26  
Alternative 2 Emissions by Task

			Mitigated Emissions										
			Total										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
1	<b>Electrical Substation Construction at Pier J (mitigation only)</b>												
1	<b>Off-Road Equipment</b>												
1	Caterpillar 320 excavator	Offroad Construction Equipment	0.33	0.33	0.33	6.59	0.11	24.52	3.12	5.30	0.00	0.00	5.30
1	Small asphalt roller	Offroad Construction Equipment	0.13	0.13	0.13	19.12	0.03	23.58	1.06	1.51	0.00	0.00	1.51
1	Water truck	Offroad Construction Equipment	0.60	0.60	0.60	12.06	0.20	51.75	5.93	0.00	0.00	0.00	0.00
1	Forklift	Offroad Construction Equipment	0.02	0.02	0.02	3.23	0.01	3.59	0.18	0.00	0.00	0.00	0.00
1	Mobile crane (35 ton)	Offroad Construction Equipment	0.04	0.04	0.04	0.87	0.01	4.83	0.43	0.00	0.00	0.00	0.00
1	<b>On-Road Vehicles</b>												
1	Haul trucks	Onroad Construction Vehicles	0.44	0.11	0.00	0.24	0.00	0.03	0.00	0.04	0.00	0.00	0.04
1	Supply trucks	Onroad Construction Vehicles	1.03	0.26	0.00	0.55	0.00	0.06	0.01	0.08	0.00	0.00	0.09
1	Haul trucks	Onroad Construction Vehicles	0.08	0.03	0.00	0.53	0.00	0.03	0.00	0.15	0.00	0.00	0.16
1	Supply trucks	Onroad Construction Vehicles	0.34	0.13	0.02	2.25	0.01	0.13	0.02	0.64	0.00	0.00	0.67
1	Workers	Onroad Construction Vehicles	9.08	2.88	0.00	3.33	0.21	54.81	0.86	9.66	0.00	0.00	9.71
1	<b>Fugitive Dust</b>												
1	Soil handling	Fugitive Emissions	40.12	6.07									
1	Asphalting	Fugitive Emissions											
2	<b>Pier J Breakwater Construction</b>												
2	<b>Marine Activities</b>												
2	Pier J Breakwater Tugboat propulsion engine	Marine Equipment	213.33	189.87	213.33	4172.56	3.46	3137.27	231.25	185.57	0.00	0.01	188.25
2	Pier J Breakwater Tugboat auxiliary engine	Marine Equipment	20.01	17.81	20.01	733.17	0.79	786.05	40.63	42.27	0.00	0.00	42.88
2	Pier J Breakwater Crew boat propulsion engine	Marine Equipment	14.91	13.27	14.91	291.63	0.24	219.27	16.16	12.97	0.00	0.00	13.16
2	Pier J Breakwater Crew boat auxiliary engine	Marine Equipment	0.64	0.57	0.64	23.32	0.03	25.00	1.29	1.34	0.00	0.00	1.36
2	Pier J Breakwater Survey boat propulsion engine	Marine Equipment	13.30	11.84	13.30	260.22	0.22	195.66	14.42	11.57	0.00	0.00	11.74
2	<b>Off-Road Equipment</b>												
2	Piling crane	Offroad Construction Equipment	1.29	1.29	1.29	25.89	0.42	144.43	12.72	20.52	0.00	0.00	20.52
2	Long arm excavator	Offroad Construction Equipment	2.14	2.14	2.14	42.75	0.70	149.87	17.33	34.23	0.00	0.00	34.23
2	<b>On-Road Vehicles</b>												
2	Delivery Trucks	Onroad Construction Vehicles	0.74	0.18	0.00	0.39	0.00	0.05	0.01	0.06	0.00	0.00	0.06
2	Delivery Trucks	Onroad Construction Vehicles	2.43	0.94	0.11	16.08	0.10	0.92	0.13	4.60	0.00	0.00	4.81
2	Workers	Onroad Construction Vehicles	8.58	2.72	0.00	3.14	0.20	51.79	0.81	9.13	0.00	0.00	9.18

Table H1.26

Alternative 2 Emissions by Task

Task ID						Unmitigated Emissions										
						Peak Day										
						PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Construction Element/Equipment		Source Type 1	Source Type 2	Onsite/Off site	Days Total	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
<b>3 Approach Channel (hopper dredge 1,144,000 CY)</b>																
3	Marine Hopper Dredge															
3	Hopper propulsion engine	Marine Equipment	dredging	onsite	66	26.63	23.70	26.63	495.89	0.29	266.32	27.48	15.75	0.00	0.00	15.9819
3	Hopper propulsion engine	Marine Equipment	transit	offsite	66	50.31	44.77	50.31	936.68	0.56	503.05	51.91	29.76	0.00	0.00	30.1880
3	Hopper auxiliary engine	Marine Equipment	disposal	near shore	66	0.22	0.20	0.22	5.06	0.00	3.70	0.28	0.00	0.00	0.00	0.2219
3	Hopper Crew boat propulsion engine	Marine Equipment	support	onsite	66	0.41	0.36	0.41	8.02	0.00	4.06	0.44	0.24	0.00	0.00	0.2437
3	Hopper Crew boat auxiliary engine	Marine Equipment	support	onsite	66	0.03	0.03	0.03	0.60	0.00	0.42	0.03	0.02	0.00	0.00	0.0253
3	Hopper Survey boat propulsion engine	Marine Equipment	dredging	onsite	66	1.45	1.29	1.45	28.64	0.02	14.49	1.59	0.86	0.00	0.00	0.8697
<b>4 Main Channel Widening (clam shell dredge 1,065,000 CY)</b>																
4	Marine Clamshell Dredge															
4	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	178	4.37	4.37	4.37	132.70	0.15	75.66	7.35	5.79	0.00	0.00	5.7854
4	Clamshell Dredge generator	Marine Equipment	dredging	onsite	178	3.27	3.27	3.27	99.52	0.11	56.75	5.52	3.20	0.00	0.00	3.1964
4	Clamshell Barge dump scow	Marine Equipment	disposal	near shore	178	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.00	0.00	0.0382
4	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	178	0.61	0.54	0.61	11.39	0.01	6.12	0.63	0.36	0.00	0.00	0.3670
4	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	178	0.09	0.08	0.09	1.57	0.00	1.10	0.09	0.07	0.00	0.00	0.0662
4	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	178	11.01	9.80	11.01	204.97	0.12	110.08	11.36	6.51	0.00	0.00	6.6058
4	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	178	1.59	1.41	1.59	28.29	0.02	19.85	1.57	1.17	0.00	0.00	1.1911
4	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	178	0.41	0.36	0.41	8.02	0.00	4.06	0.44	0.24	0.00	0.00	0.2437
4	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	178	0.03	0.03	0.03	0.60	0.00	0.42	0.03	0.02	0.00	0.00	0.0253
4	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	178	0.36	0.32	0.36	7.16	0.00	3.62	0.40	0.21	0.00	0.00	0.2174
<b>5 West Basin (clam shell dredge 501,000 CY)</b>																
5	Marine Clamshell Dredge															
5	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	84	4.37	4.37	4.37	132.70	0.15	75.66	7.35	5.79	0.00	0.00	5.7854
5	Clamshell Dredge generator	Marine Equipment	dredging	onsite	84	3.27	3.27	3.27	99.52	0.11	56.75	5.52	3.20	0.00	0.00	3.1964
5	Clamshell Barge dump scow	Marine Equipment	disposal	near shore	84	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.00	0.00	0.0382
5	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	84	0.61	0.54	0.61	11.39	0.01	6.12	0.63	0.36	0.00	0.00	0.3670
5	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	84	0.09	0.08	0.09	1.57	0.00	1.10	0.09	0.07	0.00	0.00	0.0662
5	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	84	11.01	9.80	11.01	204.97	0.12	110.08	11.36	6.51	0.00	0.00	6.6058
5	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	84	1.59	1.41	1.59	28.29	0.02	19.85	1.57	1.17	0.00	0.00	1.1911
5	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	84	0.41	0.36	0.41	8.02	0.00	4.06	0.44	0.24	0.00	0.00	0.2437
5	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	84	0.03	0.03	0.03	0.60	0.00	0.42	0.03	0.02	0.00	0.00	0.0253
5	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	84	0.36	0.32	0.36	7.16	0.00	3.62	0.40	0.21	0.00	0.00	0.2174

Table H1.26

Alternative 2 Emissions by Task

			Unmitigated Emissions										
			Total										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
3 Approach Channel (hopper dredge 1,144,000 CY)													
3	Marine Hopper Dredge												
3	Hopper propulsion engine	Marine Equipment	1757.72	1564.37	1757.72	32728.77	19.41	17577.21	1813.86	1039.68	0.02	0.05	1054.80
3	Hopper propulsion engine	Marine Equipment	3320.14	2954.92	3320.14	61821.01	36.65	33201.40	3426.19	1963.84	0.03	0.09	1992.41
3	Hopper auxiliary engine	Marine Equipment	14.65	13.04	14.65	333.97	0.27	244.13	18.51	14.44	0.00	0.00	14.65
3	Hopper Crew boat propulsion engine	Marine Equipment	26.80	23.85	26.80	529.56	0.30	268.00	29.35	15.85	0.00	0.00	16.08
3	Hopper Crew boat auxiliary engine	Marine Equipment	2.22	1.98	2.22	39.58	0.03	27.78	2.19	1.64	0.00	0.00	1.67
3	Hopper Survey boat propulsion engine	Marine Equipment	95.65	85.13	95.65	1890.14	1.06	956.55	104.75	56.58	0.00	0.00	57.40
4 Main Channel Widening (clam shell dredge 1,065,000 CY)													
4	Marine Clamshell Dredge												
4	Clamshell Dredge hoist	Marine Equipment	776.98	776.98	776.98	23620.32	25.87	13467.72	1309.06	1029.80	0.00	0.00	1029.80
4	Clamshell Dredge generator	Marine Equipment	582.74	582.74	582.74	17715.24	19.40	10100.79	981.80	568.97	0.00	0.00	568.97
4	Clamshell Barge dump scow	Marine Equipment	8.24	8.24	8.24	156.57	0.27	142.84	8.68	6.80	0.00	0.00	6.80
4	Clamshell Tugboat propulsion engine	Marine Equipment	108.86	96.88	108.86	2026.91	1.20	1088.56	112.33	64.39	0.00	0.00	65.32
4	Clamshell Tugboat auxiliary engine	Marine Equipment	15.70	13.98	15.70	279.72	0.22	196.29	15.50	11.61	0.00	0.00	11.78
4	Clamshell Tugboat propulsion engine	Marine Equipment	1959.42	1743.88	1959.42	36484.31	21.63	19594.15	2022.00	1158.98	0.02	0.06	1175.84
4	Clamshell Tugboat auxiliary engine	Marine Equipment	282.66	251.57	282.66	5034.91	3.90	3533.27	279.04	208.99	0.00	0.01	212.01
4	Clamshell Crew boat propulsion engine	Marine Equipment	72.28	64.33	72.28	1428.22	0.80	722.78	79.15	42.75	0.00	0.00	43.38
4	Clamshell Crew boat auxiliary engine	Marine Equipment	5.99	5.33	5.99	106.75	0.08	74.91	5.92	4.43	0.00	0.00	4.50
4	Clamshell Survey boat propulsion engine	Marine Equipment	64.49	57.40	64.49	1274.41	0.71	644.94	70.63	38.15	0.00	0.00	38.70
5 West Basin (clam shell dredge 501,000 CY)													
5	Marine Clamshell Dredge												
5	Clamshell Dredge hoist	Marine Equipment	366.67	366.67	366.67	11146.67	12.21	6355.56	617.76	485.97	0.00	0.00	485.97
5	Clamshell Dredge generator	Marine Equipment	275.00	275.00	275.00	8360.00	9.16	4766.67	463.32	268.50	0.00	0.00	268.50
5	Clamshell Barge dump scow	Marine Equipment	3.89	3.89	3.89	73.89	0.13	67.41	4.10	3.21	0.00	0.00	3.21
5	Clamshell Tugboat propulsion engine	Marine Equipment	51.37	45.72	51.37	956.52	0.57	513.70	53.01	30.39	0.00	0.00	30.83
5	Clamshell Tugboat auxiliary engine	Marine Equipment	7.41	6.60	7.41	132.00	0.10	92.63	7.32	5.48	0.00	0.00	5.56
5	Clamshell Tugboat propulsion engine	Marine Equipment	924.67	822.95	924.67	17217.32	10.21	9246.68	954.20	546.94	0.01	0.03	554.89
5	Clamshell Tugboat auxiliary engine	Marine Equipment	133.39	118.72	133.39	2376.02	1.84	1667.38	131.68	98.62	0.00	0.00	100.05
5	Clamshell Crew boat propulsion engine	Marine Equipment	34.11	30.36	34.11	673.99	0.38	341.09	37.35	20.18	0.00	0.00	20.47
5	Clamshell Crew boat auxiliary engine	Marine Equipment	2.83	2.52	2.83	50.38	0.04	35.35	2.79	2.09	0.00	0.00	2.12
5	Clamshell Survey boat propulsion engine	Marine Equipment	30.44	27.09	30.44	601.41	0.34	304.36	33.33	18.00	0.00	0.00	18.26

Table H1.26

Alternative 2 Emissions by Task

			Mitigated Peak Day										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	Source Type 1	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
3 Approach Channel (hopper dredge 1,144,000 CY)													
3	Marine Hopper Dredge												
3	Hopper propulsion engine	Marine Equipment	26.63	23.70	26.63	495.89	0.29	266.32	27.48	15.75	0.00	0.00	15.9819
3	Hopper propulsion engine	Marine Equipment	50.31	44.77	50.31	936.68	0.56	503.05	51.91	29.76	0.00	0.00	30.1880
3	Hopper auxiliary engine	Marine Equipment	0.22	0.20	0.22	5.06	0.00	3.70	0.28	0.22	0.00	0.00	0.2219
3	Hopper Crew boat propulsion engine	Marine Equipment	0.28	0.25	0.28	5.40	0.00	4.06	0.30	0.24	0.00	0.00	0.2436
3	Hopper Crew boat auxiliary engine	Marine Equipment	0.01	0.01	0.01	0.43	0.00	0.46	0.02	0.02	0.00	0.00	0.0253
3	Hopper Survey boat propulsion engine	Marine Equipment	0.99	0.88	0.99	19.28	0.02	14.49	1.07	0.86	0.00	0.00	0.8696
4 Main Channel Widening (clam shell dredge 1,065,000 CY)													
4	Marine Clamshell Dredge												
4	Clamshell Dredge hoist	Marine Equipment	0.44	0.44	0.44	13.27	0.01	7.57	0.74	0.58	0.00	0.00	0.5785
4	Clamshell Dredge generator	Marine Equipment	0.33	0.33	0.33	9.95	0.01	5.67	0.55	0.32	0.00	0.00	0.3196
4	Clamshell Barge dump scow	Marine Equipment	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.00	0.00	0.0382
4	Clamshell Tugboat propulsion engine	Marine Equipment	0.42	0.37	0.42	8.13	0.01	6.12	0.45	0.36	0.00	0.00	0.3670
4	Clamshell Tugboat auxiliary engine	Marine Equipment	0.03	0.03	0.03	1.13	0.00	1.21	0.06	0.07	0.00	0.00	0.0662
4	Clamshell Tugboat propulsion engine	Marine Equipment	7.49	6.66	7.49	146.41	0.12	110.08	8.11	6.51	0.00	0.00	6.6051
4	Clamshell Tugboat auxiliary engine	Marine Equipment	0.56	0.49	0.56	20.37	0.02	21.83	1.13	1.17	0.00	0.00	1.1910
4	Clamshell Crew boat propulsion engine	Marine Equipment	0.28	0.25	0.28	5.40	0.00	4.06	0.30	0.24	0.00	0.00	0.2436
4	Clamshell Crew boat auxiliary engine	Marine Equipment	0.01	0.01	0.01	0.43	0.00	0.46	0.02	0.02	0.00	0.00	0.0253
4	Clamshell Survey boat propulsion engine	Marine Equipment	0.25	0.22	0.25	4.82	0.00	3.62	0.27	0.21	0.00	0.00	0.2174
5 West Basin (clam shell dredge 501,000 CY)													
5	Marine Clamshell Dredge												
5	Clamshell Dredge hoist	Marine Equipment	0.44	0.44	0.44	13.27	0.01	7.57	0.74	0.58	0.00	0.00	0.5785
5	Clamshell Dredge generator	Marine Equipment	0.33	0.33	0.33	9.95	0.01	5.67	0.55	0.32	0.00	0.00	0.3196
5	Clamshell Barge dump scow	Marine Equipment	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.00	0.00	0.0382
5	Clamshell Tugboat propulsion engine	Marine Equipment	0.42	0.37	0.42	8.13	0.01	6.12	0.45	0.36	0.00	0.00	0.3670
5	Clamshell Tugboat auxiliary engine	Marine Equipment	0.03	0.03	0.03	1.13	0.00	1.21	0.06	0.07	0.00	0.00	0.0662
5	Clamshell Tugboat propulsion engine	Marine Equipment	7.49	6.66	7.49	146.41	0.12	110.08	8.11	6.51	0.00	0.00	6.6051
5	Clamshell Tugboat auxiliary engine	Marine Equipment	0.56	0.49	0.56	20.37	0.02	21.83	1.13	1.17	0.00	0.00	1.1910
5	Clamshell Crew boat propulsion engine	Marine Equipment	0.28	0.25	0.28	5.40	0.00	4.06	0.30	0.24	0.00	0.00	0.2436
5	Clamshell Crew boat auxiliary engine	Marine Equipment	0.01	0.01	0.01	0.43	0.00	0.46	0.02	0.02	0.00	0.00	0.0253
5	Clamshell Survey boat propulsion engine	Marine Equipment	0.25	0.22	0.25	4.82	0.00	3.62	0.27	0.21	0.00	0.00	0.2174
Note: clamshell dredge would be electric with mitigation: assume 90 percent reduction in diesel exhaust emissions													

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.26

Alternative 2 Emissions by Task

			Mitigated Emissions										
			Total										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
<b>3 Approach Channel (hopper dredge 1,144,000 CY)</b>													
3	<b>Marine Hopper Dredge</b>												
3	Hopper propulsion engine	Marine Equipment	1757.72	1564.37	1757.72	32728.77	19.41	17577.21	1813.86	1039.68	0.02	0.05	1054.80
3	Hopper propulsion engine	Marine Equipment	3320.14	2954.92	3320.14	61821.01	36.65	33201.40	3426.19	1963.84	0.03	0.09	1992.41
3	Hopper auxiliary engine	Marine Equipment	14.65	13.04	14.65	333.97	0.27	244.13	18.51	14.44	0.00	0.00	14.65
3	Hopper Crew boat propulsion engine	Marine Equipment	18.22	16.22	18.22	356.44	0.30	268.00	19.75	15.85	0.00	0.00	16.08
3	Hopper Crew boat auxiliary engine	Marine Equipment	0.78	0.69	0.78	28.50	0.03	30.55	1.58	1.64	0.00	0.00	1.67
3	Hopper Survey boat propulsion engine	Marine Equipment	65.05	57.89	65.05	1272.21	1.06	956.55	70.51	56.58	0.00	0.00	57.40
<b>4 Main Channel Widening (clam shell dredge 1,065,000 CY)</b>													
4	<b>Marine Clamshell Dredge</b>												
4	Clamshell Dredge hoist	Marine Equipment	77.70	77.70	77.70	2362.03	2.59	1346.77	130.91	102.98	0.00	0.00	102.98
4	Clamshell Dredge generator	Marine Equipment	58.27	58.27	58.27	1771.52	1.94	1010.08	98.18	56.90	0.00	0.00	56.90
4	Clamshell Barge dump scow	Marine Equipment	8.24	8.24	8.24	156.57	0.27	142.84	8.68	6.80	0.00	0.00	6.80
4	Clamshell Tugboat propulsion engine	Marine Equipment	74.02	65.88	74.02	1447.79	1.20	1088.56	80.24	64.39	0.00	0.00	65.32
4	Clamshell Tugboat auxiliary engine	Marine Equipment	5.50	4.89	5.50	201.40	0.22	215.92	11.16	11.61	0.00	0.00	11.78
4	Clamshell Tugboat propulsion engine	Marine Equipment	1332.40	1185.84	1332.40	26060.22	21.63	19594.15	1444.28	1158.98	0.01	0.06	1175.72
4	Clamshell Tugboat auxiliary engine	Marine Equipment	98.93	88.05	98.93	3625.13	3.90	3886.59	200.91	208.99	0.00	0.01	212.00
4	Clamshell Crew boat propulsion engine	Marine Equipment	49.15	43.74	49.15	961.30	0.80	722.78	53.28	42.75	0.00	0.00	43.37
4	Clamshell Crew boat auxiliary engine	Marine Equipment	2.10	1.87	2.10	76.86	0.08	82.40	4.26	4.43	0.00	0.00	4.49
4	Clamshell Survey boat propulsion engine	Marine Equipment	43.86	39.03	43.86	857.78	0.71	644.94	47.54	38.15	0.00	0.00	38.70
<b>5 West Basin (clam shell dredge 501,000 CY)</b>													
5	<b>Marine Clamshell Dredge</b>												
5	Clamshell Dredge hoist	Marine Equipment	36.67	36.67	36.67	1114.67	1.22	635.56	61.78	48.60	0.00	0.00	48.60
5	Clamshell Dredge generator	Marine Equipment	27.50	27.50	27.50	836.00	0.92	476.67	46.33	26.85	0.00	0.00	26.85
5	Clamshell Barge dump scow	Marine Equipment	3.89	3.89	3.89	73.89	0.13	67.41	4.10	3.21	0.00	0.00	3.21
5	Clamshell Tugboat propulsion engine	Marine Equipment	34.93	31.09	34.93	683.23	0.57	513.70	37.87	30.39	0.00	0.00	30.82
5	Clamshell Tugboat auxiliary engine	Marine Equipment	2.59	2.31	2.59	95.04	0.10	101.90	5.27	5.48	0.00	0.00	5.56
5	Clamshell Tugboat propulsion engine	Marine Equipment	628.77	559.61	628.77	12298.08	10.21	9246.68	681.57	546.94	0.01	0.03	554.83
5	Clamshell Tugboat auxiliary engine	Marine Equipment	46.69	41.55	46.69	1710.74	1.84	1834.12	94.81	98.62	0.00	0.00	100.04
5	Clamshell Crew boat propulsion engine	Marine Equipment	23.19	20.64	23.19	453.65	0.38	341.09	25.14	20.18	0.00	0.00	20.47
5	Clamshell Crew boat auxiliary engine	Marine Equipment	0.99	0.88	0.99	36.27	0.04	38.89	2.01	2.09	0.00	0.00	2.12
5	Clamshell Survey boat propulsion engine	Marine Equipment	20.70	18.42	20.70	404.79	0.34	304.36	22.43	18.00	0.00	0.00	18.26

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.



Table H1.26  
Alternative 2 Emissions by Task

						Unmitigated Emissions										
						Peak Day										
						PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
<b>6 Pier J Basin (clam shell dredge 202,000 CY)</b>																
6	<b>Marine Clamshell Dredge</b>															
6	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	34	4.37	4.37	4.37	132.70	0.15	75.66	7.35	5.79	0.00	0.00	5.7854
6	Clamshell Dredge generator	Marine Equipment	dredging	onsite	34	3.27	3.27	3.27	99.52	0.11	56.75	5.52	3.20	0.00	0.00	3.1964
6	Clamshell Barge dump scow	Marine Equipment	disposal	offsite	34	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.00	0.00	0.0382
6	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	34	0.61	0.54	0.61	11.39	0.01	6.12	0.63	0.36	0.00	0.00	0.3670
6	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	34	0.09	0.08	0.09	1.57	0.00	1.10	0.09	0.07	0.00	0.00	0.0662
6	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	34	11.01	9.80	11.01	204.97	0.12	110.08	11.36	6.51	0.00	0.00	6.6058
6	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	34	1.59	1.41	1.59	28.29	0.02	19.85	1.57	1.17	0.00	0.00	1.1911
6	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	34	0.41	0.36	0.41	8.02	0.00	4.06	0.44	0.24	0.00	0.00	0.2437
6	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	34	0.03	0.03	0.03	0.60	0.00	0.42	0.03	0.02	0.00	0.00	0.0253
6	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	34	0.36	0.32	0.36	7.16	0.00	3.62	0.40	0.21	0.00	0.00	0.2174
<b>7 Pier J Approach (clam shell dredge 270,000 CY)</b>																
7	<b>Marine Clamshell Dredge</b>															
7	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	45	4.37	4.37	4.37	132.70	0.15	75.66	7.35	5.79	0.00	0.00	5.7854
7	Clamshell Dredge generator	Marine Equipment	dredging	onsite	45	3.27	3.27	3.27	99.52	0.11	56.75	5.52	3.20	0.00	0.00	3.1964
7	Clamshell Barge dump scow	Marine Equipment	disposal	offsite	45	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.00	0.00	0.0382
7	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	45	0.61	0.54	0.61	11.39	0.01	6.12	0.63	0.36	0.00	0.00	0.3670
7	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	45	0.09	0.08	0.09	1.57	0.00	1.10	0.09	0.07	0.00	0.00	0.0662
7	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	45	11.01	9.80	11.01	204.97	0.12	110.08	11.36	6.51	0.00	0.00	6.6058
7	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	45	1.59	1.41	1.59	28.29	0.02	19.85	1.57	1.17	0.00	0.00	1.1911
7	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	45	0.41	0.36	0.41	8.02	0.00	4.06	0.44	0.24	0.00	0.00	0.2437
7	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	45	0.03	0.03	0.03	0.60	0.00	0.42	0.03	0.02	0.00	0.00	0.0253
7	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	45	0.36	0.32	0.36	7.16	0.00	3.62	0.40	0.21	0.00	0.00	0.2174
<b>8 Pier J Approach (clam shell dredge 1,699,000 CY)</b>																
8	<b>Marine Clamshell Dredge</b>															
8	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	283	4.37	4.37	4.37	132.70	0.15	75.66	7.35	5.79	0.00	0.00	5.7854
8	Clamshell Dredge generator	Marine Equipment	dredging	onsite	283	3.27	3.27	3.27	99.52	0.11	56.75	5.52	3.20	0.00	0.00	3.1964
8	Clamshell Barge dump scow	Marine Equipment	disposal	offsite	283	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.00	0.00	0.0382
8	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	283	0.61	0.54	0.61	11.39	0.01	6.12	0.63	0.36	0.00	0.00	0.3670
8	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	283	0.09	0.08	0.09	1.57	0.00	1.10	0.09	0.07	0.00	0.00	0.0662
8	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	283	11.01	9.80	11.01	204.97	0.12	110.08	11.36	6.51	0.00	0.00	6.6058
8	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	283	1.59	1.41	1.59	28.29	0.02	19.85	1.57	1.17	0.00	0.00	1.1911
8	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	283	0.41	0.36	0.41	8.02	0.00	4.06	0.44	0.24	0.00	0.00	0.2437
8	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	283	0.03	0.03	0.03	0.60	0.00	0.42	0.03	0.02	0.00	0.00	0.0253
8	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	283	0.36	0.32	0.36	7.16	0.00	3.62	0.40	0.21	0.00	0.00	0.2174

Table H1.26  
Alternative 2 Emissions by Task

			Unmitigated Emissions										
			Total										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
6 Pier J Basin (clam shell dredge 202,000 CY)													
6	Marine Clamshell Dredge												
6	Clamshell Dredge hoist	Marine Equipment	148.41	148.41	148.41	4511.75	4.94	2572.49	250.05	196.70	0.00	0.00	196.70
6	Clamshell Dredge generator	Marine Equipment	111.31	111.31	111.31	3383.81	3.71	1929.37	187.53	108.68	0.00	0.00	108.68
6	Clamshell Barge dump scow	Marine Equipment	1.57	1.57	1.57	29.91	0.05	27.28	1.66	1.30	0.00	0.00	1.30
6	Clamshell Tugboat propulsion engine	Marine Equipment	20.79	18.51	20.79	387.16	0.23	207.93	21.46	12.30	0.00	0.00	12.48
6	Clamshell Tugboat auxiliary engine	Marine Equipment	3.00	2.67	3.00	53.43	0.04	37.49	2.96	2.22	0.00	0.00	2.25
6	Clamshell Tugboat propulsion engine	Marine Equipment	374.27	333.10	374.27	6968.91	4.13	3742.70	386.22	221.38	0.00	0.01	224.60
6	Clamshell Tugboat auxiliary engine	Marine Equipment	53.99	48.05	53.99	961.72	0.75	674.89	53.30	39.92	0.00	0.00	40.50
6	Clamshell Crew boat propulsion engine	Marine Equipment	13.81	12.29	13.81	272.81	0.15	138.06	15.12	8.17	0.00	0.00	8.29
6	Clamshell Crew boat auxiliary engine	Marine Equipment	1.14	1.02	1.14	20.39	0.02	14.31	1.13	0.85	0.00	0.00	0.86
6	Clamshell Survey boat propulsion engine	Marine Equipment	12.32	10.96	12.32	243.43	0.14	123.19	13.49	7.29	0.00	0.00	7.39
7 Pier J Approach (clam shell dredge 270,000 CY)													
7	Marine Clamshell Dredge												
7	Clamshell Dredge hoist	Marine Equipment	196.43	196.43	196.43	5971.43	6.54	3404.76	330.94	260.34	0.00	0.00	260.34
7	Clamshell Dredge generator	Marine Equipment	147.32	147.32	147.32	4478.57	4.90	2553.57	248.21	143.84	0.00	0.00	143.84
7	Clamshell Barge dump scow	Marine Equipment	2.08	2.08	2.08	39.58	0.07	36.11	2.19	1.72	0.00	0.00	1.72
7	Clamshell Tugboat propulsion engine	Marine Equipment	27.52	24.49	27.52	512.42	0.30	275.20	28.40	16.28	0.00	0.00	16.51
7	Clamshell Tugboat auxiliary engine	Marine Equipment	3.97	3.53	3.97	70.71	0.05	49.62	3.92	2.94	0.00	0.00	2.98
7	Clamshell Tugboat propulsion engine	Marine Equipment	495.36	440.87	495.36	9223.56	5.47	4953.58	511.18	293.00	0.00	0.01	297.26
7	Clamshell Tugboat auxiliary engine	Marine Equipment	71.46	63.60	71.46	1272.87	0.99	893.24	70.54	52.83	0.00	0.00	53.60
7	Clamshell Crew boat propulsion engine	Marine Equipment	18.27	16.26	18.27	361.07	0.20	182.73	20.01	10.81	0.00	0.00	10.97
7	Clamshell Crew boat auxiliary engine	Marine Equipment	1.52	1.35	1.52	26.99	0.02	18.94	1.50	1.12	0.00	0.00	1.14
7	Clamshell Survey boat propulsion engine	Marine Equipment	16.30	14.51	16.30	322.18	0.18	163.05	17.86	9.64	0.00	0.00	9.78
8 Pier J Approach (clam shell dredge 1,699,000 CY)													
8	Marine Clamshell Dredge												
8	Clamshell Dredge hoist	Marine Equipment	1235.32	1235.32	1235.32	37553.65	41.13	21412.17	2081.26	1637.26	0.00	0.00	1637.26
8	Clamshell Dredge generator	Marine Equipment	926.49	926.49	926.49	28165.24	30.85	16059.13	1560.95	904.59	0.00	0.00	904.59
8	Clamshell Barge dump scow	Marine Equipment	13.10	13.10	13.10	248.94	0.44	227.10	13.80	10.82	0.00	0.00	10.82
8	Clamshell Tugboat propulsion engine	Marine Equipment	173.07	154.03	173.07	3222.55	1.91	1730.69	178.60	102.37	0.00	0.00	103.86
8	Clamshell Tugboat auxiliary engine	Marine Equipment	24.97	22.22	24.97	444.72	0.34	312.08	24.65	18.46	0.00	0.00	18.73
8	Clamshell Tugboat propulsion engine	Marine Equipment	3115.25	2772.57	3115.25	58005.95	34.39	31152.50	3214.75	1842.65	0.03	0.09	1869.45
8	Clamshell Tugboat auxiliary engine	Marine Equipment	449.40	399.97	449.40	8004.94	6.20	5617.50	443.64	332.27	0.00	0.02	337.08
8	Clamshell Crew boat propulsion engine	Marine Equipment	114.91	102.27	114.91	2270.71	1.27	1149.14	125.85	67.97	0.00	0.00	68.96
8	Clamshell Crew boat auxiliary engine	Marine Equipment	9.53	8.48	9.53	169.72	0.13	119.10	9.41	7.04	0.00	0.00	7.15
8	Clamshell Survey boat propulsion engine	Marine Equipment	102.54	91.26	102.54	2026.17	1.13	1025.39	112.29	60.65	0.00	0.00	61.53

Table H1.26  
Alternative 2 Emissions by Task

Task ID	Construction Element/Equipment	Source Type 1	Mitigated										
			Peak Day										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
			(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
<b>6 Pier J Basin (clam shell dredge 202,000 CY)</b>													
6	Marine Clamshell Dredge												
6	Clamshell Dredge hoist	Marine Equipment	0.44	0.44	0.44	13.27	0.01	7.57	0.74	0.58	0.00	0.00	0.5785
6	Clamshell Dredge generator	Marine Equipment	0.33	0.33	0.33	9.95	0.01	5.67	0.55	0.32	0.00	0.00	0.3196
6	Clamshell Barge dump scow	Marine Equipment	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.00	0.00	0.0382
6	Clamshell Tugboat propulsion engine	Marine Equipment	0.42	0.37	0.42	8.13	0.01	6.12	0.45	0.36	0.00	0.00	0.3670
6	Clamshell Tugboat auxiliary engine	Marine Equipment	0.03	0.03	0.03	1.13	0.00	1.21	0.06	0.07	0.00	0.00	0.0662
6	Clamshell Tugboat propulsion engine	Marine Equipment	7.49	6.66	7.49	146.41	0.12	110.08	8.11	6.51	0.00	0.00	6.6051
6	Clamshell Tugboat auxiliary engine	Marine Equipment	0.56	0.49	0.56	20.37	0.02	21.83	1.13	1.17	0.00	0.00	1.1910
6	Clamshell Crew boat propulsion engine	Marine Equipment	0.28	0.25	0.28	5.40	0.00	4.06	0.30	0.24	0.00	0.00	0.2436
6	Clamshell Crew boat auxiliary engine	Marine Equipment	0.01	0.01	0.01	0.43	0.00	0.46	0.02	0.02	0.00	0.00	0.0253
6	Clamshell Survey boat propulsion engine	Marine Equipment	0.25	0.22	0.25	4.82	0.00	3.62	0.27	0.21	0.00	0.00	0.2174
<b>7 Pier J Approach (clam shell dredge 270,000 CY)</b>													
7	Marine Clamshell Dredge												
7	Clamshell Dredge hoist	Marine Equipment	0.44	0.44	0.44	13.27	0.01	7.57	0.74	0.58	0.00	0.00	0.5785
7	Clamshell Dredge generator	Marine Equipment	0.33	0.33	0.33	9.95	0.01	5.67	0.55	0.32	0.00	0.00	0.3196
7	Clamshell Barge dump scow	Marine Equipment	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.00	0.00	0.0382
7	Clamshell Tugboat propulsion engine	Marine Equipment	0.42	0.37	0.42	8.13	0.01	6.12	0.45	0.36	0.00	0.00	0.3670
7	Clamshell Tugboat auxiliary engine	Marine Equipment	0.03	0.03	0.03	1.13	0.00	1.21	0.06	0.07	0.00	0.00	0.0662
7	Clamshell Tugboat propulsion engine	Marine Equipment	7.49	6.66	7.49	146.41	0.12	110.08	8.11	6.51	0.00	0.00	6.6051
7	Clamshell Tugboat auxiliary engine	Marine Equipment	0.56	0.49	0.56	20.37	0.02	21.83	1.13	1.17	0.00	0.00	1.1910
7	Clamshell Crew boat propulsion engine	Marine Equipment	0.28	0.25	0.28	5.40	0.00	4.06	0.30	0.24	0.00	0.00	0.2436
7	Clamshell Crew boat auxiliary engine	Marine Equipment	0.01	0.01	0.01	0.43	0.00	0.46	0.02	0.02	0.00	0.00	0.0253
7	Clamshell Survey boat propulsion engine	Marine Equipment	0.25	0.22	0.25	4.82	0.00	3.62	0.27	0.21	0.00	0.00	0.2174
<b>8 Pier J Approach (clam shell dredge 1,699,000 CY)</b>													
8	Marine Clamshell Dredge												
8	Clamshell Dredge hoist	Marine Equipment	0.44	0.44	0.44	13.27	0.01	7.57	0.74	0.58	0.00	0.00	0.5785
8	Clamshell Dredge generator	Marine Equipment	0.33	0.33	0.33	9.95	0.01	5.67	0.55	0.32	0.00	0.00	0.3196
8	Clamshell Barge dump scow	Marine Equipment	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.00	0.00	0.0382
8	Clamshell Tugboat propulsion engine	Marine Equipment	0.42	0.37	0.42	8.13	0.01	6.12	0.45	0.36	0.00	0.00	0.3670
8	Clamshell Tugboat auxiliary engine	Marine Equipment	0.03	0.03	0.03	1.13	0.00	1.21	0.06	0.07	0.00	0.00	0.0662
8	Clamshell Tugboat propulsion engine	Marine Equipment	7.49	6.66	7.49	146.41	0.12	110.08	8.11	6.51	0.00	0.00	6.6051
8	Clamshell Tugboat auxiliary engine	Marine Equipment	0.56	0.49	0.56	20.37	0.02	21.83	1.13	1.17	0.00	0.00	1.1910
8	Clamshell Crew boat propulsion engine	Marine Equipment	0.28	0.25	0.28	5.40	0.00	4.06	0.30	0.24	0.00	0.00	0.2436
8	Clamshell Crew boat auxiliary engine	Marine Equipment	0.01	0.01	0.01	0.43	0.00	0.46	0.02	0.02	0.00	0.00	0.0253
8	Clamshell Survey boat propulsion engine	Marine Equipment	0.25	0.22	0.25	4.82	0.00	3.62	0.27	0.21	0.00	0.00	0.2174

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.26

Alternative 2 Emissions by Task

			Mitigated Emissions										
			Total										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
<b>6 Pier J Basin (clam shell dredge 202,000 CY)</b>													
6	<b>Marine Clamshell Dredge</b>												
6	Clamshell Dredge hoist	Marine Equipment	14.84	14.84	14.84	451.17	0.49	257.25	25.00	19.67	0.00	0.00	19.67
6	Clamshell Dredge generator	Marine Equipment	11.13	11.13	11.13	338.38	0.37	192.94	18.75	10.87	0.00	0.00	10.87
6	Clamshell Barge dump scow	Marine Equipment	1.57	1.57	1.57	29.91	0.05	27.28	1.66	1.30	0.00	0.00	1.30
6	Clamshell Tugboat propulsion engine	Marine Equipment	14.14	12.58	14.14	276.54	0.23	207.93	15.33	12.30	0.00	0.00	12.48
6	Clamshell Tugboat auxiliary engine	Marine Equipment	1.05	0.93	1.05	38.47	0.04	41.24	2.13	2.22	0.00	0.00	2.25
6	Clamshell Tugboat propulsion engine	Marine Equipment	254.50	226.51	254.50	4977.80	4.13	3742.70	275.87	221.38	0.00	0.01	224.57
6	Clamshell Tugboat auxiliary engine	Marine Equipment	18.90	16.82	18.90	692.44	0.75	742.38	38.38	39.92	0.00	0.00	40.49
6	Clamshell Crew boat propulsion engine	Marine Equipment	9.39	8.36	9.39	183.62	0.15	138.06	10.18	8.17	0.00	0.00	8.28
6	Clamshell Crew boat auxiliary engine	Marine Equipment	0.40	0.36	0.40	14.68	0.02	15.74	0.81	0.85	0.00	0.00	0.86
6	Clamshell Survey boat propulsion engine	Marine Equipment	8.38	7.46	8.38	163.84	0.14	123.19	9.08	7.29	0.00	0.00	7.39
<b>7 Pier J Approach (clam shell dredge 270,000 CY)</b>													
7	<b>Marine Clamshell Dredge</b>												
7	Clamshell Dredge hoist	Marine Equipment	19.64	19.64	19.64	597.14	0.65	340.48	33.09	26.03	0.00	0.00	26.03
7	Clamshell Dredge generator	Marine Equipment	14.73	14.73	14.73	447.86	0.49	255.36	24.82	14.38	0.00	0.00	14.38
7	Clamshell Barge dump scow	Marine Equipment	2.08	2.08	2.08	39.58	0.07	36.11	2.19	1.72	0.00	0.00	1.72
7	Clamshell Tugboat propulsion engine	Marine Equipment	18.71	16.66	18.71	366.01	0.30	275.20	20.28	16.28	0.00	0.00	16.51
7	Clamshell Tugboat auxiliary engine	Marine Equipment	1.39	1.24	1.39	50.91	0.05	54.59	2.82	2.94	0.00	0.00	2.98
7	Clamshell Tugboat propulsion engine	Marine Equipment	336.84	299.79	336.84	6588.26	5.47	4953.58	365.13	293.00	0.00	0.01	297.23
7	Clamshell Tugboat auxiliary engine	Marine Equipment	25.01	22.26	25.01	916.47	0.99	982.57	50.79	52.83	0.00	0.00	53.59
7	Clamshell Crew boat propulsion engine	Marine Equipment	12.43	11.06	12.43	243.03	0.20	182.73	13.47	10.81	0.00	0.00	10.96
7	Clamshell Crew boat auxiliary engine	Marine Equipment	0.53	0.47	0.53	19.43	0.02	20.83	1.08	1.12	0.00	0.00	1.14
7	Clamshell Survey boat propulsion engine	Marine Equipment	11.09	9.87	11.09	216.85	0.18	163.05	12.02	9.64	0.00	0.00	9.78
<b>8 Pier J Approach (clam shell dredge 1,699,000 CY)</b>													
8	<b>Marine Clamshell Dredge</b>												
8	Clamshell Dredge hoist	Marine Equipment	123.53	123.53	123.53	3755.37	4.11	2141.22	208.13	163.73	0.00	0.00	163.73
8	Clamshell Dredge generator	Marine Equipment	92.65	92.65	92.65	2816.52	3.08	1605.91	156.09	90.46	0.00	0.00	90.46
8	Clamshell Barge dump scow	Marine Equipment	13.10	13.10	13.10	248.94	0.44	227.10	13.80	10.82	0.00	0.00	10.82
8	Clamshell Tugboat propulsion engine	Marine Equipment	117.69	104.74	117.69	2301.82	1.91	1730.69	127.57	102.37	0.00	0.00	103.85
8	Clamshell Tugboat auxiliary engine	Marine Equipment	8.74	7.78	8.74	320.20	0.34	343.29	17.75	18.46	0.00	0.00	18.72
8	Clamshell Tugboat propulsion engine	Marine Equipment	2118.37	1885.35	2118.37	41432.82	34.39	31152.50	2296.25	1842.65	0.02	0.09	1869.26
8	Clamshell Tugboat auxiliary engine	Marine Equipment	157.29	139.99	157.29	5763.55	6.20	6179.25	319.42	332.27	0.00	0.02	337.05
8	Clamshell Crew boat propulsion engine	Marine Equipment	78.14	69.55	78.14	1528.36	1.27	1149.14	84.70	67.97	0.00	0.00	68.95
8	Clamshell Crew boat auxiliary engine	Marine Equipment	3.33	2.97	3.33	122.20	0.13	131.01	6.77	7.04	0.00	0.00	7.15
8	Clamshell Survey boat propulsion engine	Marine Equipment	69.73	62.06	69.73	1363.77	1.13	1025.39	75.58	60.65	0.00	0.00	61.53

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.27  
Alternative 3 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
							PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
<b>1 Electrical Substation Construction at Pier J (mitigation only)</b>																	
1		<b>Off-Road Equipment</b>															
1		Caterpillar 320 excavator	Offroad Construction Equipment		onsite	20.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Small asphalt roller	Offroad Construction Equipment		onsite	26.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Water truck	Offroad Construction Equipment		onsite	20.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Forklift	Offroad Construction Equipment		onsite	22.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Mobile crane (35 ton)	Offroad Construction Equipment		onsite	2.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		<b>On-Road Vehicles</b>															
1		Haul trucks	Onroad Construction Vehicles		onsite	5.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Supply trucks	Onroad Construction Vehicles		onsite	5.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Haul trucks	Onroad Construction Vehicles		offsite	5.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Supply trucks	Onroad Construction Vehicles		offsite	5.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Workers	Onroad Construction Vehicles		offsite	60.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Fugitive Dust															
1		Soil handling	Fugitive Emissions		onsite	20.00	n/a	n/a									
1		Asphalting	Fugitive Emissions		onsite												
<b>2 Pier J Breakwater Construction</b>																	
2		<b>Marine Activities</b>															
2		Pier J Breakwater Tugboat propulsion	Marine Equipment	Pier J Breakwater Construction	onsite	54.00	5.81	5.17	5.81	108.18	0.06	58.10	6.00	3.44	0.0001	0.00	3.49
2		Pier J Breakwater Tugboat auxiliary	Marine Equipment	Pier J Breakwater Construction	onsite	54.00	1.06	0.94	1.06	18.86	0.01	13.23	1.05	0.78	0.0000	0.00	0.79
2		Pier J Breakwater Crew boat propulsion engine	Marine Equipment	Pier J Breakwater Construction	onsite	54.00	0.41	0.36	0.41	8.02	0.00	4.06	0.44	0.24	0.0000	0.00	0.24
2		Pier J Breakwater Crew boat auxiliary engine	Marine Equipment	Pier J Breakwater Construction	onsite	54.00	0.03	0.03	0.03	0.60	0.00	0.42	0.03	0.02	0.0000	0.00	0.03
2		Pier J Breakwater Survey boat propulsion engine	Marine Equipment	Pier J Breakwater Construction	onsite	54.00	0.36	0.32	0.36	7.16	0.00	3.62	0.40	0.21	0.0000	0.00	0.22
2		<b>Off-Road Equipment</b>															
2		Piling crane	Offroad Construction Equipment		onsite	54.00	0.21	0.19	0.21	5.00	0.01	2.67	0.47	0.38	0.0000	0.00	0.38
2		Long arm excavator	Offroad Construction Equipment		onsite	54.00	0.08	0.07	0.08	2.19	0.01	2.78	0.32	0.63	0.0000	0.00	0.63
2		<b>On-Road Vehicles</b>															
2		Delivery Trucks	Onroad Construction Vehicles		onsite	5.00	0.15	0.04	0.00	0.08	0.00	0.01	0.00	0.01	0.0000	0.00	0.01
2		Delivery Trucks	Onroad Construction Vehicles		offsite	5.00	0.49	0.19	0.02	3.22	0.02	0.18	0.03	0.92	0.0000	0.00	0.96
2		Workers	Onroad Construction Vehicles		offsite	54.00	0.16	0.05	0.00	0.06	0.00	0.96	0.01	0.17	0.0000	0.00	0.17

Table H1.27  
Alternative 3 Emissions by Task

			Unmitigated Emissions										
			Total										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
<b>1 Electrical Substation Construction at Pier J (mitigation only)</b>													
1	Off-Road Equipment												
	Caterpillar 320 excavator	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Small asphalt roller	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Water truck	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Forklift	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Mobile crane (35 ton)	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	On-Road Vehicles												
1	Haul trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Supply trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Haul trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Supply trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Workers	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Fugitive Dust												
1	Soil handling	Fugitive Emissions	n/a	n/a									
1	Asphalting	Fugitive Emissions											
<b>2 Pier J Breakwater Construction</b>													
2	Marine Activities												
2	Pier J Breakwater Tugboat propulsion	Marine Equipment	313.73	279.22	313.73	5841.59	3.46	3137.27	323.75	185.57	0.00	0.01	188.27
2	Pier J Breakwater Tugboat auxiliary	Marine Equipment	57.17	50.88	57.17	1018.30	0.79	714.59	56.44	42.27	0.00	0.00	42.88
2	Pier J Breakwater Crew boat propulsion engine	Marine Equipment	21.93	19.52	21.93	433.28	0.24	219.27	24.01	12.97	0.00	0.00	13.16
2	Pier J Breakwater Crew boat auxiliary engine	Marine Equipment	1.82	1.62	1.82	32.38	0.03	22.73	1.79	1.34	0.00	0.00	1.36
2	Pier J Breakwater Survey boat propulsion engine	Marine Equipment	19.57	17.41	19.57	386.62	0.22	195.66	21.43	11.57	0.00	0.00	11.74
2	Off-Road Equipment												
2	Piling crane	Offroad Construction Equipment	11.27	10.36	11.27	270.12	0.42	144.43	25.20	20.52	0.00	0.00	20.52
2	Long arm excavator	Offroad Construction Equipment	4.06	3.74	4.06	118.13	0.70	149.87	17.33	34.23	0.00	0.00	34.23
2	On-Road Vehicles												
2	Delivery Trucks	Onroad Construction Vehicles	0.74	0.18	0.00	0.39	0.00	0.05	0.01	0.06	0.00	0.00	0.06
2	Delivery Trucks	Onroad Construction Vehicles	2.43	0.94	0.11	16.08	0.10	0.92	0.13	4.60	0.00	0.00	4.81
2	Workers	Onroad Construction Vehicles	8.58	2.72	0.00	3.14	0.20	51.79	0.81	9.13	0.00	0.00	9.18

Table H1.27  
Alternative 3 Emissions by Task

				Mitigated										
				Peak Day										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
1 Electrical Substation Construction at Pier J (mitigation only)														
1		Off-Road Equipment												
		Caterpillar 320 excavator	Offroad Construction Equipment	0.02	0.02	0.02	0.33	0.01	1.23	0.1561	0.26	0.00	0.00	0.26
1		Small asphalt roller	Offroad Construction Equipment	0.00	0.00	0.00	0.74	0.00	0.91	0.0408	0.06	0.00	0.00	0.06
1		Water truck	Offroad Construction Equipment	0.03	0.03	0.03	0.60	0.01	2.59	0.2964	0.00	0.00	0.00	0.00
1		Forklift	Offroad Construction Equipment	0.00	0.00	0.00	0.15	0.00	0.16	0.0081	0.00	0.00	0.00	0.00
1		Mobile crane (35 ton)	Offroad Construction Equipment	0.02	0.02	0.02	0.43	0.01	2.41	0.2126	0.00	0.00	0.00	0.00
1		On-Road Vehicles												
1		Haul trucks	Onroad Construction Vehicles	0.09	0.02	0.00	0.05	0.00	0.01	0.0006	0.01	0.00	0.00	0.01
1		Supply trucks	Onroad Construction Vehicles	0.21	0.05	0.00	0.11	0.00	0.01	0.0015	0.02	0.00	0.00	0.02
1		Haul trucks	Onroad Construction Vehicles	0.02	0.01	0.00	0.11	0.00	0.01	0.0008	0.03	0.00	0.00	0.03
1		Supply trucks	Onroad Construction Vehicles	0.07	0.03	0.00	0.45	0.00	0.03	0.0036	0.13	0.00	0.00	0.13
1		Workers	Onroad Construction Vehicles	0.15	0.05	0.00	0.06	0.00	0.91	0.0143	0.16	0.00	0.00	0.16
1		Fugitive Dust												
1		Soil handling	Fugitive Emissions	2.01	0.30									
1		Asphalting	Fugitive Emissions											
2 Pier J Breakwater Construction														
2		Marine Activities												
2		Pier J Breakwater Tugboat propulsion	Marine Equipment	3.95	3.52	3.95	77.27	0.06	58.10	4.2824	3.44	0.00	0.00	3.49
2		Pier J Breakwater Tugboat auxiliary	Marine Equipment	0.37	0.33	0.37	13.58	0.01	14.56	0.7525	0.78	0.00	0.00	0.79
2		Pier J Breakwater Crew boat propulsion engine	Marine Equipment	0.28	0.25	0.28	5.40	0.00	4.06	0.2993	0.24	0.00	0.00	0.24
2		Pier J Breakwater Crew boat auxiliary engine	Marine Equipment	0.01	0.01	0.01	0.43	0.00	0.46	0.0239	0.02	0.00	0.00	0.03
2		Pier J Breakwater Survey boat propulsion engine	Marine Equipment	0.25	0.22	0.25	4.82	0.00	3.62	0.2671	0.21	0.00	0.00	0.22
2		Off-Road Equipment												
2		Piling crane	Offroad Construction Equipment	0.02	0.02	0.02	0.48	0.01	2.67	0.2356	0.38	0.00	0.00	0.38
2		Long arm excavator	Offroad Construction Equipment	0.04	0.04	0.04	0.79	0.01	2.78	0.3209	0.63	0.00	0.00	0.63
2		On-Road Vehicles												
2		Delivery Trucks	Onroad Construction Vehicles	0.15	0.04	0.00	0.08	0.00	0.01	0.0011	0.01	0.00	0.00	0.01
2		Delivery Trucks	Onroad Construction Vehicles	0.49	0.19	0.02	3.22	0.02	0.18	0.0256	0.92	0.00	0.00	0.96
2		Workers	Onroad Construction Vehicles	0.16	0.05	0.00	0.06	0.00	0.96	0.0150	0.17	0.00	0.00	0.17

Table H1.27  
Alternative 3 Emissions by Task

				Mitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
1 Electrical Substation Construction at Pier J (mitigation only)														
1		Off-Road Equipment												
		Caterpillar 320 excavator	Offroad Construction Equipment	0.33	0.33	0.33	6.59	0.11	24.52	3.12	5.30	0.00	0.00	5.30
1		Small asphalt roller	Offroad Construction Equipment	0.13	0.13	0.13	19.12	0.03	23.58	1.06	1.511223352	0	0	1.511223352
1		Water truck	Offroad Construction Equipment	0.60	0.60	0.60	12.06	0.20	51.75	5.93	0	0	0	0
1		Forklift	Offroad Construction Equipment	0.02	0.02	0.02	3.23	0.01	3.59	0.18	0	0	0	0
1		Mobile crane (35 ton)	Offroad Construction Equipment	0.04	0.04	0.04	0.87	0.01	4.83	0.43	0	0	0	0
1		On-Road Vehicles												
1		Haul trucks	Onroad Construction Vehicles	0.44	0.11	0.00	0.24	0.00	0.03	0.00	0.035354006	6.65075E-08	5.55716E-06	0.037011702
1		Supply trucks	Onroad Construction Vehicles	1.03	0.26	0.00	0.55	0.00	0.06	0.01	0.082492681	1.55184E-07	1.29667E-05	0.086360637
1		Haul trucks	Onroad Construction Vehicles	0.08	0.03	0.00	0.53	0.00	0.03	0.00	0.151656946	8.88911E-08	2.38384E-05	0.158763
1		Supply trucks	Onroad Construction Vehicles	0.34	0.13	0.02	2.25	0.01	0.13	0.02	0.643393105	3.77114E-07	0.000101132	0.673539999
1		Workers	Onroad Construction Vehicles	9.08	2.88	0.00	3.33	0.21	54.81	0.86	9.659044664	9.91447E-05	0.0001697	9.712093981
1		Fugitive Dust												
1		Soil handling	Fugitive Emissions	40.12	6.07									
1		Asphalting	Fugitive Emissions											
2 Pier J Breakwater Construction														
2		Marine Activities												
2		Pier J Breakwater Tugboat propulsion	Marine Equipment	213.33	189.87	213.33	4172.56	3.46	3137.27	231.25	185.57	0.00	0.01	188.25
2		Pier J Breakwater Tugboat auxiliary	Marine Equipment	20.01	17.81	20.01	733.17	0.79	786.05	40.63	42.27	0.00	0.00	42.88
2		Pier J Breakwater Crew boat propulsion engine	Marine Equipment	14.91	13.27	14.91	291.63	0.24	219.27	16.16	12.97	0.00	0.00	13.16
2		Pier J Breakwater Crew boat auxiliary engine	Marine Equipment	0.64	0.57	0.64	23.32	0.03	25.00	1.29	1.34	0.00	0.00	1.36
2		Pier J Breakwater Survey boat propulsion engine	Marine Equipment	13.30	11.84	13.30	260.22	0.22	195.66	14.42	11.57	0.00	0.00	11.74
2		Off-Road Equipment												
2		Piling crane	Offroad Construction Equipment	1.29	1.29	1.29	25.89	0.42	144.43	12.72	20.52	0.00	0.00	20.52
2		Long arm excavator	Offroad Construction Equipment	2.14	2.14	2.14	42.75	0.70	149.87	17.33	34.23	0.00	0.00	34.23
2		On-Road Vehicles												
2		Delivery Trucks	Onroad Construction Vehicles	0.74	0.18	0.00	0.39	0.00	0.05	0.01	0.058923344	1.10846E-07	9.26193E-06	0.06168617
2		Delivery Trucks	Onroad Construction Vehicles	2.43	0.94	0.11	16.08	0.10	0.92	0.13	4.595665034	2.69367E-06	0.000722375	4.81099999
2		Workers	Onroad Construction Vehicles	8.58	2.72	0.00	3.14	0.20	51.79	0.81	9.127797208	9.36918E-05	0.000160367	9.177928812



Table H1.27  
Alternative 3 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
							PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
<b>3 Approach Channel (hopper dredge 2,600,000 CY)</b>																	
3		Marine Hopper Dredge															
3		Hopper propulsion engine	Marine Equipment	dredging	onsite	150.00	26.63	23.70	26.63	495.89	0.29	266.32	27.48	15.75	0.0002	0.00	15.98
3		Hopper propulsion engine	Marine Equipment	transit	offsite	150.00	50.31	44.77	50.31	936.68	0.56	503.05	51.91	29.76	0.0004	0.00	30.19
3		Hopper auxiliary engine	Marine Equipment	disposal	near shore	150.00	0.22	0.20	0.22	5.06	0.00	3.70	0.28	0.22	0.0000	0.00	0.22
3		Crew boat propulsion engine	Marine Equipment	support	onsite	150.00	0.41	0.36	0.41	8.02	0.00	4.06	0.44	0.24	0.0000	0.00	0.24
3		Crew boat auxiliary engine	Marine Equipment	support	onsite	150.00	0.03	0.03	0.03	0.60	0.00	0.42	0.03	0.02	0.0000	0.00	0.03
3		Survey boat propulsion engine	Marine Equipment	dredging	onsite	150.00	1.45	1.29	1.45	28.64	0.02	14.49	1.59	0.86	0.0000	0.00	0.87
<b>4 Main Channel Widening (clam shell dredge 1,065,000 CY)</b>																	
4		Marine Clamshell Dredge															
4		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	177.00	4.37	4.37	4.37	132.70	0.15	75.66	7.35	5.79	0.0000	0.00	5.79
4		Clamshell Dredge generator	Marine Equipment	dredging	onsite	177.00	3.27	3.27	3.27	99.52	0.11	56.75	5.52	3.20	0.0000	0.00	3.20
4		Clamshell Barge dump scow	Marine Equipment	disposal	near shore	177.00	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.0000	0.00	0.04
4		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	177.00	0.61	0.54	0.61	11.39	0.01	6.12	0.63	0.36	0.0000	0.00	0.37
4		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	177.00	0.09	0.08	0.09	1.57	0.00	1.10	0.09	0.07	0.0000	0.00	0.07
4		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	177.00	11.01	9.80	11.01	204.97	0.12	110.08	11.36	6.51	0.0001	0.00	6.61
4		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	177.00	1.59	1.41	1.59	28.29	0.02	19.85	1.57	1.17	0.00	0.00	1.19
4		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	177	0.4060579	0.3613915	0.4060579	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
4		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	177.0000	0.0336683	0.0300	0.0336683	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
4		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	177.00	0.36	0.32	0.36	7.16	0.00	3.62	0.40	0.21	0.0000	0.00	0.22

Table H1.27  
Alternative 3 Emissions by Task

				Unmitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
3 Approach Channel (hopper dredge 2,600,000 CY)														
3		Marine Hopper Dredge												
3		Hopper propulsion engine	Marine Equipment	3994.82	3555.39	3994.82	74383.56	44.10	39948.21	4122.42	2362.91	0.04	0.11	2397.28
3		Hopper propulsion engine	Marine Equipment	7545.77	6715.74	7545.77	140502.28	83.31	75457.73	7786.78	4463.28	0.07	0.21	4528.20
3		Hopper auxiliary engine	Marine Equipment	33.29	29.63	33.29	759.02	0.61	554.84	42.07	32.82	0.00	0.00	33.29
3		Crew boat propulsion engine	Marine Equipment	60.91	54.21	60.91	1203.56	0.67	609.09	66.70	36.03	0.00	0.00	36.55
3		Crew boat auxiliary engine	Marine Equipment	5.05	4.49	5.05	89.96	0.07	63.13	4.99	3.73	0.00	0.00	3.79
3		Survey boat propulsion engine	Marine Equipment	217.40	193.48	217.40	4295.77	2.40	2173.97	238.08	128.59	0.00	0.01	130.46
4 Main Channel Widening (clam shell dredge 1,065,000 CY)														
4		Marine Clamshell Dredge												
4		Clamshell Dredge hoist	Marine Equipment	772.62	772.62	772.62	23487.62	25.72	13392.06	1301.71	1024.01	0.00	0.00	1024.01
4		Clamshell Dredge generator	Marine Equipment	579.46	579.46	579.46	17615.71	19.29	10044.05	976.28	565.77	0.00	0.00	565.77
4		Clamshell Barge dump scow	Marine Equipment	8.19	8.19	8.19	155.69	0.27	142.04	8.63	6.77	0.00	0.00	6.77
4		Clamshell Tugboat propulsion engine	Marine Equipment	108.24	96.34	108.24	2015.52	1.20	1082.45	111.70	64.03	0.00	0.00	64.96
4		Clamshell Tugboat auxiliary engine	Marine Equipment	15.62	13.90	15.62	278.15	0.22	195.19	15.42	11.55	0.00	0.00	11.71
4		Clamshell Tugboat propulsion engine	Marine Equipment	1948.41	1734.08	1948.41	36279.34	21.51	19484.07	2010.64	1152.47	0.02	0.05	1169.23
4		Clamshell Tugboat auxiliary engine	Marine Equipment	281.07	250.16	281.07	5006.62	3.88	3513.42	277.47	207.82	0.00	0.01	210.82
4		Clamshell Crew boat propulsion engine	Marine Equipment	71.87225	63.966303	71.87225	1420.19566	0.7934696	718.7225	78.708739	42.512033	0.000678106	0.002021278	43.131327
4		Clamshell Crew boat auxiliary engine	Marine Equipment	5.9592862	5.3037647	5.9592862	106.149785	0.0822381	74.49	5.8829328	4.4061055	0.00	0.000209493	4.4698014
4		Clamshell Survey boat propulsion engine	Marine Equipment	64.13	57.08	64.13	1267.25	0.71	641.32	70.23	37.93	0.00	0.00	38.49

Table H1.27  
Alternative 3 Emissions by Task

				Mitigated										
				Peak Day										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
3 Approach Channel (hopper dredge 2,600,000 CY)														
3		Marine Hopper Dredge												
3		Hopper propulsion engine	Marine Equipment	26.63	23.70	26.63	495.89	0.29	266.32	27.4828	15.75	0.00	0.00	15.98
3		Hopper propulsion engine	Marine Equipment	50.31	44.77	50.31	936.68	0.56	503.05	51.9119	29.76	0.00	0.00	30.19
3		Hopper auxiliary engine	Marine Equipment	0.22	0.20	0.22	5.06	0.00	3.70	0.2804	0.22	0.00	0.00	0.22
3		Crew boat propulsion engine	Marine Equipment	0.28	0.25	0.28	5.40	0.00	4.06	0.2993	0.24	0.00	0.00	0.24
3		Crew boat auxiliary engine	Marine Equipment	0.01	0.01	0.01	0.43	0.00	0.46	0.0239	0.02	0.00	0.00	0.03
3		Survey boat propulsion engine	Marine Equipment	0.99	0.88	0.99	19.28	0.02	14.49	1.0683	0.86	0.00	0.00	0.87
4 Main Channel Widening (clam shell dredge 1,065,000 CY)														
4		Marine Clamshell Dredge												
4		Clamshell Dredge hoist	Marine Equipment	0.44	0.44	0.44	13.27	0.01	7.57	0.7354	0.58	0.00	0.00	0.58
4		Clamshell Dredge generator	Marine Equipment	0.33	0.33	0.33	9.95	0.01	5.67	0.5516	0.32	0.00	0.00	0.32
4		Clamshell Barge dump scow	Marine Equipment	0.05	0.05	0.05	0.88	0.00	0.80	0.0488	0.04	0.00	0.00	0.04
4		Clamshell Tugboat propulsion engine	Marine Equipment	0.42	0.37	0.42	8.13	0.01	6.12	0.4508	0.36	0.00	0.00	0.37
4		Clamshell Tugboat auxiliary engine	Marine Equipment	0.03	0.03	0.03	1.13	0.00	1.21	0.0627	0.07	0.00	0.00	0.07
4		Clamshell Tugboat propulsion engine	Marine Equipment	7.49	6.66	7.49	146.41	0.12	110.08	8.1140	6.51	0.00	0.00	6.61
4		Clamshell Tugboat auxiliary engine	Marine Equipment	0.56	0.49	0.56	20.37	0.02	21.83	1.13	1.17	0.00	0.00	1.19
4		Clamshell Crew boat propulsion engine	Marine Equipment	0.2761194	0.2457462	0.2761194	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
4		Clamshell Crew boat auxiliary engine	Marine Equipment	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
4		Clamshell Survey boat propulsion engine	Marine Equipment	0.25	0.22	0.25	4.82	0.00	3.62	0.2671	0.21	0.00	0.00	0.22
Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.														

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.27  
Alternative 3 Emissions by Task

				Mitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
3 Approach Channel (hopper dredge 2,600,000 CY)														
3		Marine Hopper Dredge												
3		Hopper propulsion engine	Marine Equipment	3994.82	3555.39	3994.82	74383.56	44.10	39948.21	4122.42	2362.91	0.04	0.11	2397.28
3		Hopper propulsion engine	Marine Equipment	7545.77	6715.74	7545.77	140502.28	83.31	75457.73	7786.78	4463.282182	0.067086143	0.212211269	4528.198294
3		Hopper auxiliary engine	Marine Equipment	33.29	29.63	33.29	759.02	0.61	554.84	42.07	32.81825134	0.00036241	0.001560377	33.29230393
3		Crew boat propulsion engine	Marine Equipment	41.42	36.86	41.42	810.09	0.67	609.09	44.90	36.02714702	0.000386795	0.001712947	36.54727515
3		Crew boat auxiliary engine	Marine Equipment	1.77	1.57	1.77	64.77	0.07	69.44	3.59	3.733987708	3.09257E-05	0.000177536	3.787666645
3		Survey boat propulsion engine	Marine Equipment	147.83	131.57	147.83	2891.38	2.40	2173.97	160.24	128.5892017	0.001380559	0.006113904	130.445659
4 Main Channel Widening (clam shell dredge 1,065,000 CY)														
4		Marine Clamshell Dredge												
4		Clamshell Dredge hoist	Marine Equipment	77.26	77.26	77.26	2348.76	2.57	1339.21	130.17	102.4011648	0	0	102.4011648
4		Clamshell Dredge generator	Marine Equipment	57.95	57.95	57.95	1761.57	1.93	1004.40	97.63	56.57711647	0	0	56.57711647
4		Clamshell Barge dump scow	Marine Equipment	8.19	8.19	8.19	155.69	0.27	142.04	8.63	6.766310242	0	0	6.766310242
4		Clamshell Tugboat propulsion engine	Marine Equipment	73.61	65.51	73.61	1439.66	1.20	1082.45	79.79	64.02622048	0.000687398	0.003044191	64.95057449
4		Clamshell Tugboat auxiliary engine	Marine Equipment	5.47	4.86	5.47	200.26	0.22	214.71	11.10	11.54537331	9.56212E-05	0.000548936	11.7113469
4		Clamshell Tugboat propulsion engine	Marine Equipment	1324.92	1179.18	1324.92	25913.82	21.51	19484.07	1436.17	1152.471969	0.012373165	0.054795446	1169.110341
4		Clamshell Tugboat auxiliary engine	Marine Equipment	98.38	87.55	98.38	3604.77	3.88	3864.76	199.78	207.8167195	0.001721181	0.009880856	210.8042442
4		Clamshell Crew boat propulsion engine	Marine Equipment	48.87313	43.497086	48.87313	955.900927	0.7934696	718.7225	52.977036	42.51203349	0.000456418	0.002021278	43.12578467
4		Clamshell Crew boat auxiliary engine	Marine Equipment	2.0857502	1.8563176	2.0857502	76.4278451	0.0822381	81.94	4.2357116	4.406105495	3.64923E-05	0.000209493	4.469446641
4		Clamshell Survey boat propulsion engine	Marine Equipment	43.61	38.81	43.61	852.96	0.71	641.32	47.27	37.93	0.00	0.00	38.48
Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.														

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.27  
Alternative 3 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
							PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
<b>5 West Basin (clam shell dredge 717,000 CY)</b>																	
5		Marine Clamshell Dredge															
5		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	120.00	4.37	4.37	4.37	132.70	0.15	75.66	7.35	5.79	0.0000	0.00	5.79
5		Clamshell Dredge generator	Marine Equipment	dredging	onsite	120.00	3.27	3.27	3.27	99.52	0.11	56.75	5.52	3.20	0.0000	0.00	3.20
5		Clamshell Barge dump scow	Marine Equipment	disposal	near shore	120.00	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.0000	0.00	0.04
5		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	120.00	0.61	0.54	0.61	11.39	0.01	6.12	0.63	0.36	0.0000	0.00	0.37
5		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	120.00	0.09	0.08	0.09	1.57	0.00	1.10	0.09	0.07	0.0000	0.00	0.07
5		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	120.00	11.01	9.80	11.01	204.97	0.12	110.08	11.36	6.51	0.0001	0.00	6.61
5		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	120.00	1.59	1.41	1.59	28.29	0.02	19.85	1.57	1.17	0.00	0.00	1.19
5		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	120	0.4060579	0.3613915	0.4060579	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
5		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	120.0000	0.0336683	0.0300	0.0336683	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
5		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	120.00	0.36	0.32	0.36	7.16	0.00	3.62	0.40	0.21	0.0000	0.00	0.22
<b>6 Pier J Basin (clam shell dredge 258,000 CY)</b>																	
6		Marine Clamshell Dredge															
6		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	43.00	4.37	4.37	4.37	132.70	0.15	75.66	7.35	5.79	0.0000	0.00	5.79
6		Clamshell Dredge generator	Marine Equipment	dredging	onsite	43.00	3.27	3.27	3.27	99.52	0.11	56.75	5.52	3.20	0.0000	0.00	3.20
6		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	43.00	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.0000	0.00	0.04
6		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	43.00	0.61	0.54	0.61	11.39	0.01	6.12	0.63	0.36	0.0000	0.00	0.37
6		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	43.00	0.09	0.08	0.09	1.57	0.00	1.10	0.09	0.07	0.0000	0.00	0.07
6		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	43.00	11.01	9.80	11.01	204.97	0.12	110.08	11.36	6.51	0.0001	0.00	6.61
6		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	43.00	1.59	1.41	1.59	28.29	0.02	19.85	1.57	1.17	0.0000	0.00	1.19
6		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	43	0.4060579	0.3613915	0.4060579	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
6		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	43.0000	0.0336683	0.0300	0.0336683	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
6		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	43.00	0.36	0.32	0.36	7.16	0.00	3.62	0.40	0.21	0.0000	0.00	0.22

Table H1.27  
Alternative 3 Emissions by Task

				Unmitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
5 West Basin (clam shell dredge 717,000 CY)														
5		Marine Clamshell Dredge												
5		Clamshell Dredge hoist	Marine Equipment	523.81	523.81	523.81	15923.81	17.44	9079.37	882.51	694.25	0.00	0.00	694.25
5		Clamshell Dredge generator	Marine Equipment	392.86	392.86	392.86	11942.86	13.08	6809.52	661.89	383.57	0.00	0.00	383.57
5		Clamshell Barge dump scow	Marine Equipment	5.56	5.56	5.56	105.56	0.18	96.30	5.85	4.59	0.00	0.00	4.59
5		Clamshell Tugboat propulsion engine	Marine Equipment	73.39	65.31	73.39	1366.45	0.81	733.86	75.73	43.41	0.00	0.00	44.04
5		Clamshell Tugboat auxiliary engine	Marine Equipment	10.59	9.42	10.59	188.57	0.15	132.33	10.45	7.83	0.00	0.00	7.94
5		Clamshell Tugboat propulsion engine	Marine Equipment	1320.95	1175.65	1320.95	24596.16	14.58	13209.54	1363.15	781.34	0.01	0.04	792.70
5		Clamshell Tugboat auxiliary engine	Marine Equipment	190.56	169.60	190.56	3394.32	2.63	2381.98	188.12	140.89	0.00	0.01	142.93
5		Clamshell Crew boat propulsion engine	Marine Equipment	48.726949	43.366985	48.726949	962.844517	0.5379455	487.26949	53.361857	28.821718	0.000459733	0.001370358	29.241578
5		Clamshell Crew boat auxiliary engine	Marine Equipment	4.040194	3.5957727	4.040194	71.9659558	0.0557547	50.50	3.988429	2.9871902	0.00	0.0001	3.0303738
5		Clamshell Survey boat propulsion engine	Marine Equipment	43.48	38.70	43.48	859.15	0.48	434.79	47.62	25.72	0.00	0.00	26.09
6 Pier J Basin (clam shell dredge 258,000 CY)														
6		Marine Clamshell Dredge												
6		Clamshell Dredge hoist	Marine Equipment	187.70	187.70	187.70	5706.03	6.25	3253.44	316.23	248.77	0.00	0.00	248.77
6		Clamshell Dredge generator	Marine Equipment	140.77	140.77	140.77	4279.52	4.69	2440.08	237.18	137.45	0.00	0.00	137.45
6		Clamshell Barge dump scow	Marine Equipment	1.99	1.99	1.99	37.82	0.07	34.51	2.10	1.64	0.00	0.00	1.64
6		Clamshell Tugboat propulsion engine	Marine Equipment	26.30	23.40	26.30	489.65	0.29	262.97	27.14	15.55	0.00	0.00	15.78
6		Clamshell Tugboat auxiliary engine	Marine Equipment	3.79	3.38	3.79	67.57	0.05	47.42	3.74	2.80	0.00	0.00	2.85
6		Clamshell Tugboat propulsion engine	Marine Equipment	473.34	421.27	473.34	8813.63	5.23	4733.42	488.46	279.98	0.00	0.01	284.05
6		Clamshell Tugboat auxiliary engine	Marine Equipment	68.28	60.77	68.28	1216.30	0.94	853.54	67.41	50.49	0.00	0.00	51.22
6		Clamshell Crew boat propulsion engine	Marine Equipment	17.46049	15.539836	17.46049	345.019285	0.1927638	174.6049	19.121332	10.327782	0.000164738	0.000491045	10.478232
6		Clamshell Crew boat auxiliary engine	Marine Equipment	1.4477362	1.2884852	1.4477362	25.7878008	0.0199788	18.10	1.4291871	1.0704098	0.00	0.0001	1.085884
6		Clamshell Survey boat propulsion engine	Marine Equipment	15.58	13.87	15.58	307.86	0.17	155.80	17.06	9.22	0.00	0.00	9.35

Table H1.27  
Alternative 3 Emissions by Task

				Mitigated										
				Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
<b>5 West Basin (clam shell dredge 717,000 CY)</b>														
5		Marine Clamshell Dredge												
5		Clamshell Dredge hoist	Marine Equipment	0.44	0.44	0.44	13.27	0.01	7.57	0.7354	0.58	0.00	0.00	0.58
5		Clamshell Dredge generator	Marine Equipment	0.33	0.33	0.33	9.95	0.01	5.67	0.5516	0.32	0.00	0.00	0.32
5		Clamshell Barge dump scow	Marine Equipment	0.05	0.05	0.05	0.88	0.00	0.80	0.0488	0.04	0.00	0.00	0.04
5		Clamshell Tugboat propulsion engine	Marine Equipment	0.42	0.37	0.42	8.13	0.01	6.12	0.4508	0.36	0.00	0.00	0.37
5		Clamshell Tugboat auxiliary engine	Marine Equipment	0.03	0.03	0.03	1.13	0.00	1.21	0.0627	0.07	0.00	0.00	0.07
5		Clamshell Tugboat propulsion engine	Marine Equipment	7.49	6.66	7.49	146.41	0.12	110.08	8.1140	6.51	0.00	0.00	6.61
5		Clamshell Tugboat auxiliary engine	Marine Equipment	0.56	0.49	0.56	20.37	0.02	21.83	1.13	1.17	0.00	0.00	1.19
5		Clamshell Crew boat propulsion engine	Marine Equipment	0.2761194	0.2457462	0.2761194	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
5		Clamshell Crew boat auxiliary engine	Marine Equipment	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
5		Clamshell Survey boat propulsion engine	Marine Equipment	0.25	0.22	0.25	4.82	0.00	3.62	0.2671	0.21	0.00	0.00	0.22
<b>6 Pier J Basin (clam shell dredge 258,000 CY)</b>														
6		Marine Clamshell Dredge												
6		Clamshell Dredge hoist	Marine Equipment	0.44	0.44	0.44	13.27	0.01	7.57	0.7354	0.58	0.00	0.00	0.58
6		Clamshell Dredge generator	Marine Equipment	0.33	0.33	0.33	9.95	0.01	5.67	0.5516	0.32	0.00	0.00	0.32
6		Clamshell Barge dump scow	Marine Equipment	0.05	0.05	0.05	0.88	0.00	0.80	0.0488	0.04	0.00	0.00	0.04
6		Clamshell Tugboat propulsion engine	Marine Equipment	0.42	0.37	0.42	8.13	0.01	6.12	0.4508	0.36	0.00	0.00	0.37
6		Clamshell Tugboat auxiliary engine	Marine Equipment	0.03	0.03	0.03	1.13	0.00	1.21	0.0627	0.07	0.00	0.00	0.07
6		Clamshell Tugboat propulsion engine	Marine Equipment	7.49	6.66	7.49	146.41	0.12	110.08	8.1140	6.51	0.00	0.00	6.61
6		Clamshell Tugboat auxiliary engine	Marine Equipment	0.56	0.49	0.56	20.37	0.02	21.83	1.1287	1.17	0.00	0.00	1.19
6		Clamshell Crew boat propulsion engine	Marine Equipment	0.2761194	0.2457462	0.2761194	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
6		Clamshell Crew boat auxiliary engine	Marine Equipment	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
6		Clamshell Survey boat propulsion engine	Marine Equipment	0.25	0.22	0.25	4.82	0.00	3.62	0.2671	0.21	0.00	0.00	0.22

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.27  
Alternative 3 Emissions by Task

				Mitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
5 West Basin (clam shell dredge 717,000 CY)														
5		Marine Clamshell Dredge												
5		Clamshell Dredge hoist	Marine Equipment	52.38	52.38	52.38	1592.38	1.74	907.94	88.25	69.42451853	0	0	69.42451853
5		Clamshell Dredge generator	Marine Equipment	39.29	39.29	39.29	1194.29	1.31	680.95	66.19	38.3573671	0	0	38.3573671
5		Clamshell Barge dump scow	Marine Equipment	5.56	5.56	5.56	105.56	0.18	96.30	5.85	4.587328978	0	0	4.587328978
5		Clamshell Tugboat propulsion engine	Marine Equipment	49.90	44.41	49.90	976.04	0.81	733.86	54.09	43.4076071	0.000466033	0.002063859	44.03428779
5		Clamshell Tugboat auxiliary engine	Marine Equipment	3.71	3.30	3.71	135.77	0.15	145.57	7.52	7.827371733	6.48279E-05	0.00037216	7.939896204
5		Clamshell Tugboat propulsion engine	Marine Equipment	898.25	799.44	898.25	17568.69	14.58	13209.54	973.68	781.3369279	0.008388587	0.037149455	792.6171802
5		Clamshell Tugboat auxiliary engine	Marine Equipment	66.70	59.36	66.70	2443.91	2.63	2620.18	135.44	140.8926912	0.001166903	0.006698886	142.9181317
5		Clamshell Crew boat propulsion engine	Marine Equipment	33.134326	29.48955	33.134326	648.068425	0.5379455	487.26949	35.916634	28.82171762	0.000309436	0.001370358	29.23782012
5		Clamshell Crew boat auxiliary engine	Marine Equipment	1.4140679	1.2585204	1.4140679	51.82	0.0557547	55.552668	2.87	2.987190166	2.47405E-05	0.000142029	3.030133316
5		Clamshell Survey boat propulsion engine	Marine Equipment	29.57	26.31	29.57	578.28	0.48	434.79	32.05	25.72	0.00	0.00	26.09
6 Pier J Basin (clam shell dredge 258,000 CY)														
6		Marine Clamshell Dredge												
6		Clamshell Dredge hoist	Marine Equipment	18.77	18.77	18.77	570.60	0.62	325.34	31.62	24.87711914	0	0	24.87711914
6		Clamshell Dredge generator	Marine Equipment	14.08	14.08	14.08	427.95	0.47	244.01	23.72	13.74472321	0	0	13.74472321
6		Clamshell Barge dump scow	Marine Equipment	1.99	1.99	1.99	37.82	0.07	34.51	2.10	1.643792884	0	0	1.643792884
6		Clamshell Tugboat propulsion engine	Marine Equipment	17.88	15.91	17.88	349.75	0.29	262.97	19.38	15.55439255	0.000166995	0.000739549	15.77895312
6		Clamshell Tugboat auxiliary engine	Marine Equipment	1.33	1.18	1.33	48.65	0.05	52.16	2.70	2.804808204	2.323E-05	0.000133357	2.845129473
6		Clamshell Tugboat propulsion engine	Marine Equipment	321.87	286.47	321.87	6295.45	5.23	4733.42	348.90	279.9790658	0.00300591	0.013311888	284.0211562
6		Clamshell Tugboat auxiliary engine	Marine Equipment	23.90	21.27	23.90	875.73	0.94	938.90	48.53	50.48654767	0.00041814	0.002400434	51.21233051
6		Clamshell Crew boat propulsion engine	Marine Equipment	11.873133	10.567089	11.873133	232.224519	0.1927638	174.6049	12.870127	10.32778215	0.000110881	0.000491045	10.47688554
6		Clamshell Crew boat auxiliary engine	Marine Equipment	0.5067077	0.4509698	0.5067077	18.57	0.0199788	19.906373	1.03	1.07040981	8.86536E-06	5.08937E-05	1.085797771
6		Clamshell Survey boat propulsion engine	Marine Equipment	10.59	9.43	10.59	207.22	0.17	155.80	11.48	9.22	0.00	0.00	9.35
Note: clamshell dredge would be electric with mitigation: assume 90 percent reduction in diesel exhaust emissions														

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.



Table H1.27  
Alternative 3 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
							PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
<b>7 Pier J Basin (clam shell dredge 46,000 CY)</b>																	
7		Marine Clamshell Dredge															
7		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	8.00	4.37	4.37	4.37	132.70	0.15	75.66	7.35	5.79	0.0000	0.00	5.79
7		Clamshell Dredge generator	Marine Equipment	dredging	onsite	8.00	3.27	3.27	3.27	99.52	0.11	56.75	5.52	3.20	0.0000	0.00	3.20
7		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	8.00	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.0000	0.00	0.04
7		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	8.00	0.61	0.54	0.61	11.39	0.01	6.12	0.63	0.36	0.0000	0.00	0.37
7		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	8.00	0.09	0.08	0.09	1.57	0.00	1.10	0.09	0.07	0.0000	0.00	0.07
7		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	8.00	11.01	9.80	11.01	204.97	0.12	110.08	11.36	6.51	0.0001	0.00	6.61
7		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	8.00	1.59	1.41	1.59	28.29	0.02	19.85	1.57	1.17	0.0000	0.00	1.19
7		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	8	0.4060579	0.3613915	0.4060579	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
7		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	8.0000	0.0336683	0.0300	0.0336683	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
7		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	8.00	0.36	0.32	0.36	7.16	0.00	3.62	0.40	0.21	0.0000	0.00	0.22
<b>8 Pier J Approach (clam shell dredge 1,994,000 CY)</b>																	
8		Marine Clamshell Dredge															
8		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	332.00	4.37	4.37	4.37	132.70	0.15	75.66	7.35	5.79	0.0000	0.00	5.79
8		Clamshell Dredge generator	Marine Equipment	dredging	onsite	332.00	3.27	3.27	3.27	99.52	0.11	56.75	5.52	3.20	0.0000	0.00	3.20
8		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	332.00	0.05	0.05	0.05	0.88	0.00	0.80	0.05	0.04	0.0000	0.00	0.04
8		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	332.00	0.61	0.54	0.61	11.39	0.01	6.12	0.63	0.36	0.0000	0.00	0.37
8		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	332.00	0.09	0.08	0.09	1.57	0.00	1.10	0.09	0.07	0.0000	0.00	0.07
8		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	332.00	11.01	9.80	11.01	204.97	0.12	110.08	11.36	6.51	0.0001	0.00	6.61
8		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	332.00	1.59	1.41	1.59	28.29	0.02	19.85	1.57	1.17	0.0000	0.00	1.19
8		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	332	0.4060579	0.3613915	0.4060579	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
8		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	332	0.0336683	0.0299648	0.0336683	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
8		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	332	0.3623286	0.3224725	0.3623286	7.1596131	0.0040001	3.623286	0.3967933	0.2143153	3.41853E-06	1.01898E-05	0.2174374

Table H1.27  
Alternative 3 Emissions by Task

				Unmitigated Emissions											
				Total											
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e	
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	
7 Pier J Basin (clam shell dredge 46,000 CY)															
7		Marine Clamshell Dredge													
7		Clamshell Dredge hoist	Marine Equipment	34.92	34.92	34.92	1061.59	1.16	605.29	58.83	46.28	0.00	0.00	46.28	
7		Clamshell Dredge generator	Marine Equipment	26.19	26.19	26.19	796.19	0.87	453.97	44.13	25.57	0.00	0.00	25.57	
7		Clamshell Barge dump scow	Marine Equipment	0.37	0.37	0.37	7.04	0.01	6.42	0.39	0.31	0.00	0.00	0.31	
7		Clamshell Tugboat propulsion engine	Marine Equipment	4.89	4.35	4.89	91.10	0.05	48.92	5.05	2.89	0.00	0.00	2.94	
7		Clamshell Tugboat auxiliary engine	Marine Equipment	0.71	0.63	0.71	12.57	0.01	8.82	0.70	0.52	0.00	0.00	0.53	
7		Clamshell Tugboat propulsion engine	Marine Equipment	88.06	78.38	88.06	1639.74	0.97	880.64	90.88	52.09	0.00	0.00	52.85	
7		Clamshell Tugboat auxiliary engine	Marine Equipment	12.70	11.31	12.70	226.29	0.18	158.80	12.54	9.39	0.00	0.00	9.53	
7		Clamshell Crew boat propulsion engine	Marine Equipment	3.2484633	2.8911323	3.2484633	64.1896345	0.035863	32.484633	3.5574571	1.9214478	3.06489E-05	9.13572E-05	1.9494385	
7		Clamshell Crew boat auxiliary engine	Marine Equipment	0.2693463	0.24	0.2693463	4.79773039	0.003717	3.37	0.2658953	0.199146	0.00	0.0000	0.2020249	
7		Clamshell Survey boat propulsion engine	Marine Equipment	2.90	2.58	2.90	57.28	0.03	28.99	3.17	1.71	0.00	0.00	1.74	
8 Pier J Approach (clam shell dredge 1,994,000 CY)															
8		Marine Clamshell Dredge													
8		Clamshell Dredge hoist	Marine Equipment	1449.21	1449.21	1449.21	44055.87	48.25	25119.58	2441.62	1920.75	0.00	0.00	1920.75	
8		Clamshell Dredge generator	Marine Equipment	1086.90	1086.90	1086.90	33041.90	36.19	18839.68	1831.22	1061.22	0.00	0.00	1061.22	
8		Clamshell Barge dump scow	Marine Equipment	15.37	15.37	15.37	292.04	0.51	266.42	16.19	12.69	0.00	0.00	12.69	
8		Clamshell Tugboat propulsion engine	Marine Equipment	203.04	180.70	203.04	3780.52	2.24	2030.36	209.52	120.09	0.00	0.01	121.84	
8		Clamshell Tugboat auxiliary engine	Marine Equipment	29.29	26.07	29.29	521.72	0.40	366.12	28.91	21.66	0.00	0.00	21.97	
8		Clamshell Tugboat propulsion engine	Marine Equipment	3654.64	3252.63	3654.64	68049.39	40.35	36546.40	3771.37	2161.70	0.03	0.10	2193.14	
8		Clamshell Tugboat auxiliary engine	Marine Equipment	527.21	469.22	527.21	9390.95	7.28	6590.14	520.46	389.80	0.00	0.02	395.44	
8		Clamshell Crew boat propulsion engine	Marine Equipment	134.81123	119.98199	134.81123	2663.86983	1.4883159	1348.1123	147.63447	79.740085	0.001271928	0.003791323	80.901698	
8		Clamshell Crew boat auxiliary engine	Marine Equipment	11.17787	9.9483044	11.17787	199.105811	0.1542546	139.72338	11.034654	8.2645595	9.50678E-05	0.000392947	8.3840343	
8		Clamshell Survey boat propulsion engine	Marine Equipment	120.29309	107.06085	120.29309	2376.99154	1.3280358	1202.9309	131.73537	71.152692	0.001134951	0.003383027	72.189207	

Table H1.27  
Alternative 3 Emissions by Task

				Mitigated										
				Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
<b>7 Pier J Basin (clam shell dredge 46,000 CY)</b>														
7		Marine Clamshell Dredge												
7		Clamshell Dredge hoist	Marine Equipment	0.44	0.44	0.44	13.27	0.01	7.57	0.7354	0.58	0.00	0.00	0.58
7		Clamshell Dredge generator	Marine Equipment	0.33	0.33	0.33	9.95	0.01	5.67	0.5516	0.32	0.00	0.00	0.32
7		Clamshell Barge dump scow	Marine Equipment	0.05	0.05	0.05	0.88	0.00	0.80	0.0488	0.04	0.00	0.00	0.04
7		Clamshell Tugboat propulsion engine	Marine Equipment	0.42	0.37	0.42	8.13	0.01	6.12	0.4508	0.36	0.00	0.00	0.37
7		Clamshell Tugboat auxiliary engine	Marine Equipment	0.03	0.03	0.03	1.13	0.00	1.21	0.0627	0.07	0.00	0.00	0.07
7		Clamshell Tugboat propulsion engine	Marine Equipment	7.49	6.66	7.49	146.41	0.12	110.08	8.1140	6.51	0.00	0.00	6.61
7		Clamshell Tugboat auxiliary engine	Marine Equipment	0.56	0.49	0.56	20.37	0.02	21.83	1.1287	1.17	0.00	0.00	1.19
7		Clamshell Crew boat propulsion engine	Marine Equipment	0.2761194	0.2457462	0.2761194	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
7		Clamshell Crew boat auxiliary engine	Marine Equipment	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
7		Clamshell Survey boat propulsion engine	Marine Equipment	0.25	0.22	0.25	4.82	0.00	3.62	0.2671	0.21	0.00	0.00	0.22
<b>8 Pier J Approach (clam shell dredge 1,994,000 CY)</b>														
8		Marine Clamshell Dredge												
8		Clamshell Dredge hoist	Marine Equipment	0.44	0.44	0.44	13.27	0.01	7.57	0.7354	0.58	0.00	0.00	0.58
8		Clamshell Dredge generator	Marine Equipment	0.33	0.33	0.33	9.95	0.01	5.67	0.5516	0.32	0.00	0.00	0.32
8		Clamshell Barge dump scow	Marine Equipment	0.05	0.05	0.05	0.88	0.00	0.80	0.0488	0.04	0.00	0.00	0.04
8		Clamshell Tugboat propulsion engine	Marine Equipment	0.42	0.37	0.42	8.13	0.01	6.12	0.4508	0.36	0.00	0.00	0.37
8		Clamshell Tugboat auxiliary engine	Marine Equipment	0.03	0.03	0.03	1.13	0.00	1.21	0.0627	0.07	0.00	0.00	0.07
8		Clamshell Tugboat propulsion engine	Marine Equipment	7.49	6.66	7.49	146.41	0.12	110.08	8.1140	6.51	0.00	0.00	6.61
8		Clamshell Tugboat auxiliary engine	Marine Equipment	0.56	0.49	0.5558	20.37	0.02	21.83	1.13	1.17	0.00	0.00	1.19
8		Clamshell Crew boat propulsion engine	Marine Equipment	0.2761194	0.2457462	0.2761194	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
8		Clamshell Crew boat auxiliary engine	Marine Equipment	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
8		Clamshell Survey boat propulsion engine	Marine Equipment	0.2463834	0.2192813	0.2463834	4.8189703	0.0040001	3.623286	0.2670724	0.2143153	2.30093E-06	1.01898E-05	0.2174094

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.27  
Alternative 3 Emissions by Task

				Mitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
7 Pier J Basin (clam shell dredge 46,000 CY)														
7		Marine Clamshell Dredge												
7		Clamshell Dredge hoist	Marine Equipment	3.49	3.49	3.49	106.16	0.12	60.53	5.88	4.628301236	0	0	4.628301236
7		Clamshell Dredge generator	Marine Equipment	2.62	2.62	2.62	79.62	0.09	45.40	4.41	2.557157807	0	0	2.557157807
7		Clamshell Barge dump scow	Marine Equipment	0.37	0.37	0.37	7.04	0.01	6.42	0.39	0.305821932	0	0	0.305821932
7		Clamshell Tugboat propulsion engine	Marine Equipment	3.33	2.96	3.33	65.07	0.05	48.92	3.61	2.893840474	3.10688E-05	0.000137591	2.935619186
7		Clamshell Tugboat auxiliary engine	Marine Equipment	0.25	0.22	0.25	9.05	0.01	9.70	0.50	0.521824782	4.32186E-06	2.48107E-05	0.529326414
7		Clamshell Tugboat propulsion engine	Marine Equipment	59.88	53.30	59.88	1171.25	0.97	880.64	64.91	52.08912852	0.000559239	0.00247663	52.84114534
7		Clamshell Tugboat auxiliary engine	Marine Equipment	4.45	3.96	4.45	162.93	0.18	174.68	9.03	9.392846079	7.77935E-05	0.000446592	9.527875445
7		Clamshell Crew boat propulsion engine	Marine Equipment	2.208955	1.96597	2.208955	43.2045617	0.035863	32.484633	2.3944423	1.921447841	2.0629E-05	9.13572E-05	1.949188008
7		Clamshell Crew boat auxiliary engine	Marine Equipment	0.0942712	0.0839014	0.0942712	3.45	0.003717	3.7035112	0.19	0.199146011	1.64937E-06	9.4686E-06	0.202008888
7		Clamshell Survey boat propulsion engine	Marine Equipment	1.97	1.75	1.97	38.55	0.03	28.99	2.14	1.71	0.00	0.00	1.74
8 Pier J Approach (clam shell dredge 1,994,000 CY)														
8		Marine Clamshell Dredge												
8		Clamshell Dredge hoist	Marine Equipment	144.92	144.92	144.92	4405.59	4.83	2511.96	244.16	192.0745013	0	0	192.0745013
8		Clamshell Dredge generator	Marine Equipment	108.69	108.69	108.69	3304.19	3.62	1883.97	183.12	106.122049	0	0	106.122049
8		Clamshell Barge dump scow	Marine Equipment	15.37	15.37	15.37	292.04	0.51	266.42	16.19	12.69161017	0	0	12.69161017
8		Clamshell Tugboat propulsion engine	Marine Equipment	138.06	122.88	138.06	2700.37	2.24	2030.36	149.66	120.0943797	0.001289357	0.005710009	121.8281962
8		Clamshell Tugboat auxiliary engine	Marine Equipment	10.25	9.12	10.25	375.64	0.40	402.73	20.82	21.65572846	0.000179357	0.001029644	21.96704616
8		Clamshell Tugboat propulsion engine	Marine Equipment	2485.15	2211.79	2485.15	48606.71	40.35	36546.40	2693.83	2161.698834	0.023208423	0.102780159	2192.907532
8		Clamshell Tugboat auxiliary engine	Marine Equipment	184.52	164.23	184.52	6761.48	7.28	7249.15	374.73	389.8031123	0.003228431	0.018533584	395.4068309
8		Clamshell Crew boat propulsion engine	Marine Equipment	91.671634	81.587754	91.671634	1792.98931	1.4883159	1348.1123	99.369355	79.74008541	0.000856105	0.003791323	80.89130232
8		Clamshell Crew boat auxiliary engine	Marine Equipment	3.9122545	3.4819065	3.9122545	143.356184	0.1542546	153.69571	7.9449506	8.26455946	6.84488E-05	0.000392947	8.38336884
8		Clamshell Survey boat propulsion engine	Marine Equipment	81.799304	72.801381	81.799304	1599.89815	1.3280358	1202.9309	88.66804	71.1526916	0.000763909	0.003383027	72.1799313
Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.														

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.27  
Alternative 3 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
							PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/da y)	(tonnes/day)	(tonnes/day)	(tonnes/da y)
9 Pier J Approach (clam shell dredge 679,000 CY)																	
9		Marine Clamshell Dredge															
9		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	113	4.3650794	4.3650794	4.3650794	132.69841	0.145332	75.661376	7.3542857	5.7853765	0	0	5.7853765
9		Clamshell Dredge generator	Marine Equipment	dredging	onsite	113	3.2738095	3.2738095	3.2738095	99.52381	0.108999	56.746032	5.5157143	3.1964473	0	0	3.1964473
9		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	113	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
9		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	113	0.6115528	0.544282	0.6115528	11.387113	0.0067515	6.115528	0.6310858	0.3617301	5.43705E-06	1.71988E-05	0.3669912
9		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	113	0.0882214	0.0785171	0.0882214	1.5714441	0.0012175	1.1027678	0.0870911	0.0652281	7.50323E-07	3.10134E-06	0.0661711
9		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	113	11.00795	9.7970759	11.00795	204.96804	0.1215278	110.0795	11.359544	6.5111411	9.78668E-05	0.000309579	6.6058422
9		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	113	1.5879856	1.4133072	1.5879856	28.285994	0.0219142	19.84982	1.5676396	1.1741058	1.35058E-05	5.5824E-05	1.191079
9		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	113	0.4060579	0.3613915	0.4060579	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
9		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	113	0.0336683	0.0299648	0.0336683	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
9		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	113	0.3623286	0.3224725	0.3623286	7.1596131	0.0040001	3.623286	0.3967933	0.2143153	3.41853E-06	1.01898E-05	0.2174374

Table H1.27  
Alternative 3 Emissions by Task

				Unmitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
9 Pier J Approach (clam shell dredge 679,000 CY)														
9		Marine Clamshell Dredge												
9		Clamshell Dredge hoist	Marine Equipment	493.25397	493.25397	493.25397	14994.9206	16.422516	8549.7354	831.03429	653.74755	0	0	653.74755
9		Clamshell Dredge generator	Marine Equipment	369.94048	369.94048	369.94048	11246.1905	12.316887	6412.3016	623.27571	361.19854	0	0	361.19854
9		Clamshell Barge dump scow	Marine Equipment	5.2314815	5.2314815	5.2314815	99.3981481	0.1741782	90.679012	5.50875	4.3197348	0	0	4.3197348
9		Clamshell Tugboat propulsion engine	Marine Equipment	69.105467	61.503866	69.105467	1286.74379	0.7629244	691.05467	71.312696	40.875497	0.000614386	0.001943467	41.470009
9		Clamshell Tugboat auxiliary engine	Marine Equipment	9.9690209	8.8724286	9.9690209	177.573185	0.1375725	124.61276	9.8412928	7.370775	8.47865E-05	0.000350451	7.4773291
9		Clamshell Tugboat propulsion engine	Marine Equipment	1243.8984	1107.0696	1243.8984	23161.3883	13.732638	12438.984	1283.6285	735.75894	0.011058953	0.034982404	746.46017
9		Clamshell Tugboat auxiliary engine	Marine Equipment	179.44238	159.70371	179.44238	3196.31733	2.4763048	2243.0297	177.14327	132.67395	0.001526157	0.006308117	134.59192
9		Clamshell Crew boat propulsion engine	Marine Equipment	45.884544	40.837244	45.884544	906.678587	0.5065654	458.84544	50.249082	27.140451	0.000432915	0.00129042	27.535819
9		Clamshell Crew boat auxiliary engine	Marine Equipment	3.804516	3.3860193	3.804516	67.7679417	0.0525023	47.55645	3.7557707	2.8129374	3.23574E-05	0.000133744	2.853602
9		Clamshell Survey boat propulsion engine	Marine Equipment	40.943131	36.439387	40.943131	809.036278	0.4520122	409.43131	44.837642	24.217633	0.000386294	0.001151452	24.570423

Table H1.27  
Alternative 3 Emissions by Task

				Mitigated										
				Peak Day										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
9 Pier J Approach (clam shell dredge 679,000 CY)														
9		Marine Clamshell Dredge												
9		Clamshell Dredge hoist	Marine Equipment	0.4365079	0.4365079	0.4365079	13.269841	0.0145332	7.5661376	0.7354286	0.5785377	0	0	0.5785377
9		Clamshell Dredge generator	Marine Equipment	0.327381	0.327381	0.327381	9.952381	0.0108999	5.6746032	0.5515714	0.3196447	0	0	0.3196447
9		Clamshell Barge dump scow	Marine Equipment	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
9		Clamshell Tugboat propulsion engine	Marine Equipment	0.4158559	0.3701118	0.4158559	8.1336523	0.0067515	6.115528	0.4507756	0.3617301	3.8836E-06	1.71988E-05	0.3669524
9		Clamshell Tugboat auxiliary engine	Marine Equipment	0.0308775	0.027481	0.0308775	1.1314398	0.0012175	1.2130446	0.0627056	0.0652281	5.40233E-07	3.10134E-06	0.0661658
9		Clamshell Tugboat propulsion engine	Marine Equipment	7.4854063	6.6620116	7.4854063	146.40574	0.1215278	110.0795	8.1139603	6.5111411	6.99049E-05	0.000309579	6.6051432
9		Clamshell Tugboat auxiliary engine	Marine Equipment	0.555795	0.4946575	0.555795	20.365916	0.0219142	21.834802	1.1287005	1.1741058	9.72419E-06	5.5824E-05	1.1909844
9		Clamshell Crew boat propulsion engine	Marine Equipment	0.2761194	0.2457462	0.2761194	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
9		Clamshell Crew boat auxiliary engine	Marine Equipment	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
9		Clamshell Survey boat propulsion engine	Marine Equipment	0.2463834	0.2192813	0.2463834	4.8189703	0.0040001	3.623286	0.2670724	0.2143153	2.30093E-06	1.01898E-05	0.2174094

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.27  
Alternative 3 Emissions by Task

				Mitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
<b>9 Pier J Approach (clam shell dredge 679,000 CY)</b>														
9		Marine Clamshell Dredge												
9		Clamshell Dredge hoist	Marine Equipment	49.325397	49.325397	49.325397	1499.49206	1.6422516	854.97354	83.103429	65.37475495	0	0	65.37475495
9		Clamshell Dredge generator	Marine Equipment	36.994048	36.994048	36.994048	1124.61905	1.2316887	641.23016	62.327571	36.11985402	0	0	36.11985402
9		Clamshell Barge dump scow	Marine Equipment	5.2314815	5.2314815	5.2314815	99.3981481	0.1741782	90.679012	5.50875	4.319734787	0	0	4.319734787
9		Clamshell Tugboat propulsion engine	Marine Equipment	46.991718	41.822629	46.991718	919.10271	0.7629244	691.05467	50.93764	40.87549669	0.000438847	0.001943467	41.465621
9		Clamshell Tugboat auxiliary engine	Marine Equipment	3.4891573	3.10535	3.4891573	127.852693	0.1375725	137.07404	7.0857308	7.370775048	6.10463E-05	0.000350451	7.476735592
9		Clamshell Tugboat propulsion engine	Marine Equipment	845.85092	752.80731	845.85092	16543.8488	13.732638	12438.984	916.87751	735.7589404	0.007899252	0.034982404	746.381178
9		Clamshell Tugboat auxiliary engine	Marine Equipment	62.804832	55.8963	62.804832	2301.34848	2.4763048	2467.3327	127.54316	132.6739509	0.001098833	0.006308117	134.5812407
9		Clamshell Crew boat propulsion engine	Marine Equipment	31.20149	27.769326	31.20149	610.264434	0.5065654	458.84544	33.821497	27.14045076	0.000291385	0.00129042	27.53228061
9		Clamshell Crew boat auxiliary engine	Marine Equipment	1.3315806	1.1851067	1.3315806	48.7929181	0.0525023	52.312095	2.7041549	2.812937407	2.32973E-05	0.000133744	2.853375539
9		Clamshell Survey boat propulsion engine	Marine Equipment	27.841329	24.778783	27.841329	544.543649	0.4520122	409.43131	30.179182	24.21763298	0.000260005	0.001151452	24.56726578

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.



Table H1.28  
Alternative 4 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
1		Electrical Substation Construction at Pier J (mitigation only)															
1		Off-Road Equipment															
1		Caterpillar 320 excavator	Offroad Construction Equipment		onsite	20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Small asphalt roller	Offroad Construction Equipment		onsite	26	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Water truck	Offroad Construction Equipment		onsite	20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Forklift	Offroad Construction Equipment		onsite	22	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Mobile crane (35 ton)	Offroad Construction Equipment		onsite	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		On-Road Vehicles															
1		Haul trucks	Onroad Construction Vehicles		onsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Supply trucks	Onroad Construction Vehicles		onsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Haul trucks	Onroad Construction Vehicles		offsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Supply trucks	Onroad Construction Vehicles		offsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Workers	Onroad Construction Vehicles		offsite	60	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Fugitive Dust															
1		Soil handling	Fugitive Emissions		onsite	20	n/a	n/a									
1		Asphalting	Fugitive Emissions		onsite												
2		Pier J Breakwater Construction															
2		Marine Activities															
2		Pier J Breakwater Construction Tugboat propulsion engine	Marine Equipment		onsite	54	5.810	5.171	5.810	108.178	0.064	58.098	5.995	3.436	0.000	0.000	3.486
2		Pier J Breakwater Construction Tugboat auxiliary engine	Marine Equipment		onsite	54	1.059	0.942	1.059	18.857	0.015	13.233	1.045	0.783	0.000	0.000	0.794
2		Pier J Breakwater Construction Crew boat propulsion engine	Marine Equipment		onsite	54	0.406	0.361	0.406	8.024	0.004	4.061	0.445	0.240	0.000	0.000	0.244
2		Pier J Breakwater Construction Crew boat auxiliary engine	Marine Equipment		onsite	54	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
2		Pier J Breakwater Construction Survey boat propulsion engine	Marine Equipment		onsite	54	0.362	0.322	0.362	7.160	0.004	3.623	0.397	0.214	0.000	0.000	0.217
2		Off-Road Equipment															
2		Piling crane	Offroad Construction Equipment		onsite	54	0.209	0.192	0.209	5.002	0.008	2.675	0.467	0.380	0.000	0.000	0.380
2		Long arm excavator	Offroad Construction Equipment		onsite	54	0.075	0.069	0.075	2.188	0.013	2.775	0.321	0.634	0.000	0.000	0.634
2		On-Road Vehicles															
2		Delivery Trucks	Onroad Construction Vehicles		onsite	5	0.147	0.037	0.000	0.079	0.000	0.009	0.001	0.012	0.000	0.000	0.012
2		Delivery Trucks	Onroad Construction Vehicles		offsite	5	0.486	0.189	0.022	3.217	0.019	0.185	0.026	0.919	0.000	0.000	0.962
2		Workers	Onroad Construction Vehicles		offsite	54	0.159	0.050	0.000	0.058	0.004	0.959	0.015	0.169	0.000	0.000	0.170

Table H1.28  
Alternative 4 Emissions by Task

				Unmitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
1		Electrical Substation Construction at Pier J (mitigation only)												
1		Off-Road Equipment												
		Caterpillar 320 excavator	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Small asphalt roller	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Water truck	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Forklift	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Mobile crane (35 ton)	Offroad Construction Equipment	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		On-Road Vehicles												
1		Haul trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Supply trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Haul trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Supply trucks	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Workers	Onroad Construction Vehicles	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1		Fugitive Dust												
1		Soil handling	Fugitive Emissions	n/a	n/a									
1		Asphalting	Fugitive Emissions											
2		Pier J Breakwater Construction												
2		Marine Activities												
		Pier J Breakwater Construction Tugboat propulsion engine	Marine Equipment											
2		Pier J Breakwater ConstructionTugboat auxiliary engine	Marine Equipment	313.727	279.217	313.727	5841.589	3.464	3137.266	323.747	185.568	0.003	0.009	188.267
2				57.167	50.879	57.167	1018.296	0.789	714.594	56.435	42.268	0.000	0.002	42.879
2		Pier J Breakwater Construction Crew boat propulsion engine	Marine Equipment	21.927	19.515	21.927	433.280	0.242	219.271	24.013	12.970	0.000	0.001	13.159
2		Pier J Breakwater Construction Crew boat auxiliary engine	Marine Equipment	1.818	1.618	1.818	32.385	0.025	22.726	1.795	1.344	0.000	0.000	1.364
2		Pier J Breakwater Construction Survey boat propulsion engine	Marine Equipment	19.566	17.414	19.566	386.619	0.216	195.657	21.427	11.573	0.000	0.001	11.742
2		Off-Road Equipment												
2		Piling crane	Offroad Construction Equipment	11.266	10.365	11.266	270.124	0.418	144.427	25.201	20.519	0.000	0.000	20.519
2		Long arm excavator	Offroad Construction Equipment	4.061	3.736	4.061	118.133	0.697	149.866	17.327	34.235	0.000	0.000	34.235
2		On-Road Vehicles												
2		Delivery Trucks	Onroad Construction Vehicles	0.736	0.185	0.001	0.394	0.001	0.046	0.005	0.059	0.000	0.000	0.062
2		Delivery Trucks	Onroad Construction Vehicles	2.431	0.943	0.111	16.084	0.096	0.924	0.128	4.596	0.000	0.001	4.811
2		Workers	Onroad Construction Vehicles	8.583	2.719	0.000	3.143	0.199	51.794	0.809	9.128	0.000	0.000	9.178

Table H1.28  
Alternative 4 Emissions by Task

				Mitigated											
				Peak Day											
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e	
Task ID		Construction Element/Equipment	Source Type 1	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
1		Electrical Substation Construction at Pier J (mitigation only)													
1		Off-Road Equipment													
		Caterpillar 320 excavator	Offroad Construction Equipment	0.016	0.016	0.016	0.330	0.005	1.226	0.156	0.265	0.000	0.000	0.000	0.265
1		Small asphalt roller	Offroad Construction Equipment	0.005	0.005	0.005	0.735	0.001	0.907	0.041	0.058	0.000	0.000	0.000	0.058
1		Water truck	Offroad Construction Equipment	0.030	0.030	0.030	0.603	0.010	2.587	0.296	0.482	0.000	0.000	0.000	0.482
1		Forklift	Offroad Construction Equipment	0.001	0.001	0.001	0.147	0.000	0.163	0.008	0.012	0.000	0.000	0.000	0.012
1		Mobile crane (35 ton)	Offroad Construction Equipment	0.022	0.022	0.022	0.433	0.007	2.414	0.213	0.343	0.000	0.000	0.000	0.343
1		On-Road Vehicles													
1		Haul trucks	Onroad Construction Vehicles	0.088	0.022	0.000	0.047	0.000	0.006	0.001	0.007	0.000	0.000	0.000	0.007
1		Supply trucks	Onroad Construction Vehicles	0.206	0.052	0.000	0.110	0.000	0.013	0.001	0.016	0.000	0.000	0.000	0.017
1		Haul trucks	Onroad Construction Vehicles	0.016	0.006	0.001	0.113	0.002	0.006	0.004	0.030	0.000	0.000	0.000	0.032
1		Supply trucks	Onroad Construction Vehicles	0.068	0.026	0.003	0.514	0.019	0.026	0.038	0.129	0.000	0.000	0.000	0.133
1		Workers	Onroad Construction Vehicles	0.151	0.048	0.000	0.055	0.004	0.913	0.014	0.161	0.000	0.000	0.000	0.162
1		Fugitive Dust													
1		Soil handling	Fugitive Emissions	2.006	0.304										
1		Asphalting	Fugitive Emissions												
2		Pier J Breakwater Construction													
2		Marine Activities													
		Pier J Breakwater Construction Tugboat propulsion engine													
2		Marine Equipment		3.951	3.516	3.951	77.270	0.064	58.098	4.282	3.436	0.000	0.000	0.000	3.486
		Pier J Breakwater Construction Tugboat auxiliary engine													
2		Marine Equipment		0.371	0.330	0.371	13.577	0.015	14.557	0.752	0.783	0.000	0.000	0.000	0.794
		Pier J Breakwater Construction Crew boat propulsion engine													
2		Marine Equipment		0.276	0.246	0.276	5.401	0.004	4.061	0.299	0.240	0.000	0.000	0.000	0.244
		Pier J Breakwater Construction Crew boat auxiliary engine													
2		Marine Equipment		0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.000	0.025
		Pier J Breakwater Construction Survey boat propulsion engine													
2		Marine Equipment		0.246	0.219	0.246	4.819	0.004	3.623	0.267	0.214	0.000	0.000	0.000	0.217
2		Off-Road Equipment													
2		Piling crane	Offroad Construction Equipment	0.024	0.024	0.024	0.479	0.008	2.675	0.236	0.380	0.000	0.000	0.000	0.380
2		Long arm excavator	Offroad Construction Equipment	0.040	0.040	0.040	0.792	0.013	2.775	0.321	0.634	0.000	0.000	0.000	0.634
2		On-Road Vehicles													
2		Delivery Trucks	Onroad Construction Vehicles	0.147	0.037	0.000	0.079	0.000	0.009	0.001	0.012	0.000	0.000	0.000	0.012
2		Delivery Trucks	Onroad Construction Vehicles	0.486	0.189	0.022	3.541	0.101	0.185	0.199	0.919	0.000	0.000	0.000	0.962
2		Workers	Onroad Construction Vehicles	0.159	0.050	0.000	0.058	0.004	0.959	0.015	0.169	0.000	0.000	0.000	0.170

Table H1.28  
Alternative 4 Emissions by Task

				Mitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
1		Electrical Substation Construction at Pier J (mitigation only)												
1		Off-Road Equipment												
		Caterpillar 320 excavator	Offroad Construction Equipment	0.330	0.330	0.330	6.595	0.108	24.518	3.122	5.296	0.000	0.000	5.296
1		Small asphalt roller	Offroad Construction Equipment	0.127	0.127	0.127	19.120	0.031	23.576	1.060	1.511	0.000	0.000	1.511
1		Water truck	Offroad Construction Equipment	0.603	0.603	0.603	12.063	0.196	51.747	5.928	9.642	0.000	0.000	9.642
1		Forklift	Offroad Construction Equipment	0.021	0.021	0.021	3.225	0.005	3.589	0.179	0.260	0.000	0.000	0.260
1		Mobile crane (35 ton)	Offroad Construction Equipment	0.043	0.043	0.043	0.865	0.014	4.827	0.425	0.686	0.000	0.000	0.686
1		On-Road Vehicles												
1		Haul trucks	Onroad Construction Vehicles	0.442	0.111	0.000	0.236	0.001	0.028	0.003	0.035	0.000	0.000	0.035
1		Supply trucks	Onroad Construction Vehicles	1.030	0.258	0.001	0.552	0.002	0.064	0.007	0.082	0.000	0.000	0.082
1		Haul trucks	Onroad Construction Vehicles	0.080	0.031	0.004	0.563	0.011	0.031	0.021	0.152	0.000	0.000	0.152
1		Supply trucks	Onroad Construction Vehicles	0.340	0.132	0.016	2.570	0.093	0.130	0.188	0.643	0.000	0.000	0.674
1		Workers	Onroad Construction Vehicles	9.083	2.877	0.000	3.326	0.211	54.809	0.856	9.659	0.000	0.000	9.712
1		Fugitive Dust												
1		Soil handling	Fugitive Emissions	40.118	6.075									
1		Asphalting	Fugitive Emissions											
2		Pier J Breakwater Construction												
2		Marine Activities												
2		Pier J Breakwater Construction Tugboat propulsion engine	Marine Equipment	213.334	189.867	213.334	4172.564	3.464	3137.266	231.248	185.568	0.002	0.009	188.247
2		Pier J Breakwater Construction Tugboat auxiliary engine	Marine Equipment	20.009	17.808	20.009	733.173	0.789	786.053	40.633	42.268	0.000	0.002	42.875
2		Pier J Breakwater Construction Crew boat propulsion engine	Marine Equipment	14.910	13.270	14.910	291.631	0.242	219.271	16.162	12.970	0.000	0.001	13.157
2		Pier J Breakwater Construction Crew boat auxiliary engine	Marine Equipment	0.636	0.566	0.636	23.317	0.025	24.999	1.292	1.344	0.000	0.000	1.364
2		Pier J Breakwater Construction Survey boat propulsion engine	Marine Equipment	13.305	11.841	13.305	260.224	0.216	195.657	14.422	11.573	0.000	0.001	11.740
2		Off-Road Equipment												
2		Piling crane	Offroad Construction Equipment	1.295	1.295	1.295	25.893	0.418	144.427	12.724	20.519	0.000	0.000	20.519
2		Long arm excavator	Offroad Construction Equipment	2.138	2.138	2.138	42.750	0.697	149.866	17.327	34.235	0.000	0.000	34.235
2		On-Road Vehicles												
2		Delivery Trucks	Onroad Construction Vehicles	0.736	0.185	0.001	0.394	0.001	0.046	0.005	0.059	0.000	0.000	0.062
2		Delivery Trucks	Onroad Construction Vehicles	2.431	0.943	0.111	17.707	0.503	0.926	0.996	4.596	0.000	0.001	4.811
2		Workers	Onroad Construction Vehicles	8.583	2.719	0.000	3.143	0.199	51.794	0.809	9.128	0.000	0.000	9.178

Table H1.28  
Alternative 4 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
<b>3 Pier J Wharf Upgrade</b>																	
3		Marine Activities															
3		Pier J Wharf Tugboat propulsion engine	Marine Equipment		onsite	175	6.116	5.443	6.116	113.871	0.068	61.155	6.311	3.617	0.000	0.000	3.670
3		Pier J Wharf Tugboat auxiliary engine	Marine Equipment		onsite	175	0.529	0.471	0.529	9.429	0.007	6.617	0.523	0.391	0.000	0.000	0.397
3		Pier J Wharf Crew boat propulsion engine	Marine Equipment		onsite	175	0.500	0.445	0.500	9.306	0.006	4.998	0.516	0.296	0.000	0.000	0.300
3		Pier J Wharf Crew boat auxiliary engine	Marine Equipment		onsite	175	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
3		Pier J Wharf Survey boat propulsion engine	Marine Equipment		onsite	175	0.250	0.222	0.250	4.653	0.003	2.499	0.258	0.148	0.000	0.000	0.150
3		Off-Road Equipment															
3		Const Barge - piling crane	Offroad Construction Equipment		onsite	170	0.209	0.192	0.209	5.002	0.008	2.675	0.467	0.380	0.000	0.000	0.380
3		Cong Barge - long arm excavator	Offroad Construction Equipment		onsite	170	0.075	0.069	0.075	2.188	0.013	2.775	0.321	0.634	0.000	0.000	0.634
3		Const barge - deck equipment	Offroad Construction Equipment		onsite	170	0.192	0.177	0.192	2.758	0.004	2.819	0.327	0.181	0.000	0.000	0.181
3		Sheet pile barge - deck equipment	Offroad Construction Equipment		onsite	170	0.192	0.177	0.192	2.758	0.004	2.819	0.327	0.181	0.000	0.000	0.181
3		On-Road Vehicles															
3		Workers	Onroad Construction Vehicles		offsite	175	0.144	0.046	0.000	0.053	0.003	0.868	0.014	0.153	0.000	0.000	0.154
<b>4 Pier T Wharf Upgrade</b>																	
4		Marine Activities															
4		Pier T Wharf Tugboat propulsion engine	Marine Equipment		onsite	320	6.116	5.443	6.116	113.871	0.068	61.155	6.311	3.617	0.000	0.000	3.670
4		Pier T Wharf Tugboat auxiliary engine	Marine Equipment		onsite	320	0.529	0.471	0.529	9.429	0.007	6.617	0.523	0.391	0.000	0.000	0.397
4		Pier T Wharf Crew boat propulsion engine	Marine Equipment		onsite	320	0.500	0.445	0.500	9.306	0.006	4.998	0.516	0.296	0.000	0.000	0.300
4		Pier T Wharf Crew boat auxiliary engine	Marine Equipment		onsite	320	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
4		Pier T Wharf Survey boat propulsion engine	Marine Equipment		onsite	320	0.250	0.222	0.250	4.653	0.003	2.499	0.258	0.148	0.000	0.000	0.150
4		Off-Road Equipment															
4		Const Barge - piling crane	Offroad Construction Equipment		onsite	310	0.209	0.192	0.209	5.002	0.008	2.675	0.467	0.380	0.000	0.000	0.380
4		Cong Barge - long arm excavator	Offroad Construction Equipment		onsite	310	0.075	0.069	0.075	2.188	0.013	2.775	0.321	0.634	0.000	0.000	0.634
4		Const barge - deck equipment	Offroad Construction Equipment		onsite	310	0.192	0.177	0.192	2.758	0.004	2.819	0.327	0.181	0.000	0.000	0.181
4		Sheet pile barge - deck equipment	Offroad Construction Equipment		onsite	310	0.192	0.177	0.192	2.758	0.004	2.819	0.327	0.181	0.000	0.000	0.181
4		On-Road Vehicles															
4		Workers	Onroad Construction Vehicles		offsite	320	0.144	0.046	0.000	0.053	0.003	0.868	0.014	0.153	0.000	0.000	0.154

Table H1.28  
Alternative 4 Emissions by Task

				Unmitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
3	Pier J Wharf Upgrade													
3		Marine Activities												
3		Pier J Wharf Tugboat propulsion engine	Marine Equipment	1070.217	952.493	1070.217	19927.448	11.815	10702.174	1104.400	633.028	0.010	0.030	642.235
3		Pier J Wharf Tugboat auxiliary engine	Marine Equipment	92.632	82.443	92.632	1650.016	1.278	1157.906	91.446	68.490	0.001	0.003	69.480
3		Pier J Wharf Crew boat propulsion engine	Marine Equipment	87.459	77.838	87.459	1628.480	0.966	874.586	90.252	51.731	0.001	0.002	52.484
3		Pier J Wharf Crew boat auxiliary engine	Marine Equipment	5.892	5.244	5.892	104.950	0.081	73.649	5.816	4.356	0.000	0.000	4.419
3		Pier J Wharf Survey boat propulsion engine	Marine Equipment	43.729	38.919	43.729	814.240	0.483	437.293	45.126	25.866	0.000	0.001	26.242
3		Off-Road Equipment												
3		Const Barge - piling crane	Offroad Construction Equipment	35.467	32.630	35.467	850.389	1.315	454.676	79.338	64.597	0.000	0.000	64.597
3		Cong Barge - long arm excavator	Offroad Construction Equipment	12.784	11.761	12.784	371.901	2.195	471.801	54.548	107.776	0.000	0.000	107.776
3		Const barge - deck equipment	Offroad Construction Equipment	32.705	30.088	32.705	468.878	0.625	479.240	55.642	30.730	0.000	0.000	30.730
3		Sheet pile barge - deck equipment	Offroad Construction Equipment	32.705	30.088	32.705	468.878	0.625	479.240	55.642	30.730	0.000	0.000	30.730
3		On-Road Vehicles												
3		Workers	Onroad Construction Vehicles	25.167	7.972	0.000	9.217	0.584	151.865	2.372	26.764	0.000	0.000	26.911
4	Pier T Wharf Upgrade													
4		Marine Activities												
4		Pier T Wharf Tugboat propulsion engine	Marine Equipment	1956.969	1741.702	1956.969	36438.762	21.605	19569.690	2019.475	1157.536	0.017	0.055	1174.372
4		Pier T Wharf Tugboat auxiliary engine	Marine Equipment	169.385	150.753	169.385	3017.173	2.338	2117.314	167.215	125.238	0.001	0.006	127.048
4		Pier T Wharf Crew boat propulsion engine	Marine Equipment	159.924	142.333	159.924	2977.791	1.766	1599.243	165.032	94.594	0.001	0.004	95.970
4		Pier T Wharf Crew boat auxiliary engine	Marine Equipment	10.774	9.589	10.774	191.909	0.149	134.673	10.636	7.966	0.000	0.000	8.081
4		Pier T Wharf Survey boat propulsion engine	Marine Equipment	79.962	71.166	79.962	1488.896	0.883	799.622	82.516	47.297	0.001	0.002	47.985
4		Off-Road Equipment												
4		Const Barge - piling crane	Offroad Construction Equipment	64.675	59.501	64.675	1550.709	2.397	829.115	144.674	117.794	0.000	0.000	117.794
4		Cong Barge - long arm excavator	Offroad Construction Equipment	23.312	21.447	23.312	678.172	4.003	860.342	99.471	196.533	0.000	0.000	196.533
4		Const barge - deck equipment	Offroad Construction Equipment	59.638	54.867	59.638	855.012	1.140	873.908	101.465	56.037	0.000	0.000	56.037
4		Sheet pile barge - deck equipment	Offroad Construction Equipment	59.638	54.867	59.638	855.012	1.140	873.908	101.465	56.037	0.000	0.000	56.037
4		On-Road Vehicles												
4		Workers	Onroad Construction Vehicles	46.019	14.578	0.000	16.854	1.067	277.697	4.337	48.939	0.001	0.001	49.208

Table H1.28  
Alternative 4 Emissions by Task

Task ID		Construction Element/Equipment	Source Type 1	Mitigated										
				Peak Day										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
3		Pier J Wharf Upgrade												
3		Marine Activities												
3		Pier J Wharf Tugboat propulsion engine	Marine Equipment	4.159	3.701	4.159	81.337	0.068	61.155	4.508	3.617	0.000	0.000	3.670
3		Pier J Wharf Tugboat auxiliary engine	Marine Equipment	0.185	0.165	0.185	6.789	0.007	7.278	0.376	0.391	0.000	0.000	0.397
3		Pier J Wharf Crew boat propulsion engine	Marine Equipment	0.340	0.302	0.340	6.647	0.006	4.998	0.368	0.296	0.000	0.000	0.300
3		Pier J Wharf Crew boat auxiliary engine	Marine Equipment	0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.025
3		Pier J Wharf Survey boat propulsion engine	Marine Equipment	0.170	0.151	0.170	3.323	0.003	2.499	0.184	0.148	0.000	0.000	0.150
3		Off-Road Equipment												
3		Const Barge - piling crane	Offroad Construction Equipment	0.024	0.024	0.024	0.479	0.008	2.675	0.236	0.380	0.000	0.000	0.380
3		Cong Barge - long arm excavator	Offroad Construction Equipment	0.040	0.040	0.040	0.792	0.013	2.775	0.321	0.634	0.000	0.000	0.634
3		Const barge - deck equipment	Offroad Construction Equipment	0.014	0.014	0.014	0.278	0.004	2.819	0.137	0.181	0.000	0.000	0.181
3		Sheet pile barge - deck equipment	Offroad Construction Equipment	0.014	0.014	0.014	0.278	0.004	2.819	0.137	0.181	0.000	0.000	0.181
3		On-Road Vehicles												
3		Workers	Onroad Construction Vehicles	0.144	0.046	0.000	0.053	0.003	0.868	0.014	0.153	0.000	0.000	0.154
4		Pier T Wharf Upgrade												
4		Marine Activities												
4		Pier T Wharf Tugboat propulsion engine	Marine Equipment	4.159	3.701	4.159	81.337	0.068	61.155	4.508	3.617	0.000	0.000	3.670
4		Pier T Wharf Tugboat auxiliary engine	Marine Equipment	0.185	0.165	0.185	6.789	0.007	7.278	0.376	0.391	0.000	0.000	0.397
4		Pier T Wharf Crew boat propulsion engine	Marine Equipment	0.340	0.302	0.340	6.647	0.006	4.998	0.368	0.296	0.000	0.000	0.300
4		Pier T Wharf Crew boat auxiliary engine	Marine Equipment	0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.025
4		Pier T Wharf Survey boat propulsion engine	Marine Equipment	0.170	0.151	0.170	3.323	0.003	2.499	0.184	0.148	0.000	0.000	0.150
4		Off-Road Equipment												
4		Const Barge - piling crane	Offroad Construction Equipment	0.024	0.024	0.024	0.479	0.008	2.675	0.236	0.380	0.000	0.000	0.380
4		Cong Barge - long arm excavator	Offroad Construction Equipment	0.040	0.040	0.040	0.792	0.013	2.775	0.321	0.634	0.000	0.000	0.634
4		Const barge - deck equipment	Offroad Construction Equipment	0.014	0.014	0.014	0.278	0.004	2.819	0.137	0.181	0.000	0.000	0.181
4		Sheet pile barge - deck equipment	Offroad Construction Equipment	0.014	0.014	0.014	0.278	0.004	2.819	0.137	0.181	0.000	0.000	0.181
4		On-Road Vehicles												
4		Workers	Onroad Construction Vehicles	0.144	0.046	0.000	0.053	0.003	0.868	0.014	0.153	0.000	0.000	0.154

Table H1.28  
Alternative 4 Emissions by Task

				Mitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
3		Pier J Wharf Upgrade												
3		Marine Activities												
3		Pier J Wharf Tugboat propulsion engine	Marine Equipment	727.748	647.696	727.748	14233.892	11.815	10702.174	788.857	633.028	0.007	0.030	642.167
3		Pier J Wharf Tugboat auxiliary engine	Marine Equipment	32.421	28.855	32.421	1188.012	1.278	1273.697	65.841	68.490	0.001	0.003	69.474
3		Pier J Wharf Crew boat propulsion engine	Marine Equipment	59.472	52.930	59.472	1163.200	0.966	874.586	64.466	51.731	0.001	0.002	52.478
3		Pier J Wharf Crew boat auxiliary engine	Marine Equipment	2.062	1.835	2.062	75.564	0.081	81.014	4.188	4.356	0.000	0.000	4.419
3		Pier J Wharf Survey boat propulsion engine	Marine Equipment	29.736	26.465	29.736	581.600	0.483	437.293	32.233	25.866	0.000	0.001	26.239
3		Off-Road Equipment												
3		Const Barge - piling crane	Offroad Construction Equipment	4.076	4.076	4.076	81.515	1.315	454.676	40.056	64.597	0.000	0.000	64.597
3		Cong Barge - long arm excavator	Offroad Construction Equipment	6.729	6.729	6.729	134.583	2.195	471.801	54.548	107.776	0.000	0.000	107.776
3		Const barge - deck equipment	Offroad Construction Equipment	2.361	2.361	2.361	47.222	0.625	479.240	23.205	30.730	0.000	0.000	30.730
3		Sheet pile barge - deck equipment	Offroad Construction Equipment	2.361	2.361	2.361	47.222	0.625	479.240	23.205	30.730	0.000	0.000	30.730
3		On-Road Vehicles												
3		Workers	Onroad Construction Vehicles	25.167	7.972	0.000	9.217	0.584	151.865	2.372	26.764	0.000	0.000	26.911
4		Pier T Wharf Upgrade												
4		Marine Activities												
4		Pier T Wharf Tugboat propulsion engine	Marine Equipment	1330.739	1184.358	1330.739	26027.687	21.605	19569.690	1442.482	1157.536	0.012	0.055	1174.248
4		Pier T Wharf Tugboat auxiliary engine	Marine Equipment	59.285	52.763	59.285	2172.364	2.338	2329.046	120.395	125.238	0.001	0.006	127.038
4		Pier T Wharf Crew boat propulsion engine	Marine Equipment	108.749	96.786	108.749	2126.994	1.766	1599.243	117.880	94.594	0.001	0.004	95.960
4		Pier T Wharf Crew boat auxiliary engine	Marine Equipment	3.771	3.356	3.771	138.175	0.149	148.140	7.658	7.966	0.000	0.000	8.080
4		Pier T Wharf Survey boat propulsion engine	Marine Equipment	54.374	48.393	54.374	1063.497	0.883	799.622	58.940	47.297	0.001	0.002	47.980
4		Off-Road Equipment												
4		Const Barge - piling crane	Offroad Construction Equipment	7.432	7.432	7.432	148.644	2.397	829.115	73.044	117.794	0.000	0.000	117.794
4		Cong Barge - long arm excavator	Offroad Construction Equipment	12.271	12.271	12.271	245.417	4.003	860.342	99.471	196.533	0.000	0.000	196.533
4		Const barge - deck equipment	Offroad Construction Equipment	4.306	4.306	4.306	86.111	1.140	873.908	42.315	56.037	0.000	0.000	56.037
4		Sheet pile barge - deck equipment	Offroad Construction Equipment	4.306	4.306	4.306	86.111	1.140	873.908	42.315	56.037	0.000	0.000	56.037
4		On-Road Vehicles												
4		Workers	Onroad Construction Vehicles	46.019	14.578	0.000	16.854	1.067	277.697	4.337	48.939	0.001	0.001	49.208



Table H1.28  
Alternative 4 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
5		Approach Channel (hopper dredge 5,447,000 CY)															
5		Marine Hopper Dredge															
5		Hopper propulsion engine	Marine Equipment	dredging	onsite	399	26.632	23.703	26.632	495.890	0.294	266.321	27.483	15.753	0.000	0.001	15.982
5		Hopper propulsion engine	Marine Equipment	transit	offsite	399	50.305	44.772	50.305	936.682	0.555	503.052	51.912	29.755	0.000	0.001	30.188
5		Hopper auxiliary engine	Marine Equipment	disposal	offsite	399	0.222	0.198	0.222	5.060	0.004	3.699	0.280	0.219	0.000	0.000	0.222
5		Crew boat propulsion engine	Marine Equipment	support	onsite	399	0.406	0.361	0.406	8.024	0.004	4.061	0.445	0.240	0.000	0.000	0.244
5		Crew boat auxiliary engine	Marine Equipment	support	onsite	399	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
5		Survey boat propulsion engine	Marine Equipment	dredging	onsite	399	1.449	1.290	1.449	28.638	0.016	14.493	1.587	0.857	0.000	0.000	0.870
6		Main Channel Widening (clam shell dredge 1,065,000 CY)															
6		Marine Clamshell Dredge															
6		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	178	4.365	4.365	4.365	132.698	0.145	75.661	7.354	5.785	0.000	0.000	5.785
6		Clamshell Dredge generator	Marine Equipment	dredging	onsite	178	3.274	3.274	3.274	99.524	0.109	56.746	5.516	3.196	0.000	0.000	3.196
6		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	178	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
6		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	178	0.612	0.544	0.612	11.387	0.007	6.116	0.631	0.362	0.000	0.000	0.367
6		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	178	0.088	0.079	0.088	1.571	0.001	1.103	0.087	0.065	0.000	0.000	0.066
6		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	178	11.008	9.797	11.008	204.968	0.122	110.080	11.360	6.511	0.000	0.000	6.606
6		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	178	1.588	1.413	1.588	28.286	0.022	19.850	1.568	1.174	0.000	0.000	1.191
6		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	178	0.406	0.361	0.406	8.024	0.004	4.061	0.445	0.240	0.000	0.000	0.244
6		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	178	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
6		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	178	0.362	0.322	0.362	7.160	0.004	3.623	0.397	0.214	0.000	0.000	0.217

Table H1.28  
Alternative 4 Emissions by Task

				Unmitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
5		Approach Channel (hopper dredge 5,447,000 CY)												
5		Marine Hopper Dredge												
5		Hopper propulsion engine	Marine Equipment	10626.223	9457.339	10626.223	197860.275	117.314	106262.232	10965.625	6285.351	0.094	0.299	6376.769
5		Hopper propulsion engine	Marine Equipment	20071.755	17863.862	20071.755	373736.076	221.592	200717.549	20712.847	11872.331	0.178	0.564	12045.007
5		Hopper auxiliary engine	Marine Equipment	88.552	78.811	88.552	2018.982	1.629	1475.864	111.894	87.297	0.001	0.004	88.558
5		Crew boat propulsion engine	Marine Equipment	162.017	144.195	162.017	3201.458	1.789	1620.171	177.428	95.832	0.002	0.005	97.228
5		Crew boat auxiliary engine	Marine Equipment	13.434	11.956	13.434	239.287	0.185	167.921	13.262	9.932	0.000	0.000	10.076
5		Survey boat propulsion engine	Marine Equipment	578.276	514.666	578.276	11426.742	6.384	5782.764	633.282	342.047	0.005	0.016	347.030
6		Main Channel Widening (clam shell dredge 1,065,000 CY)												
6		Marine Clamshell Dredge												
6		Clamshell Dredge hoist	Marine Equipment	776.984	776.984	776.984	23620.317	25.869	13467.725	1309.063	1029.797	0.000	0.000	1029.797
6		Clamshell Dredge generator	Marine Equipment	582.738	582.738	582.738	17715.238	19.402	10100.794	981.797	568.968	0.000	0.000	568.968
6		Clamshell Barge dump scow	Marine Equipment	8.241	8.241	8.241	156.574	0.274	142.840	8.678	5.631	0.000	0.000	5.631
6		Clamshell Tugboat propulsion engine	Marine Equipment	108.856	96.882	108.856	2026.906	1.202	1088.564	112.333	64.388	0.001	0.003	65.324
6		Clamshell Tugboat auxiliary engine	Marine Equipment	15.703	13.976	15.703	279.717	0.217	196.293	15.502	11.611	0.000	0.001	11.778
6		Clamshell Tugboat propulsion engine	Marine Equipment	1959.415	1743.880	1959.415	36484.311	21.632	19594.152	2021.999	1158.983	0.017	0.055	1175.840
6		Clamshell Tugboat auxiliary engine	Marine Equipment	282.661	251.569	282.661	5034.907	3.901	3533.268	279.040	208.991	0.002	0.010	212.012
6		Clamshell Crew boat propulsion engine	Marine Equipment	72.278	64.328	72.278	1428.219	0.798	722.783	79.153	42.752	0.001	0.002	43.375
6		Clamshell Crew boat auxiliary engine	Marine Equipment	5.993	5.334	5.993	106.750	0.083	74.912	5.916	4.431	0.000	0.000	4.495
6		Clamshell Survey boat propulsion engine	Marine Equipment	64.494	57.400	64.494	1274.411	0.712	644.945	70.629	38.148	0.001	0.002	38.704

Table H1.28  
Alternative 4 Emissions by Task

				Mitigated										
				Peak Day										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
5		Approach Channel (hopper dredge 5,447,000 CY)												
5		Marine Hopper Dredge												
5		Hopper propulsion engine	Marine Equipment	26.632	23.703	26.632	495.890	0.294	266.321	27.483	15.753	0.000	0.001	15.982
5		Hopper propulsion engine	Marine Equipment	50.305	44.772	50.305	936.682	0.555	503.052	51.912	29.755	0.000	0.001	30.188
5		Hopper auxiliary engine	Marine Equipment	0.222	0.198	0.222	5.060	0.004	3.699	0.280	0.219	0.000	0.000	0.222
5		Crew boat propulsion engine	Marine Equipment	0.276	0.246	0.276	5.401	0.004	4.061	0.299	0.240	0.000	0.000	0.244
5		Crew boat auxiliary engine	Marine Equipment	0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.025
5		Survey boat propulsion engine	Marine Equipment	0.986	0.877	0.986	19.276	0.016	14.493	1.068	0.857	0.000	0.000	0.870
6		Main Channel Widening (clam shell dredge 1,065,000 CY)												
6		Marine Clamshell Dredge												
6		Clamshell Dredge hoist	Marine Equipment	0.437	0.437	0.437	13.270	0.015	7.566	0.735	0.579	0.000	0.000	0.579
6		Clamshell Dredge generator	Marine Equipment	0.327	0.327	0.327	9.952	0.011	5.675	0.552	0.320	0.000	0.000	0.320
6		Clamshell Barge dump scow	Marine Equipment	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
6		Clamshell Tugboat propulsion engine	Marine Equipment	0.416	0.370	0.416	8.134	0.007	6.116	0.451	0.362	0.000	0.000	0.367
6		Clamshell Tugboat auxiliary engine	Marine Equipment	0.031	0.027	0.031	1.131	0.001	1.213	0.063	0.065	0.000	0.000	0.066
6		Clamshell Tugboat propulsion engine	Marine Equipment	7.485	6.662	7.485	146.406	0.122	110.080	8.114	6.511	0.000	0.000	6.605
6		Clamshell Tugboat auxiliary engine	Marine Equipment	0.556	0.495	0.556	20.366	0.022	21.835	1.129	1.174	0.000	0.000	1.191
6		Clamshell Crew boat propulsion engine	Marine Equipment	0.276	0.246	0.276	5.401	0.004	4.061	0.299	0.240	0.000	0.000	0.244
6		Clamshell Crew boat auxiliary engine	Marine Equipment	0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.025
6		Clamshell Survey boat propulsion engine	Marine Equipment	0.246	0.219	0.246	4.819	0.004	3.623	0.267	0.214	0.000	0.000	0.217
				Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.										

Table H1.28  
Alternative 4 Emissions by Task

				Mitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
5	Approach Channel (hopper dredge 5,447,000 CY)													
5		Marine Hopper Dredge												
5		Hopper propulsion engine	Marine Equipment	10626.223	9457.339	10626.223	197860.275	117.314	106262.232	10965.625	6285.351	0.094	0.299	6376.76
5		Hopper propulsiion engine	Marine Equipment	20071.755	17863.862	20071.755	373736.076	221.592	200717.549	20712.847	11872.331	0.178	0.564	12045.00
5		Hopper auxiliary engine	Marine Equipment	88.552	78.811	88.552	2018.982	1.629	1475.864	111.894	87.297	0.001	0.004	88.55
5		Crew boat propulsion engine	Marine Equipment	110.172	98.053	110.172	2154.828	1.789	1620.171	119.423	95.832	0.001	0.005	97.21
5		Crew boat auxilliary engine	Marine Equipment	4.702	4.185	4.702	172.286	0.185	184.713	9.548	9.932	0.000	0.000	10.07
5		Survey boat propulsion engine	Marine Equipment	393.228	349.973	393.228	7691.077	6.384	5782.764	426.248	342.047	0.004	0.016	346.98
6	Main Channel Widening (clam shell dredge 1,065,000 CY)													
6		Marine Clamshell Dredge												
6		Clamshell Dredge hoist	Marine Equipment	77.698	77.698	77.698	2362.032	2.587	1346.772	130.906	102.980	0.000	0.000	102.98
6		Clamshell Dredge generator	Marine Equipment	58.274	58.274	58.274	1771.524	1.940	1010.079	98.180	56.897	0.000	0.000	56.89
6		Clamshell Barge dump scow	Marine Equipment	8.241	8.241	8.241	156.574	0.274	142.840	8.678	5.631	0.000	0.000	5.63
6		Clamshell Tugboat propulsion engine	Marine Equipment	74.022	65.880	74.022	1447.790	1.202	1088.564	80.238	64.388	0.001	0.003	65.31
6		Clamshell Tugboat auxiliary engine	Marine Equipment	5.496	4.892	5.496	201.396	0.217	215.922	11.162	11.611	0.000	0.001	11.77
6		Clamshell Tugboat propulsion engine	Marine Equipment	1332.402	1185.838	1332.402	26060.222	21.632	19594.152	1444.285	1158.983	0.012	0.055	1175.71
6		Clamshell Tugboat auxiliary engine	Marine Equipment	98.932	88.049	98.932	3625.133	3.901	3886.595	200.909	208.991	0.002	0.010	211.99
6		Clamshell Crew boat propulsion engine	Marine Equipment	49.149	43.743	49.149	961.301	0.798	722.783	53.276	42.752	0.000	0.002	43.36
6		Clamshell Crew boat auxiliary engine	Marine Equipment	2.098	1.867	2.098	76.860	0.083	82.403	4.260	4.431	0.000	0.000	4.49
		Clamshell Survey boat propulsion engine	Marine Equipment	43.856	39.032	43.856	857.777	0.712	644.945	47.539	38.148	0.000	0.002	38.69
				Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.										

Table H1.28  
Alternative 4 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
7	West Basin	(clam shell dredge 975,000 CY)															
7		Marine Clamshell Dredge															
7		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	163	4.365	4.365	4.365	132.698	0.145	75.661	7.354	5.785	0.000	0.000	5.785
7		Clamshell Dredge generator	Marine Equipment	dredging	onsite	163	3.274	3.274	3.274	99.524	0.109	56.746	5.516	3.196	0.000	0.000	3.196
7		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	163	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
7		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	163	0.612	0.544	0.612	11.387	0.007	6.116	0.631	0.362	0.000	0.000	0.367
7		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	163	0.088	0.079	0.088	1.571	0.001	1.103	0.087	0.065	0.000	0.000	0.066
7		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	163	11.008	9.797	11.008	204.968	0.122	110.080	11.360	6.511	0.000	0.000	6.606
7		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	163	1.588	1.413	1.588	28.286	0.022	19.850	1.568	1.174	0.000	0.000	1.191
7		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	163	0.406	0.361	0.406	8.024	0.004	4.061	0.445	0.240	0.000	0.000	0.244
7		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	163	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
7		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	163	0.362	0.322	0.362	7.160	0.004	3.623	0.397	0.214	0.000	0.000	0.217
8	West Basin	(clam shell dredge 513,000 CY)															
8		Marine Clamshell Dredge															
8		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	86	4.365	4.365	4.365	132.698	0.145	75.661	7.354	5.785	0.000	0.000	5.785
8		Clamshell Dredge generator	Marine Equipment	dredging	onsite	86	3.274	3.274	3.274	99.524	0.109	56.746	5.516	3.196	0.000	0.000	3.196
8		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	86	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
8		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	86	0.612	0.544	0.612	11.387	0.007	6.116	0.631	0.362	0.000	0.000	0.367
8		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	86	0.088	0.079	0.088	1.571	0.001	1.103	0.087	0.065	0.000	0.000	0.066
8		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	86	11.008	9.797	11.008	204.968	0.122	110.080	11.360	6.511	0.000	0.000	6.606
8		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	86	1.588	1.413	1.588	28.286	0.022	19.850	1.568	1.174	0.000	0.000	1.191
8		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	86	0.406	0.361	0.406	8.024	0.004	4.061	0.445	0.240	0.000	0.000	0.244
8		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	86	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
8		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	86	0.362	0.322	0.362	7.160	0.004	3.623	0.397	0.214	0.000	0.000	0.217

Table H1.28  
Alternative 4 Emissions by Task

				Unmitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
7	West Basin	(clam shell dredge 975,000 CY)												
7		Marine Clamshell Dredge												
7		Clamshell Dredge hoist	Marine Equipment	711.508	711.508	711.508	21629.841	23.689	12332.804	1198.749	943.016	0.000	0.000	943.016
7		Clamshell Dredge generator	Marine Equipment	533.631	533.631	533.631	16222.381	17.767	9249.603	899.061	521.021	0.000	0.000	521.021
7		Clamshell Barge dump scow	Marine Equipment	7.546	7.546	7.546	143.380	0.251	130.802	7.946	5.156	0.000	0.000	5.156
7		Clamshell Tugboat propulsion engine	Marine Equipment	99.683	88.718	99.683	1856.099	1.101	996.831	102.867	58.962	0.001	0.003	59.820
7		Clamshell Tugboat auxiliary engine	Marine Equipment	14.380	12.798	14.380	256.145	0.198	179.751	14.196	10.632	0.000	0.001	10.786
7		Clamshell Tugboat propulsion engine	Marine Equipment	1794.296	1596.923	1794.296	33409.790	19.809	17942.959	1851.606	1061.316	0.016	0.050	1076.752
7		Clamshell Tugboat auxiliary engine	Marine Equipment	258.842	230.369	258.842	4610.617	3.572	3235.521	255.525	191.379	0.002	0.009	194.146
7		Clamshell Crew boat propulsion engine	Marine Equipment	66.187	58.907	66.187	1307.864	0.731	661.874	72.483	39.149	0.001	0.002	39.720
7		Clamshell Crew boat auxiliary engine	Marine Equipment	5.488	4.884	5.488	97.754	0.076	68.599	5.418	4.058	0.000	0.000	4.116
7		Clamshell Survey boat propulsion engine	Marine Equipment	59.060	52.563	59.060	1167.017	0.652	590.596	64.677	34.933	0.001	0.002	35.442
8	West Basin	(clam shell dredge 513,000 CY)												
8		Marine Clamshell Dredge												
8		Clamshell Dredge hoist	Marine Equipment	375.397	375.397	375.397	11412.063	12.499	6506.878	632.469	497.542	0.000	0.000	497.542
8		Clamshell Dredge generator	Marine Equipment	281.548	281.548	281.548	8559.048	9.374	4880.159	474.351	274.894	0.000	0.000	274.894
8		Clamshell Barge dump scow	Marine Equipment	3.981	3.981	3.981	75.648	0.133	69.012	4.193	2.720	0.000	0.000	2.720
8		Clamshell Tugboat propulsion engine	Marine Equipment	52.594	46.808	52.594	979.292	0.581	525.935	54.273	31.109	0.000	0.001	31.561
8		Clamshell Tugboat auxiliary engine	Marine Equipment	7.587	6.752	7.587	135.144	0.105	94.838	7.490	5.610	0.000	0.000	5.691
8		Clamshell Tugboat propulsion engine	Marine Equipment	946.684	842.549	946.684	17627.251	10.451	9466.837	976.921	559.958	0.008	0.027	568.102
8		Clamshell Tugboat auxiliary engine	Marine Equipment	136.567	121.544	136.567	2432.595	1.885	1707.085	134.817	100.973	0.001	0.005	102.433
8		Clamshell Crew boat propulsion engine	Marine Equipment	34.921	31.080	34.921	690.039	0.386	349.210	38.243	20.656	0.000	0.001	20.956
8		Clamshell Crew boat auxiliary engine	Marine Equipment	2.895	2.577	2.895	51.576	0.040	36.193	2.858	2.141	0.000	0.000	2.172
8		Clamshell Survey boat propulsion engine	Marine Equipment	31.160	27.733	31.160	615.727	0.344	311.603	34.124	18.431	0.000	0.001	18.700

Table H1.28  
Alternative 4 Emissions by Task

				Mitigated										
				Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
				(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
7	West Basin	(clam shell dredge 975,000 CY)												
7		Marine Clamshell Dredge												
7		Clamshell Dredge hoist	Marine Equipment	0.437	0.437	0.437	13.270	0.015	7.566	0.735	0.579	0.000	0.000	0.579
7		Clamshell Dredge generator	Marine Equipment	0.327	0.327	0.327	9.952	0.011	5.675	0.552	0.320	0.000	0.000	0.320
7		Clamshell Barge dump scow	Marine Equipment	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
7		Clamshell Tugboat propulsion engine	Marine Equipment	0.416	0.370	0.416	8.134	0.007	6.116	0.451	0.362	0.000	0.000	0.367
7		Clamshell Tugboat auxiliary engine	Marine Equipment	0.031	0.027	0.031	1.131	0.001	1.213	0.063	0.065	0.000	0.000	0.066
7		Clamshell Tugboat propulsion engine	Marine Equipment	7.485	6.662	7.485	146.406	0.122	110.080	8.114	6.511	0.000	0.000	6.605
7		Clamshell Tugboat auxiliary engine	Marine Equipment	0.556	0.495	0.556	20.366	0.022	21.835	1.129	1.174	0.000	0.000	1.191
7		Clamshell Crew boat propulsion engine	Marine Equipment	0.276	0.246	0.276	5.401	0.004	4.061	0.299	0.240	0.000	0.000	0.244
7		Clamshell Crew boat auxiliary engine	Marine Equipment	0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.025
7		Clamshell Survey boat propulsion engine	Marine Equipment	0.246	0.219	0.246	4.819	0.004	3.623	0.267	0.214	0.000	0.000	0.217
8	West Basin	(clam shell dredge 513,000 CY)												
8		Marine Clamshell Dredge												
8		Clamshell Dredge hoist	Marine Equipment	0.437	0.437	0.437	13.270	0.015	7.566	0.735	0.579	0.000	0.000	0.579
8		Clamshell Dredge generator	Marine Equipment	0.327	0.327	0.327	9.952	0.011	5.675	0.552	0.320	0.000	0.000	0.320
8		Clamshell Barge dump scow	Marine Equipment	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
8		Clamshell Tugboat propulsion engine	Marine Equipment	0.416	0.370	0.416	8.134	0.007	6.116	0.451	0.362	0.000	0.000	0.367
8		Clamshell Tugboat auxiliary engine	Marine Equipment	0.031	0.027	0.031	1.131	0.001	1.213	0.063	0.065	0.000	0.000	0.066
8		Clamshell Tugboat propulsion engine	Marine Equipment	7.485	6.662	7.485	146.406	0.122	110.080	8.114	6.511	0.000	0.000	6.605
8		Clamshell Tugboat auxiliary engine	Marine Equipment	0.556	0.495	0.556	20.366	0.022	21.835	1.129	1.174	0.000	0.000	1.191
8		Clamshell Crew boat propulsion engine	Marine Equipment	0.276	0.246	0.276	5.401	0.004	4.061	0.299	0.240	0.000	0.000	0.244
8		Clamshell Crew boat auxiliary engine	Marine Equipment	0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.025
8		Clamshell Survey boat propulsion engine	Marine Equipment	0.246	0.219	0.246	4.819	0.004	3.623	0.267	0.214	0.000	0.000	0.217
Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.														

Table H1.28  
Alternative 4 Emissions by Task

				Mitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
7	West Basin	(clam shell dredge 975,000 CY)												
7		Marine Clamshell Dredge												
7		Clamshell Dredge hoist	Marine Equipment	71.151	71.151	71.151	2162.984	2.369	1233.280	119.875	94.302	0.000	0.000	94.302
7		Clamshell Dredge generator	Marine Equipment	53.363	53.363	53.363	1622.238	1.777	924.960	89.906	52.102	0.000	0.000	52.102
7		Clamshell Barge dump scow	Marine Equipment	7.546	7.546	7.546	143.380	0.251	130.802	7.946	5.156	0.000	0.000	5.156
7		Clamshell Tugboat propulsion engine	Marine Equipment	67.785	60.328	67.785	1325.785	1.101	996.831	73.476	58.962	0.001	0.003	59.813
7		Clamshell Tugboat auxiliary engine	Marine Equipment	5.033	4.479	5.033	184.425	0.198	197.726	10.221	10.632	0.000	0.001	10.785
7		Clamshell Tugboat propulsion engine	Marine Equipment	1220.121	1085.908	1220.121	23864.136	19.809	17942.959	1322.576	1061.316	0.011	0.050	1076.638
7		Clamshell Tugboat auxiliary engine	Marine Equipment	90.595	80.629	90.595	3319.644	3.572	3559.073	183.978	191.379	0.002	0.009	194.130
7		Clamshell Crew boat propulsion engine	Marine Equipment	45.007	40.057	45.007	880.293	0.731	661.874	48.787	39.149	0.000	0.002	39.715
7		Clamshell Crew boat auxiliary engine	Marine Equipment	1.921	1.709	1.921	70.383	0.076	75.459	3.901	4.058	0.000	0.000	4.116
7		Clamshell Survey boat propulsion engine	Marine Equipment	40.161	35.743	40.161	785.492	0.652	590.596	43.533	34.933	0.000	0.002	35.438
8	West Basin	(clam shell dredge 513,000 CY)												
8		Marine Clamshell Dredge												
8		Clamshell Dredge hoist	Marine Equipment	37.540	37.540	37.540	1141.206	1.250	650.688	63.247	49.754	0.000	0.000	49.754
8		Clamshell Dredge generator	Marine Equipment	28.155	28.155	28.155	855.905	0.937	488.016	47.435	27.489	0.000	0.000	27.489
8		Clamshell Barge dump scow	Marine Equipment	3.981	3.981	3.981	75.648	0.133	69.012	4.193	2.720	0.000	0.000	2.720
8		Clamshell Tugboat propulsion engine	Marine Equipment	35.764	31.830	35.764	699.494	0.581	525.935	38.767	31.109	0.000	0.001	31.558
8		Clamshell Tugboat auxiliary engine	Marine Equipment	2.655	2.363	2.655	97.304	0.105	104.322	5.393	5.610	0.000	0.000	5.690
8		Clamshell Tugboat propulsion engine	Marine Equipment	643.745	572.933	643.745	12590.894	10.451	9466.837	697.801	559.958	0.006	0.027	568.042
8		Clamshell Tugboat auxiliary engine	Marine Equipment	47.798	42.541	47.798	1751.469	1.885	1877.793	97.068	100.973	0.001	0.005	102.425
8		Clamshell Crew boat propulsion engine	Marine Equipment	23.746	21.134	23.746	464.449	0.386	349.210	25.740	20.656	0.000	0.001	20.954
8		Clamshell Crew boat auxiliary engine	Marine Equipment	1.013	0.902	1.013	37.134	0.040	39.813	2.058	2.141	0.000	0.000	2.172
8		Clamshell Survey boat propulsion engine	Marine Equipment	21.189	18.858	21.189	414.431	0.344	311.603	22.968	18.431	0.000	0.001	18.697
				Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.										



Table H1.28  
Alternative 4 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
9		Pier T Berths (clam shell dredge Berths T132 to T140, 44,000 CY)															
9		Marine Clamshell Dredge															
9		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	7	4.365	4.365	4.365	132.698	0.145	75.661	7.354	5.785	0.000	0.000	5.785
9		Clamshell Dredge generator	Marine Equipment	dredging	onsite	7	3.274	3.274	3.274	99.524	0.109	56.746	5.516	3.196	0.000	0.000	3.196
9		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	7	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
9		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	7	0.612	0.544	0.612	11.387	0.007	6.116	0.631	0.362	0.000	0.000	0.367
9		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	7	0.088	0.079	0.088	1.571	0.001	1.103	0.087	0.065	0.000	0.000	0.066
9		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	7	11.008	9.797	11.008	204.968	0.122	110.080	11.360	6.511	0.000	0.000	6.606
9		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	7	1.588	1.413	1.588	28.286	0.022	19.850	1.568	1.174	0.000	0.000	1.191
9		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	7	0.406	0.361	0.406	8.024	0.004	4.061	0.445	0.240	0.000	0.000	0.244
9		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	7	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
9		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	7	0.362	0.322	0.362	7.160	0.004	3.623	0.397	0.214	0.000	0.000	0.217
10		Pier J Basin (clam shell dredge 408,000 CY)															
10		Marine Clamshell Dredge															
10		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	68	4.365	4.365	4.365	132.698	0.145	75.661	7.354	5.785	0.000	0.000	5.785
10		Clamshell Dredge generator	Marine Equipment	dredging	onsite	68	3.274	3.274	3.274	99.524	0.109	56.746	5.516	3.196	0.000	0.000	3.196
10		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	68	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
10		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	68	0.612	0.544	0.612	11.387	0.007	6.116	0.631	0.362	0.000	0.000	0.367
10		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	68	0.088	0.079	0.088	1.571	0.001	1.103	0.087	0.065	0.000	0.000	0.066
10		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	68	11.008	9.797	11.008	204.968	0.122	110.080	11.360	6.511	0.000	0.000	6.606
10		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	68	1.588	1.413	1.588	28.286	0.022	19.850	1.568	1.174	0.000	0.000	1.191
10		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	68	0.406	0.361	0.406	8.024	0.004	4.061	0.445	0.240	0.000	0.000	0.244
10		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	68	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
10		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	68	0.362	0.322	0.362	7.160	0.004	3.623	0.397	0.214	0.000	0.000	0.217

Table H1.28  
Alternative 4 Emissions by Task

				Unmitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
9	Pier T Berths (clam shell dredge Berths T132 to T140, 44,000 CY)													
9		Marine Clamshell Dredge												
9		Clamshell Dredge hoist	Marine Equipment	30.556	30.556	30.556	928.889	1.017	529.630	51.480	40.498	0.000	0.000	40.498
9		Clamshell Dredge generator	Marine Equipment	22.917	22.917	22.917	696.667	0.763	397.222	38.610	22.375	0.000	0.000	22.375
9		Clamshell Barge dump scow	Marine Equipment	0.324	0.324	0.324	6.157	0.011	5.617	0.341	0.221	0.000	0.000	0.221
9		Clamshell Tugboat propulsion engine	Marine Equipment	4.281	3.810	4.281	79.710	0.047	42.809	4.418	2.532	0.000	0.000	2.569
9		Clamshell Tugboat auxiliary engine	Marine Equipment	0.618	0.550	0.618	11.000	0.009	7.719	0.610	0.457	0.000	0.000	0.463
9		Clamshell Tugboat propulsion engine	Marine Equipment	77.056	68.580	77.056	1434.776	0.851	770.557	79.517	45.578	0.001	0.002	46.241
9		Clamshell Tugboat auxiliary engine	Marine Equipment	11.116	9.893	11.116	198.002	0.153	138.949	10.973	8.219	0.000	0.000	8.338
9		Clamshell Crew boat propulsion engine	Marine Equipment	2.842	2.530	2.842	56.166	0.031	28.424	3.113	1.681	0.000	0.000	1.706
9		Clamshell Crew boat auxiliary engine	Marine Equipment	0.236	0.210	0.236	4.198	0.003	2.946	0.233	0.174	0.000	0.000	0.177
9		Clamshell Survey boat propulsion engine	Marine Equipment	2.536	2.257	2.536	50.117	0.028	25.363	2.778	1.500	0.000	0.000	1.522
10	Pier J Basin (clam shell dredge 408,000 CY)													
10		Marine Clamshell Dredge												
10		Clamshell Dredge hoist	Marine Equipment	296.825	296.825	296.825	9023.492	9.883	5144.974	500.091	393.406	0.000	0.000	393.406
10		Clamshell Dredge generator	Marine Equipment	222.619	222.619	222.619	6767.619	7.412	3858.730	375.069	217.358	0.000	0.000	217.358
10		Clamshell Barge dump scow	Marine Equipment	3.148	3.148	3.148	59.815	0.105	54.568	3.315	2.151	0.000	0.000	2.151
10		Clamshell Tugboat propulsion engine	Marine Equipment	41.586	37.011	41.586	774.324	0.459	415.856	42.914	24.598	0.000	0.001	24.955
10		Clamshell Tugboat auxiliary engine	Marine Equipment	5.999	5.339	5.999	106.858	0.083	74.988	5.922	4.436	0.000	0.000	4.500
10		Clamshell Tugboat propulsion engine	Marine Equipment	748.541	666.201	748.541	13937.827	8.264	7485.406	772.449	442.758	0.007	0.021	449.197
10		Clamshell Tugboat auxiliary engine	Marine Equipment	107.983	96.105	107.983	1923.448	1.490	1349.788	106.599	79.839	0.001	0.004	80.993
10		Clamshell Crew boat propulsion engine	Marine Equipment	27.612	24.575	27.612	545.612	0.305	276.119	30.238	16.332	0.000	0.001	16.570
10		Clamshell Crew boat auxiliary engine	Marine Equipment	2.289	2.038	2.289	40.781	0.032	28.618	2.260	1.693	0.000	0.000	1.717
10		Clamshell Survey boat propulsion engine	Marine Equipment	24.638	21.928	24.638	486.854	0.272	246.383	26.982	14.573	0.000	0.001	14.786

Table H1.28  
Alternative 4 Emissions by Task

				Mitigated										
				Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
9		Pier T Berths (clam shell dredge Berths T132 to T140, 44,000 CY)												
9		Marine Clamshell Dredge												
9		Clamshell Dredge hoist	Marine Equipment	0.437	0.437	0.437	13.270	0.015	7.566	0.735	0.579	0.000	0.000	0.579
9		Clamshell Dredge generator	Marine Equipment	0.327	0.327	0.327	9.952	0.011	5.675	0.552	0.320	0.000	0.000	0.320
9		Clamshell Barge dump scow	Marine Equipment	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
9		Clamshell Tugboat propulsion engine	Marine Equipment	0.416	0.370	0.416	8.134	0.007	6.116	0.451	0.362	0.000	0.000	0.367
9		Clamshell Tugboat auxiliary engine	Marine Equipment	0.031	0.027	0.031	1.131	0.001	1.213	0.063	0.065	0.000	0.000	0.066
9		Clamshell Tugboat propulsion engine	Marine Equipment	7.485	6.662	7.485	146.406	0.122	110.080	8.114	6.511	0.000	0.000	6.605
9		Clamshell Tugboat auxiliary engine	Marine Equipment	0.556	0.495	0.556	20.366	0.022	21.835	1.129	1.174	0.000	0.000	1.191
9		Clamshell Crew boat propulsion engine	Marine Equipment	0.276	0.246	0.276	5.401	0.004	4.061	0.299	0.240	0.000	0.000	0.244
9		Clamshell Crew boat auxiliary engine	Marine Equipment	0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.025
9		Clamshell Survey boat propulsion engine	Marine Equipment	0.246	0.219	0.246	4.819	0.004	3.623	0.267	0.214	0.000	0.000	0.217
10		Pier J Basin (clam shell dredge 408,000 CY)												
10		Marine Clamshell Dredge												
10		Clamshell Dredge hoist	Marine Equipment	0.437	0.437	0.437	13.270	0.015	7.566	0.735	0.579	0.000	0.000	0.579
10		Clamshell Dredge generator	Marine Equipment	0.327	0.327	0.327	9.952	0.011	5.675	0.552	0.320	0.000	0.000	0.320
10		Clamshell Barge dump scow	Marine Equipment	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
10		Clamshell Tugboat propulsion engine	Marine Equipment	0.416	0.370	0.416	8.134	0.007	6.116	0.451	0.362	0.000	0.000	0.367
10		Clamshell Tugboat auxiliary engine	Marine Equipment	0.031	0.027	0.031	1.131	0.001	1.213	0.063	0.065	0.000	0.000	0.066
10		Clamshell Tugboat propulsion engine	Marine Equipment	7.485	6.662	7.485	146.406	0.122	110.080	8.114	6.511	0.000	0.000	6.605
10		Clamshell Tugboat auxiliary engine	Marine Equipment	0.556	0.495	0.556	20.366	0.022	21.835	1.129	1.174	0.000	0.000	1.191
10		Clamshell Crew boat propulsion engine	Marine Equipment	0.276	0.246	0.276	5.401	0.004	4.061	0.299	0.240	0.000	0.000	0.244
10		Clamshell Crew boat auxiliary engine	Marine Equipment	0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.025
10		Clamshell Survey boat propulsion engine	Marine Equipment	0.246	0.219	0.246	4.819	0.004	3.623	0.267	0.214	0.000	0.000	0.217
Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.														

Table H1.28  
Alternative 4 Emissions by Task

				Mitigated Emissions										
				Total										
		Construction Element/Equipment	Source Type 1	PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID				(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
9	Pier T Berths	(clam shell dredge Berths T132 to T140, 44,000 CY)												
9		Marine Clamshell Dredge												
9		Clamshell Dredge hoist	Marine Equipment	3.056	3.056	3.056	92.889	0.102	52.963	5.148	4.050	0.000	0.000	4.050
9		Clamshell Dredge generator	Marine Equipment	2.292	2.292	2.292	69.667	0.076	39.722	3.861	2.238	0.000	0.000	2.238
9		Clamshell Barge dump scow	Marine Equipment	0.324	0.324	0.324	6.157	0.011	5.617	0.341	0.221	0.000	0.000	0.221
9		Clamshell Tugboat propulsion engine	Marine Equipment	2.911	2.591	2.911	56.936	0.047	42.809	3.155	2.532	0.000	0.000	2.569
9		Clamshell Tugboat auxiliary engine	Marine Equipment	0.216	0.192	0.216	7.920	0.009	8.491	0.439	0.457	0.000	0.000	0.463
9		Clamshell Tugboat propulsion engine	Marine Equipment	52.398	46.634	52.398	1024.840	0.851	770.557	56.798	45.578	0.000	0.002	46.236
9		Clamshell Tugboat auxiliary engine	Marine Equipment	3.891	3.463	3.891	142.561	0.153	152.844	7.901	8.219	0.000	0.000	8.337
9		Clamshell Crew boat propulsion engine	Marine Equipment	1.933	1.720	1.933	37.804	0.031	28.424	2.095	1.681	0.000	0.000	1.706
9		Clamshell Crew boat auxiliary engine	Marine Equipment	0.082	0.073	0.082	3.023	0.003	3.241	0.168	0.174	0.000	0.000	0.177
9		Clamshell Survey boat propulsion engine	Marine Equipment	1.725	1.535	1.725	33.733	0.028	25.363	1.870	1.500	0.000	0.000	1.522
10	Pier J Basin	(clam shell dredge 408,000 CY)												
10		Marine Clamshell Dredge												
10		Clamshell Dredge hoist	Marine Equipment	29.683	29.683	29.683	902.349	0.988	514.497	50.009	39.341	0.000	0.000	39.341
10		Clamshell Dredge generator	Marine Equipment	22.262	22.262	22.262	676.762	0.741	385.873	37.507	21.736	0.000	0.000	21.736
10		Clamshell Barge dump scow	Marine Equipment	3.148	3.148	3.148	59.815	0.105	54.568	3.315	2.151	0.000	0.000	2.151
10		Clamshell Tugboat propulsion engine	Marine Equipment	28.278	25.168	28.278	553.088	0.459	415.856	30.653	24.598	0.000	0.001	24.953
10		Clamshell Tugboat auxiliary engine	Marine Equipment	2.100	1.869	2.100	76.938	0.083	82.487	4.264	4.436	0.000	0.000	4.499
10		Clamshell Tugboat propulsion engine	Marine Equipment	509.008	453.017	509.008	9955.590	8.264	7485.406	551.749	442.758	0.005	0.021	449.150
10		Clamshell Tugboat auxiliary engine	Marine Equipment	37.794	33.637	37.794	1384.882	1.490	1484.767	76.752	79.839	0.001	0.004	80.987
10		Clamshell Crew boat propulsion engine	Marine Equipment	18.776	16.711	18.776	367.239	0.305	276.119	20.353	16.332	0.000	0.001	16.568
10		Clamshell Crew boat auxiliary engine	Marine Equipment	0.801	0.713	0.801	29.362	0.032	31.480	1.627	1.693	0.000	0.000	1.717
10		Clamshell Survey boat propulsion engine	Marine Equipment	16.754	14.911	16.754	327.690	0.272	246.383	18.161	14.573	0.000	0.001	14.784
				Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.										

Table H1.28  
Alternative 4 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
11		<b>Pier J Approach (clam shell dredge 1,066,000 CY)</b>															
11		<b>Marine Clamshell Dredge</b>															
11		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	178	4.365	4.365	4.365	132.698	0.145	75.661	7.354	5.785	0.000	0.000	5.785
11		Clamshell Dredge generator	Marine Equipment	dredging	onsite	178	3.274	3.274	3.274	99.524	0.109	56.746	5.516	3.196	0.000	0.000	3.196
11		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	178	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
11		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	178	0.612	0.544	0.612	11.387	0.007	6.116	0.631	0.362	0.000	0.000	0.367
11		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	178	0.088	0.079	0.088	1.571	0.001	1.103	0.087	0.065	0.000	0.000	0.066
11		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	178	11.008	9.797	11.008	204.968	0.122	110.080	11.360	6.511	0.000	0.000	6.606
11		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	178	1.588	1.413	1.588	28.286	0.022	19.850	1.568	1.174	0.000	0.000	1.191
11		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	178	0.406	0.361	0.406	8.024	0.004	4.061	0.445	0.240	0.000	0.000	0.244
11		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	178	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
11		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	178	0.362	0.322	0.362	7.160	0.004	3.623	0.397	0.214	0.000	0.000	0.217
12		<b>Pier J Approach (clam shell dredge 2,040,000 CY)</b>															
12		<b>Marine Clamshell Dredge</b>															
12		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	340	4.365	4.365	4.365	132.698	0.145	75.661	7.354	5.785	0.000	0.000	5.785
12		Clamshell Dredge generator	Marine Equipment	dredging	onsite	340	3.274	3.274	3.274	99.524	0.109	56.746	5.516	3.196	0.000	0.000	3.196
12		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	340	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
12		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	340	0.612	0.544	0.612	11.387	0.007	6.116	0.631	0.362	0.000	0.000	0.367
12		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	340	0.088	0.079	0.088	1.571	0.001	1.103	0.087	0.065	0.000	0.000	0.066
12		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	340	11.008	9.797	11.008	204.968	0.122	110.080	11.360	6.511	0.000	0.000	6.606
12		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	340	1.588	1.413	1.588	28.286	0.022	19.850	1.568	1.174	0.000	0.000	1.191
12		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	340	0.406	0.361	0.406	8.024	0.004	4.061	0.445	0.240	0.000	0.000	0.244
12		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	340	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
12		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	340	0.362	0.322	0.362	7.160	0.004	3.623	0.397	0.214	0.000	0.000	0.217

Table H1.28  
Alternative 4 Emissions by Task

				Unmitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
11		Pier J Approach (clam shell dredge 1,066,000 CY)												
11		Marine Clamshell Dredge												
11		Clamshell Dredge hoist	Marine Equipment	776.984	776.984	776.984	23620.317	25.869	13467.725	1309.063	1029.797	0.000	0.000	1029.797
11		Clamshell Dredge generator	Marine Equipment	582.738	582.738	582.738	17715.238	19.402	10100.794	981.797	568.968	0.000	0.000	568.968
11		Clamshell Barge dump scow	Marine Equipment	8.241	8.241	8.241	156.574	0.274	142.840	8.678	5.631	0.000	0.000	5.631
11		Clamshell Tugboat propulsion engine	Marine Equipment	108.856	96.882	108.856	2026.906	1.202	1088.564	112.333	64.388	0.001	0.003	65.324
11		Clamshell Tugboat auxiliary engine	Marine Equipment	15.703	13.976	15.703	279.717	0.217	196.293	15.502	11.611	0.000	0.001	11.778
11		Clamshell Tugboat propulsion engine	Marine Equipment	1959.415	1743.880	1959.415	36484.311	21.632	19594.152	2021.999	1158.983	0.017	0.055	1175.840
11		Clamshell Tugboat auxiliary engine	Marine Equipment	282.661	251.569	282.661	5034.907	3.901	3533.268	279.040	208.991	0.002	0.010	212.012
11		Clamshell Crew boat propulsion engine	Marine Equipment	72.278	64.328	72.278	1428.219	0.798	722.783	79.153	42.752	0.001	0.002	43.375
11		Clamshell Crew boat auxiliary engine	Marine Equipment	5.993	5.334	5.993	106.750	0.083	74.912	5.916	4.431	0.000	0.000	4.495
11		Clamshell Survey boat propulsion engine	Marine Equipment	64.494	57.400	64.494	1274.411	0.712	644.945	70.629	38.148	0.001	0.002	38.704
12		Pier J Approach (clam shell dredge 2,040,000 CY)												
12		Marine Clamshell Dredge												
12		Clamshell Dredge hoist	Marine Equipment	1484.127	1484.127	1484.127	45117.460	49.413	25724.868	2500.457	1967.028	0.000	0.000	1967.028
12		Clamshell Dredge generator	Marine Equipment	1113.095	1113.095	1113.095	33838.095	37.060	19293.651	1875.343	1086.792	0.000	0.000	1086.792
12		Clamshell Barge dump scow	Marine Equipment	15.741	15.741	15.741	299.074	0.524	272.840	16.575	10.755	0.000	0.000	10.755
12		Clamshell Tugboat propulsion engine	Marine Equipment	207.928	185.056	207.928	3871.618	2.296	2079.280	214.569	122.988	0.002	0.006	124.777
12		Clamshell Tugboat auxiliary engine	Marine Equipment	29.995	26.696	29.995	534.291	0.414	374.941	29.611	22.178	0.000	0.001	22.498
12		Clamshell Tugboat propulsion engine	Marine Equipment	3742.703	3331.006	3742.703	69689.133	41.319	37427.032	3862.245	2213.788	0.033	0.105	2245.986
12		Clamshell Tugboat auxiliary engine	Marine Equipment	539.915	480.524	539.915	9617.238	7.451	6748.939	532.997	399.196	0.005	0.019	404.967
12		Clamshell Crew boat propulsion engine	Marine Equipment	138.060	122.873	138.060	2728.059	1.524	1380.597	151.192	81.662	0.001	0.004	82.851
12		Clamshell Crew boat auxiliary engine	Marine Equipment	11.447	10.188	11.447	203.904	0.158	143.090	11.301	8.464	0.000	0.000	8.586
12		Clamshell Survey boat propulsion engine	Marine Equipment	123.192	109.641	123.192	2434.268	1.360	1231.917	134.910	72.867	0.001	0.003	73.929

Table H1.28  
Alternative 4 Emissions by Task

				Mitigated										
				Peak Day										
		Construction Element/Equipment	Source Type 1	PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID				(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
11	Pier J Approach (clam shell dredge 1,066,000 CY)													
11		Marine Clamshell Dredge												
11		Clamshell Dredge hoist	Marine Equipment	0.437	0.437	0.437	13.270	0.015	7.566	0.735	0.579	0.000	0.000	0.579
11		Clamshell Dredge generator	Marine Equipment	0.327	0.327	0.327	9.952	0.011	5.675	0.552	0.320	0.000	0.000	0.320
11		Clamshell Barge dump scow	Marine Equipment	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
11		Clamshell Tugboat propulsion engine	Marine Equipment	0.416	0.370	0.416	8.134	0.007	6.116	0.451	0.362	0.000	0.000	0.367
11		Clamshell Tugboat auxiliary engine	Marine Equipment	0.031	0.027	0.031	1.131	0.001	1.213	0.063	0.065	0.000	0.000	0.066
11		Clamshell Tugboat propulsion engine	Marine Equipment	7.485	6.662	7.485	146.406	0.122	110.080	8.114	6.511	0.000	0.000	6.605
11		Clamshell Tugboat auxiliary engine	Marine Equipment	0.556	0.495	0.556	20.366	0.022	21.835	1.129	1.174	0.000	0.000	1.191
11		Clamshell Crew boat propulsion engine	Marine Equipment	0.276	0.246	0.276	5.401	0.004	4.061	0.299	0.240	0.000	0.000	0.244
11		Clamshell Crew boat auxiliary engine	Marine Equipment	0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.025
11		Clamshell Survey boat propulsion engine	Marine Equipment	0.246	0.219	0.246	4.819	0.004	3.623	0.267	0.214	0.000	0.000	0.217
12	Pier J Approach (clam shell dredge 2,040,000 CY)													
12		Marine Clamshell Dredge												
12		Clamshell Dredge hoist	Marine Equipment	0.437	0.437	0.437	13.270	0.015	7.566	0.735	0.579	0.000	0.000	0.579
12		Clamshell Dredge generator	Marine Equipment	0.327	0.327	0.327	9.952	0.011	5.675	0.552	0.320	0.000	0.000	0.320
12		Clamshell Barge dump scow	Marine Equipment	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
12		Clamshell Tugboat propulsion engine	Marine Equipment	0.416	0.370	0.416	8.134	0.007	6.116	0.451	0.362	0.000	0.000	0.367
12		Clamshell Tugboat auxiliary engine	Marine Equipment	0.031	0.027	0.031	1.131	0.001	1.213	0.063	0.065	0.000	0.000	0.066
12		Clamshell Tugboat propulsion engine	Marine Equipment	7.485	6.662	7.485	146.406	0.122	110.080	8.114	6.511	0.000	0.000	6.605
12		Clamshell Tugboat auxiliary engine	Marine Equipment	0.556	0.495	0.556	20.366	0.022	21.835	1.129	1.174	0.000	0.000	1.191
12		Clamshell Crew boat propulsion engine	Marine Equipment	0.276	0.246	0.276	5.401	0.004	4.061	0.299	0.240	0.000	0.000	0.244
12		Clamshell Crew boat auxiliary engine	Marine Equipment	0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.025
12		Clamshell Survey boat propulsion engine	Marine Equipment	0.246	0.219	0.246	4.819	0.004	3.623	0.267	0.214	0.000	0.000	0.217
				Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.										

Table H1.28  
Alternative 4 Emissions by Task

				Mitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
11		Pier J Approach (clam shell dredge 1,066,000 CY)												
11		Marine Clamshell Dredge												
11		Clamshell Dredge hoist	Marine Equipment	77.698	77.698	77.698	2362.032	2.587	1346.772	130.906	102.980	0.000	0.000	102.980
11		Clamshell Dredge generator	Marine Equipment	58.274	58.274	58.274	1771.524	1.940	1010.079	98.180	56.897	0.000	0.000	56.897
11		Clamshell Barge dump scow	Marine Equipment	8.241	8.241	8.241	156.574	0.274	142.840	8.678	5.631	0.000	0.000	5.631
11		Clamshell Tugboat propulsion engine	Marine Equipment	74.022	65.880	74.022	1447.790	1.202	1088.564	80.238	64.388	0.001	0.003	65.318
11		Clamshell Tugboat auxiliary engine	Marine Equipment	5.496	4.892	5.496	201.396	0.217	215.922	11.162	11.611	0.000	0.001	11.778
11		Clamshell Tugboat propulsion engine	Marine Equipment	1332.402	1185.838	1332.402	26060.222	21.632	19594.152	1444.285	1158.983	0.012	0.055	1175.715
11		Clamshell Tugboat auxiliary engine	Marine Equipment	98.932	88.049	98.932	3625.133	3.901	3886.595	200.909	208.991	0.002	0.010	211.995
11		Clamshell Crew boat propulsion engine	Marine Equipment	49.149	43.743	49.149	961.301	0.798	722.783	53.276	42.752	0.000	0.002	43.369
11		Clamshell Crew boat auxiliary engine	Marine Equipment	2.098	1.867	2.098	76.860	0.083	82.403	4.260	4.431	0.000	0.000	4.495
11		Clamshell Survey boat propulsion engine	Marine Equipment	43.856	39.032	43.856	857.777	0.712	644.945	47.539	38.148	0.000	0.002	38.699
12		Pier J Approach (clam shell dredge 2,040,000 CY)												
12		Marine Clamshell Dredge												
12		Clamshell Dredge hoist	Marine Equipment	148.413	148.413	148.413	4511.746	4.941	2572.487	250.046	196.703	0.000	0.000	196.703
12		Clamshell Dredge generator	Marine Equipment	111.310	111.310	111.310	3383.810	3.706	1929.365	187.534	108.679	0.000	0.000	108.679
12		Clamshell Barge dump scow	Marine Equipment	15.741	15.741	15.741	299.074	0.524	272.840	16.575	10.755	0.000	0.000	10.755
12		Clamshell Tugboat propulsion engine	Marine Equipment	141.391	125.838	141.391	2765.442	2.296	2079.280	153.264	122.988	0.001	0.006	124.764
12		Clamshell Tugboat auxiliary engine	Marine Equipment	10.498	9.344	10.498	384.690	0.414	412.435	21.320	22.178	0.000	0.001	22.496
12		Clamshell Tugboat propulsion engine	Marine Equipment	2545.038	2265.084	2545.038	49777.952	41.319	37427.032	2758.747	2213.788	0.024	0.105	2245.749
12		Clamshell Tugboat auxiliary engine	Marine Equipment	188.970	168.184	188.970	6924.411	7.451	7423.833	383.758	399.196	0.003	0.019	404.935
12		Clamshell Crew boat propulsion engine	Marine Equipment	93.881	83.554	93.881	1836.194	1.524	1380.597	101.764	81.662	0.001	0.004	82.840
12		Clamshell Crew boat auxiliary engine	Marine Equipment	4.007	3.566	4.007	146.811	0.158	157.399	8.136	8.464	0.000	0.000	8.585
12		Clamshell Survey boat propulsion engine	Marine Equipment	83.770	74.556	83.770	1638.450	1.360	1231.917	90.805	72.867	0.001	0.003	73.919
				Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.										



Table H1.28  
Alternative 4 Emissions by Task

							Unmitigated Emissions										
							Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
13		Pier J Approach (clam shell dredge 297,000 CY)															
13		Marine Clamshell Dredge															
13		Clamshell Dredge hoist	Marine Equipment	dredging	onsite	50	4.365	4.365	4.365	132.698	0.145	75.661	7.354	5.785	0.000	0.000	5.785
13		Clamshell Dredge generator	Marine Equipment	dredging	onsite	50	3.274	3.274	3.274	99.524	0.109	56.746	5.516	3.196	0.000	0.000	3.196
13		Clamshell Barge dump scow	Marine Equipment	disposal	offsite	50	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
13		Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	50	0.612	0.544	0.612	11.387	0.007	6.116	0.631	0.362	0.000	0.000	0.367
13		Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	50	0.088	0.079	0.088	1.571	0.001	1.103	0.087	0.065	0.000	0.000	0.066
13		Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	50	11.008	9.797	11.008	204.968	0.122	110.080	11.360	6.511	0.000	0.000	6.606
13		Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	50	1.588	1.413	1.588	28.286	0.022	19.850	1.568	1.174	0.000	0.000	1.191
13		Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	50	0.406	0.361	0.406	8.024	0.004	4.061	0.445	0.240	0.000	0.000	0.244
13		Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	50	0.034	0.030	0.034	0.600	0.000	0.421	0.033	0.025	0.000	0.000	0.025
13		Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	50	0.362	0.322	0.362	7.160	0.004	3.623	0.397	0.214	0.000	0.000	0.217

Table H1.28  
Alternative 4 Emissions by Task

				Unmitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
13		Pier J Approach (clam shell dredge 297,000 CY)												
13		Marine Clamshell Dredge												
13		Clamshell Dredge hoist	Marine Equipment	218.254	218.254	218.254	6634.921	7.267	3783.069	367.714	289.269	0.000	0.000	289.269
13		Clamshell Dredge generator	Marine Equipment	163.690	163.690	163.690	4976.190	5.450	2837.302	275.786	159.822	0.000	0.000	159.822
13		Clamshell Barge dump scow	Marine Equipment	2.315	2.315	2.315	43.981	0.077	40.123	2.438	1.582	0.000	0.000	1.582
13		Clamshell Tugboat propulsion engine	Marine Equipment	30.578	27.214	30.578	569.356	0.338	305.776	31.554	18.087	0.000	0.001	18.350
13		Clamshell Tugboat auxiliary engine	Marine Equipment	4.411	3.926	4.411	78.572	0.061	55.138	4.355	3.261	0.000	0.000	3.309
13		Clamshell Tugboat propulsion engine	Marine Equipment	550.398	489.854	550.398	10248.402	6.076	5503.975	567.977	325.557	0.005	0.015	330.292
13		Clamshell Tugboat auxiliary engine	Marine Equipment	79.399	70.665	79.399	1414.300	1.096	992.491	78.382	58.705	0.001	0.003	59.554
13		Clamshell Crew boat propulsion engine	Marine Equipment	20.303	18.070	20.303	401.185	0.224	203.029	22.234	12.009	0.000	0.001	12.184
13		Clamshell Crew boat auxiliary engine	Marine Equipment	1.683	1.498	1.683	29.986	0.023	21.043	1.662	1.245	0.000	0.000	1.263
13		Clamshell Survey boat propulsion engine	Marine Equipment	18.116	16.124	18.116	357.981	0.200	181.164	19.840	10.716	0.000	0.001	10.872

Table H1.28  
Alternative 4 Emissions by Task

				Mitigated										
				Peak Day										
Task ID		Construction Element/Equipment	Source Type 1	PM10 (lb/day)	PM2.5 (lb/day)	DPM (lb/day)	NOX (lb/day)	SOX (lb/day)	CO (lb/day)	VOC (lb/day)	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
13		Pier J Approach (clam shell dredge 297,000 CY)												
13		Marine Clamshell Dredge												
13		Clamshell Dredge hoist	Marine Equipment	0.437	0.437	0.437	13.270	0.015	7.566	0.735	0.579	0.000	0.000	0.579
13		Clamshell Dredge generator	Marine Equipment	0.327	0.327	0.327	9.952	0.011	5.675	0.552	0.320	0.000	0.000	0.320
13		Clamshell Barge dump scow	Marine Equipment	0.046	0.046	0.046	0.880	0.002	0.802	0.049	0.032	0.000	0.000	0.032
13		Clamshell Tugboat propulsion engine	Marine Equipment	0.416	0.370	0.416	8.134	0.007	6.116	0.451	0.362	0.000	0.000	0.367
13		Clamshell Tugboat auxiliary engine	Marine Equipment	0.031	0.027	0.031	1.131	0.001	1.213	0.063	0.065	0.000	0.000	0.066
13		Clamshell Tugboat propulsion engine	Marine Equipment	7.485	6.662	7.485	146.406	0.122	110.080	8.114	6.511	0.000	0.000	6.605
13		Clamshell Tugboat auxiliary engine	Marine Equipment	0.556	0.495	0.556	20.366	0.022	21.835	1.129	1.174	0.000	0.000	1.191
13		Clamshell Crew boat propulsion engine	Marine Equipment	0.276	0.246	0.276	5.401	0.004	4.061	0.299	0.240	0.000	0.000	0.244
13		Clamshell Crew boat auxiliary engine	Marine Equipment	0.012	0.010	0.012	0.432	0.000	0.463	0.024	0.025	0.000	0.000	0.025
13		Clamshell Survey boat propulsion engine	Marine Equipment	0.246	0.219	0.246	4.819	0.004	3.623	0.267	0.214	0.000	0.000	0.217

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.28  
Alternative 4 Emissions by Task

				Mitigated Emissions										
				Total										
				PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	Source Type 1	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
13		Pier J Approach (clam shell dredge 297,000 CY)												
13		Marine Clamshell Dredge												
13		Clamshell Dredge hoist	Marine Equipment	21.825	21.825	21.825	663.492	0.727	378.307	36.771	28.927	0.000	0.000	28.927
13		Clamshell Dredge generator	Marine Equipment	16.369	16.369	16.369	497.619	0.545	283.730	27.579	15.982	0.000	0.000	15.982
13		Clamshell Barge dump scow	Marine Equipment	2.315	2.315	2.315	43.981	0.077	40.123	2.438	1.582	0.000	0.000	1.582
13		Clamshell Tugboat propulsion engine	Marine Equipment	20.793	18.506	20.793	406.683	0.338	305.776	22.539	18.087	0.000	0.001	18.348
13		Clamshell Tugboat auxiliary engine	Marine Equipment	1.544	1.374	1.544	56.572	0.061	60.652	3.135	3.261	0.000	0.000	3.308
13		Clamshell Tugboat propulsion engine	Marine Equipment	374.270	333.101	374.270	7320.287	6.076	5503.975	405.698	325.557	0.003	0.015	330.257
13		Clamshell Tugboat auxiliary engine	Marine Equipment	27.790	24.733	27.790	1018.296	1.096	1091.740	56.435	58.705	0.000	0.003	59.549
13		Clamshell Crew boat propulsion engine	Marine Equipment	13.806	12.287	13.806	270.029	0.224	203.029	14.965	12.009	0.000	0.001	12.182
13		Clamshell Crew boat auxiliary engine	Marine Equipment	0.589	0.524	0.589	21.590	0.023	23.147	1.197	1.245	0.000	0.000	1.263
13		Clamshell Survey boat propulsion engine	Marine Equipment	12.319	10.964	12.319	240.949	0.200	181.164	13.354	10.716	0.000	0.001	10.870

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.29  
Alternative 5 Emissions by Task

						Unmitigated Emissions										
						Peak Day										
						PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
Task ID	Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)				
1	<b>Electrical Substation Construction at Pier J (mitigation only)</b>															
1	<b>Off-Road Equipment</b>															
1	Caterpillar 320 excavator	Offroad Construction Equipment		onsite	20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Small asphalt roller	Offroad Construction Equipment		onsite	26	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Water truck	Offroad Construction Equipment		onsite	20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Forklift	Offroad Construction Equipment		onsite	22	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Mobile crane (35 ton)	Offroad Construction Equipment		onsite	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	On-Road Vehicles															
1	Haul trucks	Onroad Construction Vehicles		onsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Supply trucks	Onroad Construction Vehicles		onsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Haul trucks	Onroad Construction Vehicles		offsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Supply trucks	Onroad Construction Vehicles		offsite	5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Workers	Onroad Construction Vehicles		offsite	60	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Fugitive Dust															
1	Soil handling	Fugitive Emissions		onsite	20	n/a	n/a									
1	Asphalting	Fugitive Emissions		onsite												
2	<b>Pier J Breakwater Construction</b>															
2	<b>Marine Activities</b>															
2	Pier J Breakwater Tugboat propulsion engine	Marine Equipment		onsite	54	5.8097516	5.170679	5.80975164	108.17758	0.0641397	58.097516	5.9953151	3.4364356	5.16519E-05	0.000163389	3.4864167
2	Pier J Breakwater Tugboat auxiliary engine	Marine Equipment		onsite	54	1.0586571	0.9422048	1.05865709	18.857329	0.0146095	13.233214	1.045093	0.7827372	9.00388E-06	3.7216E-05	0.7940526
2	Pier J Breakwater Crew boat propulsion engine	Marine Equipment		onsite	54	0.4060579	0.3613915	0.40605791	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
2	Pier J Breakwater Crew boat auxiliary engine	Marine Equipment		onsite	54	0.0336683	0.0299648	0.03366828	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
2	Pier J Breakwater Survey boat propulsion engine	Marine Equipment		onsite	54	0.3623286	0.3224725	0.3623286	7.1596131	0.0040001	3.623286	0.3967933	0.2143153	3.41853E-06	1.01898E-05	0.2174374
2	Off-Road Equipment															
2	Piling crane	Offroad Construction Equipment		onsite	54	0.208629	0.1919387	0.208629	5.0022874	0.0077334	2.6745656	0.4666913	0.3799798	0	0	0.3799798
2	Long arm excavator	Offroad Construction Equipment		onsite	54	0.0752002	0.0691842	0.07520024	2.1876515	0.0129141	2.7752975	0.3208734	0.6339765	0	0	0.6339765
2	On-Road Vehicles															
2	Delivery Trucks	Onroad Construction Vehicles		onsite	5	0.1472023	0.0369081	0.00015221	0.0787952	0.0002454	0.0091846	0.0010522	0.0117847	2.21692E-08	1.85239E-06	0.0123372
2	Delivery Trucks	Onroad Construction Vehicles		offsite	5	0.3360402	0.1510393	0.0222394	3.216786	0.0191435	0.1848032	0.0255705	0.919133	5.38734E-07	0.000144475	0.9622
2	Workers	Onroad Construction Vehicles		offsite	54	0.0643898	0.0267123	0	0.0582129	0.0036865	0.9591501	0.0149813	0.1690333	1.73503E-06	2.96976E-06	0.1699616
3	<b>Approach Channel (hopper dredge 2,600,000 CY)</b>															
3	<b>Marine Hopper Dredge</b>															
3	Hopper propulsion engine	Marine Equipment	dredging	onsite	150	26.632138	23.702603	26.6321383	495.89041	0.2940188	266.32138	27.482769	15.752761	0.000236775	0.000748981	15.981876
3	Hopper propulsion engine	Marine Equipment	transit	offsite	150	50.30515	44.771584	50.3051501	936.68189	0.5553689	503.0515	51.911897	29.755215	0.000447241	0.001414742	30.187989
3	Hopper auxiliary engine	Marine Equipment	disposal	near shore	150	0.2219345	0.1975217	0.22193449	5.0601063	0.0040836	3.6989081	0.2804364	0.2187883	2.41607E-06	1.04025E-05	0.2219487
3	Hopper Crew boat propulsion engine	Marine Equipment	support	onsite	150	0.4060579	0.3613915	0.40605791	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
3	Hopper Crew boat auxiliary engine	Marine Equipment	support	onsite	150	0.0336683	0.0299648	0.03366828	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
3	Hopper Survey boat propulsion engine	Marine Equipment	dredging	onsite	150	1.4493144	1.2898898	1.44931439	28.638452	0.0160004	14.493144	1.5871732	0.8572613	1.36741E-05	4.07594E-05	0.8697495

Table H1.29  
Alternative 5 Emissions by Task

		Unmitigated Emissions											
		Total	PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
1	Electrical Substation Construction at Pier J (mitigation on												
1	Off-Road Equipment												
1	Caterpillar 320 excavator	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Small asphalt roller	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Water truck	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Forklift	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Mobile crane (35 ton)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	On-Road Vehicles												
1	Haul trucks	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Supply trucks	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Haul trucks	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Supply trucks	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Workers	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1	Fugitive Dust												
1	Soil handling	n/a	n/a										
1	Asphalting												
2	Pier J Breakwater Construction												
2	Marine Activities												
2	Pier J Breakwater Tugboat propulsion engine	313.72659	279.21666	313.72659	5841.5891	3.4635415	3137.2659	323.74702	185.56752	0.002789205	0.008822996	188.2665	
2	Pier J Breakwater Tugboat auxiliary engine	57.167483	50.87906	57.167483	1018.2958	0.7889113	714.59353	56.435024	42.267807	0.000486209	0.002009666	42.878843	
2	Pier J Breakwater Crew boat propulsion engine	21.927127	19.515143	21.927127	433.28003	0.2420755	219.27127	24.012836	12.969773	0.00020688	0.000616661	13.15871	
2	Pier J Breakwater Crew boat auxiliary engine	1.8180873	1.6180977	1.8180873	32.38468	0.0250896	22.726091	1.7947931	1.3442356	1.54628E-05	6.3913E-05	1.3636682	
2	Pier J Breakwater Survey boat propulsion engine	19.565744	17.413512	19.565744	386.61911	0.2160058	195.65744	21.426838	11.573028	0.0001846	0.000550251	11.741618	
2	Off-Road Equipment												
2	Piling crane	11.265966	10.364689	11.265966	270.12352	0.4176015	144.42654	25.20133	20.518908	0	0	20.518908	
2	Long arm excavator	4.0608129	3.7359478	4.0608129	118.13318	0.6973593	149.86606	17.327165	34.234729	0	0	34.234729	
2	On-Road Vehicles												
2	Delivery Trucks	0.7360113	0.1845407	0.0007611	0.3939759	0.0012272	0.0459231	0.0052612	0.0589233	1.10846E-07	9.26193E-06	0.0616862	
2	Delivery Trucks	1.680201	0.7551964	0.111197	16.08393	0.0957177	0.924016	0.1278527	4.595665	2.69367E-06	0.000722375	4.811	
2	Workers	3.4770481	1.4424651	0	3.1434973	0.199072	51.794108	0.8089905	9.1277972	9.36918E-05	0.000160367	9.1779288	
3	Approach Channel (hopper dredge 2,600,000 CY)												
3	Marine Hopper Dredge												
3	Hopper propulsion engine	3994.8207	3555.3905	3994.8207	74383.562	44.102821	39948.207	4122.4153	2362.9141	0.035516193	0.112347143	2397.2814	
3	Hopper propulsion engine	7545.7725	6715.7375	7545.7725	140502.28	83.305328	75457.725	7786.7845	4463.2822	0.067086143	0.212211269	4528.1983	
3	Hopper auxiliary engine	33.290173	29.628254	33.290173	759.01594	0.6125392	554.83621	42.065462	32.818251	0.00036241	0.001560377	33.292304	
3	Hopper Crew boat propulsion engine	60.908687	54.208731	60.908687	1203.5556	0.6724319	609.08687	66.702321	36.027147	0.000574666	0.001712947	36.551972	
3	Hopper Crew boat auxiliary engine	5.0502425	4.4947158	5.0502425	89.957445	0.0696933	63.128031	4.9855363	3.7339877	4.29523E-05	0.000177536	3.7879673	
3	Hopper Survey boat propulsion engine	217.39716	193.48347	217.39716	4295.7678	2.4000646	2173.9716	238.07598	128.5892	0.002051116	0.006113904	130.46242	

Table H1.29  
Alternative 5 Emissions by Task

			Mitigated										
			Peak Day										
Task ID		Construction Element/Equipment	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
1		Electrical Substation Construction at Pier J (mitigation on											
1		Off-Road Equipment											
1		Caterpillar 320 excavator	0.0164868	0.0164868	0.01648677	0.3297354	0.005393	1.2259134	0.1560831	0.2647818	0	0	0.2647818
1		Small asphalt roller	0.0048656	0.0048656	0.00486561	0.7353704	0.0011814	0.9067725	0.040755	0.058124	0	0	0.058124
1		Water truck	0.0301587	0.0301587	0.03015873	0.6031746	0.0098162	2.5873661	0.2964	0	0	0	0
1		Forklift	0.00097	0.00097	0.00097002	0.1466049	0.0002398	0.1631393	0.008125	0	0	0	0
1		Mobile crane (35 ton)	0.0216349	0.0216349	0.02163492	0.4326984	0.0069786	2.413528	0.212628	0	0	0	0
1		On-Road Vehicles											
1		Haul trucks	0.0883214	0.0221449	9.1328E-05	0.0472771	0.0001473	0.0055108	0.0006313	0.0070708	1.33015E-08	1.11143E-06	0.0074023
1		Supply trucks	0.2060832	0.0516714	0.0002131	0.1103132	0.0003436	0.0128585	0.0014731	0.0164985	3.10369E-08	2.59334E-06	0.0172721
1		Haul trucks	0.0110893	0.0049843	0.0007339	0.1061539	0.0006317	0.0060985	0.0008438	0.0303314	1.77782E-08	4.76767E-06	0.0317526
1		Supply trucks	0.0470456	0.0211455	0.00311352	0.45035	0.0026801	0.0258724	0.0035799	0.1286786	7.54228E-08	2.02265E-05	0.134708
1		Workers	0.0613236	0.0254403	0	0.0554409	0.003511	0.9134763	0.0142679	0.1609841	1.65241E-06	2.82834E-06	0.1618682
1		Fugitive Dust											
1		Soil handling	2.0058916	0.3037493									
1		Asphalting											
2		Pier J Breakwater Construction											
2		Marine Activities											
2		Pier J Breakwater Tugboat propulsion engine	3.9506311	3.5160617	3.95063112	77.269697	0.0641397	58.097516	4.2823679	3.4364356	3.68942E-05	0.000163389	3.4860478
2		Pier J Breakwater Tugboat auxiliary engine	0.37053	0.3297717	0.37052998	13.577277	0.0146095	14.556535	0.752467	0.7827372	6.48279E-06	3.7216E-05	0.7939896
2		Pier J Breakwater Crew boat propulsion engine	0.2761194	0.2457462	0.27611938	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
2		Pier J Breakwater Crew boat auxiliary engine	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
2		Pier J Breakwater Survey boat propulsion engine	0.2463834	0.2192813	0.24638345	4.8189703	0.0040001	3.623286	0.2670724	0.2143153	2.30093E-06	1.01898E-05	0.2174094
2		Off-Road Equipment											
2		Piling crane	0.0239749	0.0239749	0.02397487	0.4794974	0.0077334	2.6745656	0.235625	0.3799798	0	0	0.3799798
2		Long arm excavator	0.0395833	0.0395833	0.03958333	0.7916667	0.0129141	2.7752975	0.3208734	0.6339765	0	0	0.6339765
2		On-Road Vehicles											
2		Delivery Trucks	0.1472023	0.0369081	0.00015221	0.0787952	0.0002454	0.0091846	0.0010522	0.0117847	2.21692E-08	1.85239E-06	0.0123372
2		Delivery Trucks	0.3360402	0.1510393	0.0222394	3.216786	0.0191435	0.1848032	0.0255705	0.919133	5.38734E-07	0.000144475	0.9622
2		Workers	0.0643898	0.0267123	0	0.0582129	0.0036865	0.9591501	0.0149813	0.1690333	1.73503E-06	2.96976E-06	0.1699616
3		Approach Channel (hopper dredge 2,600,000 CY)											
3		Marine Hopper Dredge											
3		Hopper propulsion engine	26.632138	23.702603	26.6321383	495.89041	0.2940188	266.32138	27.482769	15.752761	0.000236775	0.000748981	15.981876
3		Hopper propulsion engine	50.30515	44.771584	50.3051501	936.68189	0.5553689	503.0515	51.911897	29.755215	0.000447241	0.001414742	30.187989
3		Hopper auxiliary engine	0.2219345	0.1975217	0.22193449	5.0601063	0.0040836	3.6989081	0.2804364	0.2187883	2.41607E-06	1.04025E-05	0.2219487
3		Hopper Crew boat propulsion engine	0.2761194	0.2457462	0.27611938	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
3		Hopper Crew boat auxiliary engine	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
3		Hopper Survey boat propulsion engine	0.9855338	0.8771251	0.98553378	19.275881	0.0160004	14.493144	1.0682896	0.8572613	9.20373E-06	4.07594E-05	0.8696377

Table H1.29  
Alternative 5 Emissions by Task

			Mitigated Emissions										
			Total										
			PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID		Construction Element/Equipment	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
1		Electrical Substation Construction at Pier J (mitigation on											
1		Off-Road Equipment											
1		Caterpillar 320 excavator	0.3297354	0.3297354	0.3297354	6.594709	0.1078608	24.518268	3.1216628	5.2956351	0	0	5.2956351
1		Small asphalt roller	0.1265058	0.1265058	0.1265058	19.11963	0.0307154	23.576085	1.05963	1.5112234	0	0	1.5112234
1		Water truck	0.6031746	0.6031746	0.6031746	12.063492	0.1963245	51.747323	5.928	0	0	0	0
1		Forklift	0.0213404	0.0213404	0.0213404	3.2253086	0.0052753	3.5890653	0.17875	0	0	0	0
1		Mobile crane (35 ton)	0.0432698	0.0432698	0.0432698	0.8653968	0.0139572	4.827056	0.425256	0	0	0	0
1		On-Road Vehicles											
1		Haul trucks	0.4416068	0.1107244	0.0004566	0.2363855	0.0007363	0.0275539	0.0031567	0.035354	6.65075E-08	5.55716E-06	0.0370117
1		Supply trucks	1.0304159	0.258357	0.0010655	0.5515662	0.0017181	0.0642924	0.0073657	0.0824927	1.55184E-07	1.29667E-05	0.0863606
1		Haul trucks	0.0554466	0.0249215	0.0036695	0.5307697	0.0031587	0.0304925	0.0042191	0.1516569	8.88911E-08	2.38384E-05	0.158763
1		Supply trucks	0.2352281	0.1057275	0.0155676	2.2517502	0.0134005	0.1293622	0.0178994	0.6433931	3.77114E-07	0.000101132	0.67354
1		Workers	3.679416	1.526418	0	3.3264522	0.2106582	54.80858	0.8560746	9.6590447	9.91447E-05	0.0001697	9.712094
1		Fugitive Dust											
1		Soil handling	40.117832	6.074986									
1		Asphalting											
2		Pier J Breakwater Construction											
2		Marine Activities											
2		Pier J Breakwater Tugboat propulsion engine	213.33408	189.86733	213.33408	4172.5636	3.4635415	3137.2659	231.24787	185.56752	0.001992289	0.008822996	188.24658
2		Pier J Breakwater Tugboat auxiliary engine	20.008619	17.807671	20.008619	733.17297	0.7889113	786.05289	40.633218	42.267807	0.000350071	0.002009666	42.87544
2		Pier J Breakwater Crew boat propulsion engine	14.910446	13.270297	14.910446	291.63079	0.2420755	219.27127	16.162485	12.969773	0.000139246	0.000616661	13.157019
2		Pier J Breakwater Crew boat auxiliary engine	0.6363306	0.5663342	0.6363306	23.31697	0.0250896	24.9987	1.292251	1.3442356	1.11332E-05	6.3913E-05	1.36356
2		Pier J Breakwater Survey boat propulsion engine	13.304706	11.841188	13.304706	260.2244	0.2160058	195.65744	14.42191	11.573028	0.00012425	0.000550251	11.740109
2		Off-Road Equipment											
2		Piling crane	1.2946429	1.2946429	1.2946429	25.892857	0.4176015	144.42654	12.72375	20.518908	0	0	20.518908
2		Long arm excavator	2.1375	2.1375	2.1375	42.75	0.6973593	149.86606	17.327165	34.234729	0	0	34.234729
2		On-Road Vehicles											
2		Delivery Trucks	0.7360113	0.1845407	0.0007611	0.3939759	0.0012272	0.0459231	0.0052612	0.0589233	1.10846E-07	9.26193E-06	0.0616862
2		Delivery Trucks	1.680201	0.7551964	0.111197	16.08393	0.0957177	0.924016	0.1278527	4.595665	2.69367E-06	0.000722375	4.811
2		Workers	3.4770481	1.4424651	0	3.1434973	0.199072	51.794108	0.8089905	9.1277972	9.36918E-05	0.000160367	9.1779288
3		Approach Channel (hopper dredge 2,600,000 CY)											
3		Marine Hopper Dredge											
3		Hopper propulsion engine	3994.8207	3555.3905	3994.8207	74383.562	44.102821	39948.207	4122.4153	2362.9141	0.035516193	0.112347143	2397.2814
3		Hopper propulsion engine	7545.7725	6715.7375	7545.7725	140502.28	83.305328	75457.725	7786.7845	4463.2822	0.067086143	0.212211269	4528.1983
3		Hopper auxiliary engine	33.290173	29.628254	33.290173	759.01594	0.6125392	554.83621	42.065462	32.818251	0.00036241	0.001560377	33.292304
3		Hopper Crew boat propulsion engine	41.417907	36.861937	41.417907	810.08553	0.6724319	609.08687	44.895793	36.027147	0.000386795	0.001712947	36.547275
3		Hopper Crew boat auxiliary engine	1.7675849	1.5731505	1.7675849	64.76936	0.0696933	69.440835	3.5895861	3.7339877	3.09257E-05	0.000177536	3.7876666
3		Hopper Survey boat propulsion engine	147.83007	131.56876	147.83007	2891.3822	2.4000646	2173.9716	160.24345	128.5892	0.001380559	0.006113904	130.44566



Table H1.29  
Alternative 5 Emissions by Task

						Unmitigated Emissions										
						Peak Day										
						PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
Task ID	Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)				
4	<b>Main Channel Widening (clam shell dredge 1,065,000 CY)</b>															
4	<b>Marine Clamshell Dredge</b>															
4	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	177	4.3650794	4.3650794	4.36507937	132.69841	0.145332	75.661376	7.3542857	5.7853765	0	0	5.7853765
4	Clamshell Dredge generator	Marine Equipment	dredging	onsite	177	3.2738095	3.2738095	3.27380952	99.52381	0.108999	56.746032	5.5157143	3.1964473	0	0	3.1964473
4	Clamshell Barge dump scow	Marine Equipment	disposal	offsite	177	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
4	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	177	0.6115528	0.544282	0.6115528	11.387113	0.0067515	6.115528	0.6310858	0.3617301	5.43705E-06	1.71988E-05	0.3669912
4	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	177	0.0882214	0.0785171	0.08822142	1.5714441	0.0012175	1.1027678	0.0870911	0.0652281	7.50323E-07	3.10134E-06	0.0661711
4	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	177	11.00795	9.7970759	11.0079505	204.96804	0.1215278	110.0795	11.359544	6.5111411	9.78668E-05	0.000309579	6.6058422
4	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	177	1.5879856	1.4133072	1.58798563	28.285994	0.0219142	19.84982	1.5676396	1.1741058	1.35058E-05	5.5824E-05	1.191079
4	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	177	0.4060579	0.3613915	0.40605791	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
4	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	177	0.0336683	0.0299648	0.03366828	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
4	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	177	0.3623286	0.3224725	0.3623286	7.1596131	0.0040001	3.623286	0.3967933	0.2143153	3.41853E-06	1.01898E-05	0.2174374
5	<b>West Basin (clam shell dredge 717,000 CY)</b>															
5	<b>Marine Clamshell Dredge</b>															
5	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	120	4.3650794	4.3650794	4.36507937	132.69841	0.145332	75.661376	7.3542857	5.7853765	0	0	5.7853765
5	Clamshell Dredge generator	Marine Equipment	dredging	onsite	120	3.2738095	3.2738095	3.27380952	99.52381	0.108999	56.746032	5.5157143	3.1964473	0	0	3.1964473
5	Clamshell Barge dump scow	Marine Equipment	disposal	offsite	120	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
5	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	120	0.6115528	0.544282	0.6115528	11.387113	0.0067515	6.115528	0.6310858	0.3617301	5.43705E-06	1.71988E-05	0.3669912
5	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	120	0.0882214	0.0785171	0.08822142	1.5714441	0.0012175	1.1027678	0.0870911	0.0652281	7.50323E-07	3.10134E-06	0.0661711
5	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	120	11.00795	9.7970759	11.0079505	204.96804	0.1215278	110.0795	11.359544	6.5111411	9.78668E-05	0.000309579	6.6058422
5	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	120	1.5879856	1.4133072	1.58798563	28.285994	0.0219142	19.84982	1.5676396	1.1741058	1.35058E-05	5.5824E-05	1.191079
5	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	120	0.4060579	0.3613915	0.40605791	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
5	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	120	0.0336683	0.0299648	0.03366828	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
5	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	120	0.3623286	0.3224725	0.3623286	7.1596131	0.0040001	3.623286	0.3967933	0.2143153	3.41853E-06	1.01898E-05	0.2174374
6	<b>Pier J Basin (clam shell dredge 258,000 CY)</b>															
6	<b>Marine Clamshell Dredge</b>															
6	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	43	4.3650794	4.3650794	4.36507937	132.69841	0.145332	75.661376	7.3542857	5.7853765	0	0	5.7853765
6	Clamshell Dredge generator	Marine Equipment	dredging	onsite	43	3.2738095	3.2738095	3.27380952	99.52381	0.108999	56.746032	5.5157143	3.1964473	0	0	3.1964473
6	Clamshell Barge dump scow	Marine Equipment	disposal	offsite	43	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
6	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	43	0.6115528	0.544282	0.6115528	11.387113	0.0067515	6.115528	0.6310858	0.3617301	5.43705E-06	1.71988E-05	0.3669912
6	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	43	0.0882214	0.0785171	0.08822142	1.5714441	0.0012175	1.1027678	0.0870911	0.0652281	7.50323E-07	3.10134E-06	0.0661711
6	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	43	11.00795	9.7970759	11.0079505	204.96804	0.1215278	110.0795	11.359544	6.5111411	9.78668E-05	0.000309579	6.6058422
6	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	43	1.5879856	1.4133072	1.58798563	28.285994	0.0219142	19.84982	1.5676396	1.1741058	1.35058E-05	5.5824E-05	1.191079
6	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	43	0.4060579	0.3613915	0.40605791	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
6	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	43	0.0336683	0.0299648	0.03366828	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
6	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	43	0.3623286	0.3224725	0.3623286	7.1596131	0.0040001	3.623286	0.3967933	0.2143153	3.41853E-06	1.01898E-05	0.2174374
7	<b>Pier J Basin (clam shell dredge 46,000 CY)</b>															
7	<b>Marine Clamshell Dredge</b>															
7	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	8	4.3650794	4.3650794	4.36507937	132.69841	0.145332	75.661376	7.3542857	5.7853765	0	0	5.7853765
7	Clamshell Dredge generator	Marine Equipment	dredging	onsite	8	3.2738095	3.2738095	3.27380952	99.52381	0.108999	56.746032	5.5157143	3.1964473	0	0	3.1964473
7	Clamshell Barge dump scow	Marine Equipment	disposal	offsite	8	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
7	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	8	0.6115528	0.544282	0.6115528	11.387113	0.0067515	6.115528	0.6310858	0.3617301	5.43705E-06	1.71988E-05	0.3669912
7	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	8	0.0882214	0.0785171	0.08822142	1.5714441	0.0012175	1.1027678	0.0870911	0.0652281	7.50323E-07	3.10134E-06	0.0661711
7	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	8	11.00795	9.7970759	11.0079505	204.96804	0.1215278	110.0795	11.359544	6.5111411	9.78668E-05	0.000309579	6.6058422
7	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	8	1.5879856	1.4133072	1.58798563	28.285994	0.0219142	19.84982	1.5676396	1.1741058	1.35058E-05	5.5824E-05	1.191079
7	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	8	0.4060579	0.3613915	0.40605791	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
7	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	8	0.0336683	0.0299648	0.03366828	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
7	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	8	0.3623286	0.3224725	0.3623286	7.1596131	0.0040001	3.623286	0.3967933	0.2143153	3.41853E-06	1.01898E-05	0.2174374

Table H1.29  
Alternative 5 Emissions by Task

		Unmitigated Emissions											
		Total	PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
4	Main Channel Widening (clam shell dredge 1,065,000 CY)												
4	Marine Clamshell Dredge												
4	Clamshell Dredge hoist	772.61905	772.61905	772.61905	23487.619	25.723764	13392.063	1301.7086	1024.0116		0	0	1024.0116
4	Clamshell Dredge generator	579.46429	579.46429	579.46429	17615.714	19.292823	10044.048	976.28143	565.77116		0	0	565.77116
4	Clamshell Barge dump scow	8.1944444	8.1944444	8.1944444	155.69444	0.2728278	142.03704	8.62875	6.7663102		0	0	6.7663102
4	Clamshell Tugboat propulsion engine	108.24485	96.337913	108.24485	2015.519	1.1950231	1082.4485	111.70219	64.02622	0.000962357	0.003044191	64.957448	
4	Clamshell Tugboat auxiliary engine	15.615192	13.897521	15.615192	278.14561	0.2154897	195.1899	15.415122	11.545373	0.000132807	0.000548936	11.712277	
4	Clamshell Tugboat propulsion engine	1948.4072	1734.0824	1948.4072	36279.343	21.510416	19484.072	2010.6394	1152.472	0.017322431	0.054795446	1169.2341	
4	Clamshell Tugboat auxiliary engine	281.07346	250.15538	281.07346	5006.6209	3.8788137	3513.4182	277.4722	207.81672	0.00239053	0.009880856	210.82098	
4	Clamshell Crew boat propulsion engine	71.87225	63.966303	71.87225	1420.1957	0.7934696	718.7225	78.708739	42.512033	0.000678106	0.002021278	43.131327	
4	Clamshell Crew boat auxiliary engine	5.9592862	5.3037647	5.9592862	106.14978	0.0822381	74.491077	5.8829328	4.4061055	0.000209493	0.000209493	4.4698014	
4	Clamshell Survey boat propulsion engine	64.132162	57.077624	64.132162	1267.2515	0.7080191	641.32162	70.232413	37.933814	0.000605079	0.001803602	38.486415	
5	West Basin (clam shell dredge 717,000 CY)												
5	Marine Clamshell Dredge												
5	Clamshell Dredge hoist	523.80952	523.80952	523.80952	15923.81	17.43984	9079.3651	882.51429	694.24519		0	0	694.24519
5	Clamshell Dredge generator	392.85714	392.85714	392.85714	11942.857	13.07988	6809.5238	661.88571	383.57367		0	0	383.57367
5	Clamshell Barge dump scow	5.5555556	5.5555556	5.5555556	105.55556	0.184968	96.296296	5.85	4.587329		0	0	4.587329
5	Clamshell Tugboat propulsion engine	73.386337	65.31384	73.386337	1366.4536	0.8101852	733.86337	75.730296	43.407607	0.000652446	0.002063859	44.038948	
5	Clamshell Tugboat auxiliary engine	10.586571	9.4220481	10.586571	188.57329	0.1460947	132.33214	10.45093	7.8273717	0.000388E-05	0.00037216	7.9405265	
5	Clamshell Tugboat propulsion engine	1320.9541	1175.6491	1320.9541	24596.165	14.583333	13209.541	1363.1453	781.33693	0.011744021	0.037149455	792.70107	
5	Clamshell Tugboat auxiliary engine	190.55828	169.59687	190.55828	3394.3193	2.6297042	2381.9784	188.11675	140.89269	0.001620698	0.006698886	142.92948	
5	Clamshell Crew boat propulsion engine	48.726949	43.366985	48.726949	962.84452	0.5379455	487.26949	53.361857	28.821718	0.000459733	0.001370358	29.241578	
5	Clamshell Crew boat auxiliary engine	4.040194	3.5957727	4.040194	71.965956	0.0557547	50.502425	3.988429	2.9871902	0.000142029	0.000142029	3.0303738	
5	Clamshell Survey boat propulsion engine	43.479432	38.696694	43.479432	859.15357	0.4800129	434.79432	47.615195	25.71784	0.000410223	0.001222781	26.092485	
6	Pier J Basin (clam shell dredge 258,000 CY)												
6	Marine Clamshell Dredge												
6	Clamshell Dredge hoist	187.69841	187.69841	187.69841	5706.0317	6.249276	3253.4392	316.23429	248.77119		0	0	248.77119
6	Clamshell Dredge generator	140.77381	140.77381	140.77381	4279.5238	4.686957	2440.0794	237.17571	137.44723		0	0	137.44723
6	Clamshell Barge dump scow	1.9907407	1.9907407	1.9907407	37.824074	0.0662802	34.506173	2.09625	1.6437929		0	0	1.6437929
6	Clamshell Tugboat propulsion engine	26.296771	23.404126	26.296771	489.64587	0.2903163	262.96771	27.136689	15.554393	0.000233793	0.000739549	15.780623	
6	Clamshell Tugboat auxiliary engine	3.7935212	3.3762339	3.7935212	67.572097	0.0523506	47.419015	3.7449167	2.8048082	0.000133357	0.000133357	2.8453553	
6	Clamshell Tugboat propulsion engine	473.34187	421.27426	473.34187	8813.6256	5.2256943	4733.4187	488.46041	279.97907	0.004208274	0.013311888	284.05122	
6	Clamshell Tugboat auxiliary engine	68.283382	60.77221	68.283382	1216.2977	0.9423107	853.54228	67.408501	50.486548	0.00058075	0.002400434	51.216396	
6	Clamshell Crew boat propulsion engine	17.46049	15.539836	17.46049	345.01929	0.1927638	174.6049	19.121332	10.327782	0.000164738	0.000491045	10.478232	
6	Clamshell Crew boat auxiliary engine	1.4477362	1.2884852	1.4477362	25.787801	0.0199788	18.096702	1.4291871	1.0704098	0.000131E-05	0.000131E-05	1.085884	
6	Clamshell Survey boat propulsion engine	15.58013	13.866315	15.58013	307.86336	0.1720046	155.8013	17.062112	9.2155595	0.000146997	0.000438163	9.349807	
7	Pier J Basin (clam shell dredge 46,000 CY)												
7	Marine Clamshell Dredge												
7	Clamshell Dredge hoist	34.920635	34.920635	34.920635	1061.5873	1.162656	605.29101	58.834286	46.283012		0	0	46.283012
7	Clamshell Dredge generator	26.190476	26.190476	26.190476	796.19048	0.871992	453.96825	44.125714	25.571578		0	0	25.571578
7	Clamshell Barge dump scow	0.3703704	0.3703704	0.3703704	7.037037	0.0123312	6.4197531	0.39	0.3058219		0	0	0.3058219
7	Clamshell Tugboat propulsion engine	4.8924224	4.354256	4.8924224	91.096906	0.0540123	48.924224	5.0486864	2.8938405	0.000137591	0.000137591	2.9359299	
7	Clamshell Tugboat auxiliary engine	0.7057714	0.6281365	0.7057714	12.571553	0.0097396	8.8221424	0.6967287	0.5218248	0.000259E-06	0.000259E-06	0.5293684	
7	Clamshell Tugboat propulsion engine	88.063604	78.376607	88.063604	1639.7443	0.9722222	880.63604	90.876355	52.089129	0.000782935	0.00247663	52.846738	
7	Clamshell Tugboat auxiliary engine	12.703885	11.306458	12.703885	226.28795	0.1753136	158.79856	12.541117	9.3928461	0.000108047	0.000446592	9.5286318	
7	Clamshell Crew boat propulsion engine	3.2484633	2.8911323	3.2484633	64.189634	0.035863	32.484633	3.5574571	1.9214478	0.000489E-05	9.13572E-05	1.9494385	
7	Clamshell Crew boat auxiliary engine	0.2693463	0.2397182	0.2693463	4.7977304	0.003717	3.3668283	0.2658953	0.199146	0.00029079E-06	9.4686E-06	0.2020249	
7	Clamshell Survey boat propulsion engine	2.8986288	2.5797796	2.8986288	57.276905	0.0320009	28.986288	3.1743463	1.7145227	0.0002482E-05	8.15187E-05	1.739499	

Table H1.29  
Alternative 5 Emissions by Task

		Mitigated										
		Peak Day										
		PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
4	Main Channel Widening (clam shell dredge 1,065,000 CY)											
4	Marine Clamshell Dredge											
4	Clamshell Dredge hoist	0.4365079	0.4365079	0.43650794	13.269841	0.0145332	7.5661376	0.7354286	0.5785377	0	0	0.5785377
4	Clamshell Dredge generator	0.327381	0.327381	0.32738095	9.952381	0.0108999	5.6746032	0.5515714	0.3196447	0	0	0.3196447
4	Clamshell Barge dump scow	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
4	Clamshell Tugboat propulsion engine	0.4158559	0.3701118	0.41585591	8.1336523	0.0067515	6.115528	0.4507756	0.3617301	3.8836E-06	1.71988E-05	0.3669524
4	Clamshell Tugboat auxiliary engine	0.0308775	0.027481	0.0308775	1.1314398	0.0012175	1.2130446	0.0627056	0.0652281	5.40233E-07	3.10134E-06	0.0661658
4	Clamshell Tugboat propulsion engine	7.4854063	6.6620116	7.48540633	146.40574	0.1215278	110.0795	8.1139603	6.5111411	6.99049E-05	0.000309579	6.6051432
4	Clamshell Tugboat auxiliary engine	0.555795	0.4946575	0.55579497	20.365916	0.0219142	21.834802	1.1287005	1.1741058	9.72419E-06	5.5824E-05	1.1909844
4	Clamshell Crew boat propulsion engine	0.2761194	0.2457462	0.27611938	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
4	Clamshell Crew boat auxiliary engine	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
4	Clamshell Survey boat propulsion engine	0.2463834	0.2192813	0.24638345	4.8189703	0.0040001	3.623286	0.2670724	0.2143153	2.30093E-06	1.01898E-05	0.2174094
5	West Basin (clam shell dredge 717,000 CY)											
5	Marine Clamshell Dredge											
5	Clamshell Dredge hoist	0.4365079	0.4365079	0.43650794	13.269841	0.0145332	7.5661376	0.7354286	0.5785377	0	0	0.5785377
5	Clamshell Dredge generator	0.327381	0.327381	0.32738095	9.952381	0.0108999	5.6746032	0.5515714	0.3196447	0	0	0.3196447
5	Clamshell Barge dump scow	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
5	Clamshell Tugboat propulsion engine	0.4158559	0.3701118	0.41585591	8.1336523	0.0067515	6.115528	0.4507756	0.3617301	3.8836E-06	1.71988E-05	0.3669524
5	Clamshell Tugboat auxiliary engine	0.0308775	0.027481	0.0308775	1.1314398	0.0012175	1.2130446	0.0627056	0.0652281	5.40233E-07	3.10134E-06	0.0661658
5	Clamshell Tugboat propulsion engine	7.4854063	6.6620116	7.48540633	146.40574	0.1215278	110.0795	8.1139603	6.5111411	6.99049E-05	0.000309579	6.6051432
5	Clamshell Tugboat auxiliary engine	0.555795	0.4946575	0.55579497	20.365916	0.0219142	21.834802	1.1287005	1.1741058	9.72419E-06	5.5824E-05	1.1909844
5	Clamshell Crew boat propulsion engine	0.2761194	0.2457462	0.27611938	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
5	Clamshell Crew boat auxiliary engine	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
5	Clamshell Survey boat propulsion engine	0.2463834	0.2192813	0.24638345	4.8189703	0.0040001	3.623286	0.2670724	0.2143153	2.30093E-06	1.01898E-05	0.2174094
6	Pier J Basin (clam shell dredge 258,000 CY)											
6	Marine Clamshell Dredge											
6	Clamshell Dredge hoist	0.4365079	0.4365079	0.43650794	13.269841	0.0145332	7.5661376	0.7354286	0.5785377	0	0	0.5785377
6	Clamshell Dredge generator	0.327381	0.327381	0.32738095	9.952381	0.0108999	5.6746032	0.5515714	0.3196447	0	0	0.3196447
6	Clamshell Barge dump scow	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
6	Clamshell Tugboat propulsion engine	0.4158559	0.3701118	0.41585591	8.1336523	0.0067515	6.115528	0.4507756	0.3617301	3.8836E-06	1.71988E-05	0.3669524
6	Clamshell Tugboat auxiliary engine	0.0308775	0.027481	0.0308775	1.1314398	0.0012175	1.2130446	0.0627056	0.0652281	5.40233E-07	3.10134E-06	0.0661658
6	Clamshell Tugboat propulsion engine	7.4854063	6.6620116	7.48540633	146.40574	0.1215278	110.0795	8.1139603	6.5111411	6.99049E-05	0.000309579	6.6051432
6	Clamshell Tugboat auxiliary engine	0.555795	0.4946575	0.55579497	20.365916	0.0219142	21.834802	1.1287005	1.1741058	9.72419E-06	5.5824E-05	1.1909844
6	Clamshell Crew boat propulsion engine	0.2761194	0.2457462	0.27611938	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
6	Clamshell Crew boat auxiliary engine	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
6	Clamshell Survey boat propulsion engine	0.2463834	0.2192813	0.24638345	4.8189703	0.0040001	3.623286	0.2670724	0.2143153	2.30093E-06	1.01898E-05	0.2174094
7	Pier J Basin (clam shell dredge 46,000 CY)											
7	Marine Clamshell Dredge											
7	Clamshell Dredge hoist	0.4365079	0.4365079	0.43650794	13.269841	0.0145332	7.5661376	0.7354286	0.5785377	0	0	0.5785377
7	Clamshell Dredge generator	0.327381	0.327381	0.32738095	9.952381	0.0108999	5.6746032	0.5515714	0.3196447	0	0	0.3196447
7	Clamshell Barge dump scow	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
7	Clamshell Tugboat propulsion engine	0.4158559	0.3701118	0.41585591	8.1336523	0.0067515	6.115528	0.4507756	0.3617301	3.8836E-06	1.71988E-05	0.3669524
7	Clamshell Tugboat auxiliary engine	0.0308775	0.027481	0.0308775	1.1314398	0.0012175	1.2130446	0.0627056	0.0652281	5.40233E-07	3.10134E-06	0.0661658
7	Clamshell Tugboat propulsion engine	7.4854063	6.6620116	7.48540633	146.40574	0.1215278	110.0795	8.1139603	6.5111411	6.99049E-05	0.000309579	6.6051432
7	Clamshell Tugboat auxiliary engine	0.555795	0.4946575	0.55579497	20.365916	0.0219142	21.834802	1.1287005	1.1741058	9.72419E-06	5.5824E-05	1.1909844
7	Clamshell Crew boat propulsion engine	0.2761194	0.2457462	0.27611938	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
7	Clamshell Crew boat auxiliary engine	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
7	Clamshell Survey boat propulsion engine	0.2463834	0.2192813	0.24638345	4.8189703	0.0040001	3.623286	0.2670724	0.2143153	2.30093E-06	1.01898E-05	0.2174094
Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.												

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.29  
Alternative 5 Emissions by Task

		Mitigated Emissions											
		Total											
		PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e	
Task ID	Construction Element/Equipment	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	
4	Main Channel Widening (clam shell dredge 1,065,000 CY)												
4	Marine Clamshell Dredge												
4	Clamshell Dredge hoist	77.261905	77.261905	77.261905	2348.7619	2.5723764	1339.2063	130.17086	102.40116	0	0	102.40116	
4	Clamshell Dredge generator	57.946429	57.946429	57.946429	1761.5714	1.9292823	1004.4048	97.628143	56.577116	0	0	56.577116	
4	Clamshell Barge dump scow	8.1944444	8.1944444	8.1944444	155.69444	0.2728278	142.03704	8.62875	6.7663102	0	0	6.7663102	
4	Clamshell Tugboat propulsion engine	73.606496	65.509781	73.606496	1439.6565	1.1950231	1082.4485	79.787276	64.02622	0.000687398	0.003044191	64.950574	
4	Clamshell Tugboat auxiliary engine	5.4653172	4.8641323	5.4653172	200.26484	0.2154897	214.70889	11.098888	11.545373	9.56212E-05	0.000548936	11.711347	
4	Clamshell Tugboat propulsion engine	1324.9169	1179.1761	1324.9169	25913.816	21.510416	19484.072	1436.171	1152.472	0.012373165	0.054795446	1169.1103	
4	Clamshell Tugboat auxiliary engine	98.37571	87.554382	98.37571	3604.7671	3.8788137	3864.76	199.77999	207.81672	0.001721181	0.009880856	210.80424	
4	Clamshell Crew boat propulsion engine	48.87313	43.497086	48.87313	955.90093	0.7934696	718.7225	52.977036	42.512033	0.000456418	0.002021278	43.125785	
4	Clamshell Crew boat auxiliary engine	2.0857502	1.8563176	2.0857502	76.427845	0.0822381	81.940185	4.2357116	4.4061055	3.64923E-05	0.000209493	4.4694466	
4	Clamshell Survey boat propulsion engine	43.60987	38.812784	43.60987	852.95775	0.7080191	641.32162	47.271816	37.933814	0.000407265	0.001803602	38.481469	
5	West Basin (clam shell dredge 717,000 CY)												
5	Marine Clamshell Dredge												
5	Clamshell Dredge hoist	52.380952	52.380952	52.380952	1592.381	1.743984	907.93651	88.251429	69.424519	0	0	69.424519	
5	Clamshell Dredge generator	39.285714	39.285714	39.285714	1194.2857	1.307988	680.95238	66.188571	38.357367	0	0	38.357367	
5	Clamshell Barge dump scow	5.5555556	5.5555556	5.5555556	105.55556	0.184968	96.296296	5.85	4.587329	0	0	4.587329	
5	Clamshell Tugboat propulsion engine	49.902709	44.413411	49.902709	976.03828	0.8101852	733.86337	54.093069	43.407607	0.000466033	0.002063859	44.034288	
5	Clamshell Tugboat auxiliary engine	3.7052998	3.2977168	3.7052998	135.77277	0.1460947	145.56535	7.5246699	7.8273717	6.48279E-05	0.00037216	7.9398962	
5	Clamshell Tugboat propulsion engine	898.24876	799.4414	898.24876	17568.689	14.583333	13209.541	973.67524	781.33693	0.008388587	0.037149455	792.61718	
5	Clamshell Tugboat auxiliary engine	66.695396	59.358903	66.695396	2443.9099	2.6297042	2620.1763	135.44406	140.89269	0.001166903	0.006698886	142.91813	
5	Clamshell Crew boat propulsion engine	33.134326	29.48955	33.134326	648.06843	0.5379455	487.26949	35.916634	28.821718	0.000309436	0.001370358	29.23782	
5	Clamshell Crew boat auxiliary engine	1.4140679	1.2585204	1.4140679	51.815488	0.0557547	55.552668	2.8716689	2.9871902	2.47405E-05	0.000142029	3.0301333	
5	Clamshell Survey boat propulsion engine	29.566014	26.313752	29.566014	578.27644	0.4800129	434.79432	32.048689	25.71784	0.000276112	0.001222781	26.089132	
6	Pier J Basin (clam shell dredge 258,000 CY)												
6	Marine Clamshell Dredge												
6	Clamshell Dredge hoist	18.769841	18.769841	18.769841	570.60317	0.6249276	325.34392	31.623429	24.877119	0	0	24.877119	
6	Clamshell Dredge generator	14.077381	14.077381	14.077381	427.95238	0.4686957	244.00794	23.717571	13.744723	0	0	13.744723	
6	Clamshell Barge dump scow	1.9907407	1.9907407	1.9907407	37.824074	0.0662802	34.506173	2.09625	1.6437929	0	0	1.6437929	
6	Clamshell Tugboat propulsion engine	17.881804	15.914806	17.881804	349.74705	0.2903163	262.96771	19.38335	15.554393	0.000166995	0.000739549	15.778953	
6	Clamshell Tugboat auxiliary engine	1.3277324	1.1816819	1.3277324	48.65191	0.0523506	52.160917	2.6963401	2.8048082	2.323E-05	0.000133357	2.8451295	
6	Clamshell Tugboat propulsion engine	321.87247	286.4665	321.87247	6295.4469	5.2256943	4733.4187	348.90029	279.97907	0.00300591	0.013311888	284.02116	
6	Clamshell Tugboat auxiliary engine	23.899184	21.270274	23.899184	875.73438	0.9423107	938.8965	48.534121	50.486548	0.00041814	0.002400434	51.212331	
6	Clamshell Crew boat propulsion engine	11.873133	10.567089	11.873133	232.22452	0.1927638	174.6049	12.870127	10.327782	0.000110881	0.000491045	10.476886	
6	Clamshell Crew boat auxiliary engine	0.5067077	0.4509698	0.5067077	18.567217	0.0199788	19.906373	1.0290147	1.0704098	8.86536E-06	5.08937E-05	1.0857978	
6	Clamshell Survey boat propulsion engine	10.594488	9.4290945	10.594488	207.21572	0.1720046	155.8013	11.484114	9.2155595	9.89401E-05	0.000438163	9.3486056	
7	Pier J Basin (clam shell dredge 46,000 CY)												
7	Marine Clamshell Dredge												
7	Clamshell Dredge hoist	3.4920635	3.4920635	3.4920635	106.15873	0.1162656	60.529101	5.8834286	4.6283012	0	0	4.6283012	
7	Clamshell Dredge generator	2.6190476	2.6190476	2.6190476	79.619048	0.0871992	45.396825	4.4125714	2.5571578	0	0	2.5571578	
7	Clamshell Barge dump scow	0.3703704	0.3703704	0.3703704	7.037037	0.0123312	6.4197531	0.39	0.3058219	0	0	0.3058219	
7	Clamshell Tugboat propulsion engine	3.3268473	2.9608941	3.3268473	65.069218	0.0540123	48.924224	3.6062046	2.8938405	3.10688E-05	0.000137591	2.9356192	
7	Clamshell Tugboat auxiliary engine	0.24702	0.2198478	0.24702	9.0515181	0.0097396	9.7043566	0.5016447	0.5218248	4.32186E-06	2.48107E-05	0.5293264	
7	Clamshell Tugboat propulsion engine	59.883251	53.296093	59.883251	1171.2459	0.9722222	880.63604	64.911682	52.089129	0.000559239	0.00247663	52.841145	
7	Clamshell Tugboat auxiliary engine	4.4463598	3.9572602	4.4463598	162.92733	0.1753136	174.67842	9.0296039	9.3928461	7.77935E-05	0.000446592	9.5278754	
7	Clamshell Crew boat propulsion engine	2.208955	1.96597	2.208955	43.204562	0.035863	32.484633	2.3944423	1.9214478	2.0629E-05	9.13572E-05	1.949188	
7	Clamshell Crew boat auxiliary engine	0.0942712	0.0839014	0.0942712	3.4543659	0.003717	3.7035112	0.1914446	0.199146	1.64937E-06	9.4686E-06	0.2020089	
7	Clamshell Survey boat propulsion engine	1.9710676	1.7542501	1.9710676	38.551763	0.0320009	28.986288	2.1365793	1.7145227	1.84075E-05	8.15187E-05	1.7392755	
Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.													

Table H1.29  
Alternative 5 Emissions by Task

						Unmitigated Emissions										
						Peak Day										
						PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2 (tonnes/day)	CH4 (tonnes/day)	N2O (tonnes/day)	CO2e (tonnes/day)
Task ID	Construction Element/Equipment	Source Type 1	Source Type 2	Onsite/Off site	Days Total	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)				
<b>8 Pier J Approach (clam shell dredge 1,994,000 CY)</b>																
8	Marine Clamshell Dredge															
8	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	332	4.3650794	4.3650794	4.36507937	132.69841	0.145332	75.661376	7.3542857	5.7853765	0	0	5.7853765
8	Clamshell Dredge generator	Marine Equipment	dredging	onsite	332	3.2738095	3.2738095	3.27380952	99.52381	0.108999	56.746032	5.5157143	3.1964473	0	0	3.1964473
8	Clamshell Barge dump scow	Marine Equipment	disposal	offsite	332	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
8	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	332	0.6115528	0.544282	0.6115528	11.387113	0.0067515	6.115528	0.6310858	0.3617301	5.43705E-06	1.71988E-05	0.3669912
8	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	332	0.0882214	0.0785171	0.08822142	1.5714441	0.0012175	1.1027678	0.0870911	0.0652281	7.50323E-07	3.10134E-06	0.0661711
8	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	332	11.00795	9.7970759	11.0079505	204.96804	0.1215278	110.0795	11.359544	6.5111411	9.78668E-05	0.000309579	6.6058422
8	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	332	1.5879856	1.4133072	1.58798563	28.285994	0.0219142	19.84982	1.5676396	1.1741058	1.35058E-05	5.5824E-05	1.191079
8	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	332	0.4060579	0.3613915	0.40605791	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
8	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	332	0.0336683	0.0299648	0.03366828	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
8	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	332	0.3623286	0.3224725	0.3623286	7.1596131	0.0040001	3.623286	0.3967933	0.2143153	3.41853E-06	1.01898E-05	0.2174374
<b>9 Pier J Approach (clam shell dredge 679,000 CY)</b>																
9	Marine Clamshell Dredge															
9	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	113	4.3650794	4.3650794	4.36507937	132.69841	0.145332	75.661376	7.3542857	5.7853765	0	0	5.7853765
9	Clamshell Dredge generator	Marine Equipment	dredging	onsite	113	3.2738095	3.2738095	3.27380952	99.52381	0.108999	56.746032	5.5157143	3.1964473	0	0	3.1964473
9	Clamshell Barge dump scow	Marine Equipment	disposal	offsite	113	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
9	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	113	0.6115528	0.544282	0.6115528	11.387113	0.0067515	6.115528	0.6310858	0.3617301	5.43705E-06	1.71988E-05	0.3669912
9	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	113	0.0882214	0.0785171	0.08822142	1.5714441	0.0012175	1.1027678	0.0870911	0.0652281	7.50323E-07	3.10134E-06	0.0661711
9	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	113	11.00795	9.7970759	11.0079505	204.96804	0.1215278	110.0795	11.359544	6.5111411	9.78668E-05	0.000309579	6.6058422
9	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	113	1.5879856	1.4133072	1.58798563	28.285994	0.0219142	19.84982	1.5676396	1.1741058	1.35058E-05	5.5824E-05	1.191079
9	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	113	0.4060579	0.3613915	0.40605791	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
9	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	113	0.0336683	0.0299648	0.03366828	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
9	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	113	0.3623286	0.3224725	0.3623286	7.1596131	0.0040001	3.623286	0.3967933	0.2143153	3.41853E-06	1.01898E-05	0.2174374
<b>10 Standby Area (clam shell dredge 921,000 CY)</b>																
10	Marine Clamshell Dredge															
10	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	227	4.3650794	4.3650794	4.36507937	132.69841	0.145332	75.661376	7.3542857	5.7853765	0	0	5.7853765
10	Clamshell Dredge generator	Marine Equipment	dredging	onsite	227	3.2738095	3.2738095	3.27380952	99.52381	0.108999	56.746032	5.5157143	3.1964473	0	0	3.1964473
10	Clamshell Barge dump scow	Marine Equipment	disposal	offsite	227	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
10	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	227	0.6115528	0.544282	0.6115528	11.387113	0.0067515	6.115528	0.6310858	0.3617301	5.43705E-06	1.71988E-05	0.3669912
10	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	227	0.0882214	0.0785171	0.08822142	1.5714441	0.0012175	1.1027678	0.0870911	0.0652281	7.50323E-07	3.10134E-06	0.0661711
10	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	227	11.00795	9.7970759	11.0079505	204.96804	0.1215278	110.0795	11.359544	6.5111411	9.78668E-05	0.000309579	6.6058422
10	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	227	1.5879856	1.4133072	1.58798563	28.285994	0.0219142	19.84982	1.5676396	1.1741058	1.35058E-05	5.5824E-05	1.191079
10	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	227	0.4060579	0.3613915	0.40605791	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
10	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	227	0.0336683	0.0299648	0.03366828	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
10	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	227	0.3623286	0.3224725	0.3623286	7.1596131	0.0040001	3.623286	0.3967933	0.2143153	3.41853E-06	1.01898E-05	0.2174374
<b>11 Standby Area (clam shell dredge 118,000 CY)</b>																
11	Marine Clamshell Dredge															
11	Clamshell Dredge hoist	Marine Equipment	dredging	onsite	54	4.3650794	4.3650794	4.36507937	132.69841	0.145332	75.661376	7.3542857	5.7853765	0	0	5.7853765
11	Clamshell Dredge generator	Marine Equipment	dredging	onsite	54	3.2738095	3.2738095	3.27380952	99.52381	0.108999	56.746032	5.5157143	3.1964473	0	0	3.1964473
11	Clamshell Barge dump scow	Marine Equipment	disposal	offsite	54	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
11	Clamshell Tugboat propulsion engine	Marine Equipment	dredging	onsite	54	0.6115528	0.544282	0.6115528	11.387113	0.0067515	6.115528	0.6310858	0.3617301	5.43705E-06	1.71988E-05	0.3669912
11	Clamshell Tugboat auxiliary engine	Marine Equipment	dredging	onsite	54	0.0882214	0.0785171	0.08822142	1.5714441	0.0012175	1.1027678	0.0870911	0.0652281	7.50323E-07	3.10134E-06	0.0661711
11	Clamshell Tugboat propulsion engine	Marine Equipment	transit	offsite	54	11.00795	9.7970759	11.0079505	204.96804	0.1215278	110.0795	11.359544	6.5111411	9.78668E-05	0.000309579	6.6058422
11	Clamshell Tugboat auxiliary engine	Marine Equipment	transit	offsite	54	1.5879856	1.4133072	1.58798563	28.285994	0.0219142	19.84982	1.5676396	1.1741058	1.35058E-05	5.5824E-05	1.191079
11	Clamshell Crew boat propulsion engine	Marine Equipment	support	onsite	54	0.4060579	0.3613915	0.40605791	8.0237043	0.0044829	4.0605791	0.4446821	0.240181	3.83111E-06	1.14196E-05	0.2436798
11	Clamshell Crew boat auxiliary engine	Marine Equipment	support	onsite	54	0.0336683	0.0299648	0.03366828	0.5997163	0.0004646	0.4208535	0.0332369	0.0248933	2.86349E-07	1.18357E-06	0.0252531
11	Clamshell Survey boat propulsion engine	Marine Equipment	dredging	onsite	54	0.3623286	0.3224725	0.3623286	7.1596131	0.0040001	3.623286	0.3967933	0.2143153	3.41853E-06	1.01898E-05	0.2174374

Table H1.29  
Alternative 5 Emissions by Task

		Unmitigated Emissions										
		Total										
Task ID	Construction Element/Equipment	PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
		(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)	(tonnes)	(tonnes)
<b>8</b>	<b>Pier J Approach (clam shell dredge 1,994,000 CY)</b>											
8	Marine Clamshell Dredge											
8	Clamshell Dredge hoist	1449.2063	1449.2063	1449.2063	44055.873	48.250224	25119.577	2441.6229	1920.745	0	0	1920.745
8	Clamshell Dredge generator	1086.9048	1086.9048	1086.9048	33041.905	36.187668	18839.683	1831.2171	1061.2205	0	0	1061.2205
8	Clamshell Barge dump scow	15.37037	15.37037	15.37037	292.03704	0.5117448	266.41975	16.185	12.69161	0	0	12.69161
8	Clamshell Tugboat propulsion engine	203.03553	180.70162	203.03553	3780.5216	2.2415123	2030.3553	209.52049	120.09438	0.0018051	0.005710009	121.84109
8	Clamshell Tugboat auxiliary engine	29.289513	26.067666	29.289513	521.71945	0.4041953	366.11891	28.914241	21.655728	0.000249107	0.001029644	21.96879
8	Clamshell Tugboat propulsion engine	3654.6396	3252.6292	3654.6396	68049.389	40.347221	36546.396	3771.3687	2161.6988	0.032491792	0.102780159	2193.1396
8	Clamshell Tugboat auxiliary engine	527.21123	469.21799	527.21123	9390.95	7.275515	6590.1404	520.45634	389.80311	0.004483932	0.018533584	395.43822
8	Clamshell Crew boat propulsion engine	134.81123	119.98199	134.81123	2663.8698	1.4883159	1348.1123	147.63447	79.740085	0.001271928	0.003791323	80.901698
8	Clamshell Crew boat auxiliary engine	11.17787	9.9483044	11.17787	199.10581	0.1542546	139.72338	11.034654	8.2645595	9.50678E-05	0.000392947	8.3840343
8	Clamshell Survey boat propulsion engine	120.29309	107.06085	120.29309	2376.9915	1.3280358	1202.9309	131.73537	71.152692	0.001134951	0.003383027	72.189207
<b>9</b>	<b>Pier J Approach (clam shell dredge 679,000 CY)</b>											
9	Marine Clamshell Dredge											
9	Clamshell Dredge hoist	493.25397	493.25397	493.25397	14994.921	16.422516	8549.7354	831.03429	653.74755	0	0	653.74755
9	Clamshell Dredge generator	369.94048	369.94048	369.94048	11246.19	12.316887	6412.3016	623.27571	361.19854	0	0	361.19854
9	Clamshell Barge dump scow	5.2314815	5.2314815	5.2314815	99.398148	0.1741782	90.679012	5.50875	4.3197348	0	0	4.3197348
9	Clamshell Tugboat propulsion engine	69.105467	61.503866	69.105467	1286.7438	0.7629244	691.05467	71.312696	40.875497	0.000614386	0.001943467	41.470009
9	Clamshell Tugboat auxiliary engine	9.9690209	8.8724286	9.9690209	177.57318	0.1375725	124.61276	9.8412928	7.370775	8.47865E-05	0.000350451	7.4773291
9	Clamshell Tugboat propulsion engine	1243.8984	1107.0696	1243.8984	23161.388	13.732638	12438.984	1283.6285	735.75894	0.011058953	0.034982404	746.46017
9	Clamshell Tugboat auxiliary engine	179.44238	159.70371	179.44238	3196.3173	2.4763048	2243.0297	177.14327	132.67395	0.001526157	0.006308117	134.59192
9	Clamshell Crew boat propulsion engine	45.884544	40.837244	45.884544	906.67859	0.5065654	458.84544	50.249082	27.140451	0.000432915	0.00129042	27.535819
9	Clamshell Crew boat auxiliary engine	3.804516	3.3860193	3.804516	67.767942	0.0525023	47.55645	3.7557707	2.8129374	3.23574E-05	0.000133744	2.853602
9	Clamshell Survey boat propulsion engine	40.943131	36.439387	40.943131	809.03628	0.4520122	409.43131	44.837642	24.217633	0.000386294	0.001151452	24.570423
<b>10</b>	<b>Standby Area (clam shell dredge 921,000 CY)</b>											
10	Marine Clamshell Dredge											
10	Clamshell Dredge hoist	990.87302	990.87302	990.87302	30122.54	32.990364	17175.132	1669.4229	1313.2805	0	0	1313.2805
10	Clamshell Dredge generator	743.15476	743.15476	743.15476	22591.905	24.742773	12881.349	1252.0671	725.59353	0	0	725.59353
10	Clamshell Barge dump scow	10.509259	10.509259	10.509259	199.67593	0.3498978	182.16049	11.06625	8.6776973	0	0	8.6776973
10	Clamshell Tugboat propulsion engine	138.82249	123.55201	138.82249	2584.8747	1.5326003	1388.2249	143.25648	82.112723	0.00123421	0.003904133	83.30701
10	Clamshell Tugboat auxiliary engine	20.026263	17.823374	20.026263	356.71781	0.2763624	250.32829	19.769677	14.806778	0.000170323	0.000704003	15.020829
10	Clamshell Tugboat propulsion engine	2498.8048	2223.9362	2498.8048	46527.745	27.586805	24988.048	2578.6166	1478.029	0.022215774	0.070274386	1499.5262
10	Clamshell Tugboat auxiliary engine	360.47274	320.82074	360.47274	6420.9206	4.9745238	4505.9092	355.85418	266.52201	0.003065821	0.012672059	270.37493
10	Clamshell Crew boat propulsion engine	92.175146	82.03588	92.175146	1821.3809	1.0176136	921.75146	100.94285	54.521082	0.000869661	0.00259226	55.315318
10	Clamshell Crew boat auxiliary engine	7.6427003	6.8020033	7.6427003	136.1356	0.1054693	95.533754	7.5447782	5.6507681	6.50012E-05	0.000268671	5.7324572
10	Clamshell Survey boat propulsion engine	82.248592	73.201246	82.248592	1625.2322	0.9080245	822.48592	90.072078	48.649581	0.000776006	0.002313094	49.358283
<b>11</b>	<b>Standby Area (clam shell dredge 118,000 CY)</b>											
11	Marine Clamshell Dredge											
11	Clamshell Dredge hoist	235.71429	235.71429	235.71429	7165.7143	7.847928	4085.7143	397.13143	312.41033	0	0	312.41033
11	Clamshell Dredge generator	176.78571	176.78571	176.78571	5374.2857	5.885946	3064.2857	297.84857	172.60815	0	0	172.60815
11	Clamshell Barge dump scow	2.5	2.5	2.5	47.5	0.0832356	43.333333	2.6325	2.064298	0	0	2.064298
11	Clamshell Tugboat propulsion engine	33.023851	29.391228	33.023851	614.90411	0.3645833	330.23851	34.078633	19.533423	0.000293601	0.000928736	19.817527
11	Clamshell Tugboat auxiliary engine	4.7639569	4.2399216	4.7639569	84.857982	0.0657426	59.549461	4.7029187	3.5223173	4.05175E-05	0.000167472	3.5732369
11	Clamshell Tugboat propulsion engine	594.42933	529.0421	594.42933	11068.274	6.5624998	5944.2933	613.4154	351.60162	0.00528481	0.016717255	356.71548
11	Clamshell Tugboat auxiliary engine	85.751224	76.318589	85.751224	1527.4437	1.1833669	1071.8903	84.652537	63.401711	0.000729314	0.003014499	64.318264
11	Clamshell Crew boat propulsion engine	21.927127	19.515143	21.927127	433.28003	0.2420755	219.27127	24.012836	12.969773	0.00020688	0.000616661	13.15871
11	Clamshell Crew boat auxiliary engine	1.8180873	1.6180977	1.8180873	32.38468	0.0250896	22.726091	1.7947931	1.3442356	1.54628E-05	6.3913E-05	1.3636682
11	Clamshell Survey boat propulsion engine	19.565744	17.413512	19.565744	386.61911	0.2160058	195.65744	21.426838	11.573028	0.0001846	0.000550251	11.741618

Table H1.29  
Alternative 5 Emissions by Task

		Mitigated										
		Peak Day										
		PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Task ID	Construction Element/Equipment	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(lb/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)	(tonnes/day)
8	Pier J Approach (clam shell dredge 1,994,000 CY)											
8	Marine Clamshell Dredge											
8	Clamshell Dredge hoist	0.4365079	0.4365079	0.43650794	13.269841	0.0145332	7.5661376	0.7354286	0.5785377	0	0	0.5785377
8	Clamshell Dredge generator	0.327381	0.327381	0.32738095	9.952381	0.0108999	5.6746032	0.5515714	0.3196447	0	0	0.3196447
8	Clamshell Barge dump scow	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
8	Clamshell Tugboat propulsion engine	0.4158559	0.3701118	0.41585591	8.1336523	0.0067515	6.115528	0.4507756	0.3617301	3.8836E-06	1.71988E-05	0.3669524
8	Clamshell Tugboat auxiliary engine	0.0308775	0.027481	0.0308775	1.1314398	0.0012175	1.2130446	0.0627056	0.0652281	5.40233E-07	3.10134E-06	0.0661658
8	Clamshell Tugboat propulsion engine	7.4854063	6.6620116	7.48540633	146.40574	0.1215278	110.0795	8.1139603	6.5111411	6.99049E-05	0.000309579	6.6051432
8	Clamshell Tugboat auxiliary engine	0.555795	0.496575	0.55579497	20.365916	0.0219142	21.834802	1.1287005	1.1741058	9.72419E-06	5.5824E-05	1.1909844
8	Clamshell Crew boat propulsion engine	0.2761194	0.2457462	0.27611938	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
8	Clamshell Crew boat auxiliary engine	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
8	Clamshell Survey boat propulsion engine	0.2463834	0.2192813	0.24638345	4.8189703	0.0040001	3.623286	0.2670724	0.2143153	2.30093E-06	1.01898E-05	0.2174094
9	Pier J Approach (clam shell dredge 679,000 CY)											
9	Marine Clamshell Dredge											
9	Clamshell Dredge hoist	0.4365079	0.4365079	0.43650794	13.269841	0.0145332	7.5661376	0.7354286	0.5785377	0	0	0.5785377
9	Clamshell Dredge generator	0.327381	0.327381	0.32738095	9.952381	0.0108999	5.6746032	0.5515714	0.3196447	0	0	0.3196447
9	Clamshell Barge dump scow	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
9	Clamshell Tugboat propulsion engine	0.4158559	0.3701118	0.41585591	8.1336523	0.0067515	6.115528	0.4507756	0.3617301	3.8836E-06	1.71988E-05	0.3669524
9	Clamshell Tugboat auxiliary engine	0.0308775	0.027481	0.0308775	1.1314398	0.0012175	1.2130446	0.0627056	0.0652281	5.40233E-07	3.10134E-06	0.0661658
9	Clamshell Tugboat propulsion engine	7.4854063	6.6620116	7.48540633	146.40574	0.1215278	110.0795	8.1139603	6.5111411	6.99049E-05	0.000309579	6.6051432
9	Clamshell Tugboat auxiliary engine	0.555795	0.496575	0.55579497	20.365916	0.0219142	21.834802	1.1287005	1.1741058	9.72419E-06	5.5824E-05	1.1909844
9	Clamshell Crew boat propulsion engine	0.2761194	0.2457462	0.27611938	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
9	Clamshell Crew boat auxiliary engine	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
9	Clamshell Survey boat propulsion engine	0.2463834	0.2192813	0.24638345	4.8189703	0.0040001	3.623286	0.2670724	0.2143153	2.30093E-06	1.01898E-05	0.2174094
10	Standby Area (clam shell dredge 921,000 CY)											
10	Marine Clamshell Dredge											
10	Clamshell Dredge hoist	0.4365079	0.4365079	0.43650794	13.269841	0.0145332	7.5661376	0.7354286	0.5785377	0	0	0.5785377
10	Clamshell Dredge generator	0.327381	0.327381	0.32738095	9.952381	0.0108999	5.6746032	0.5515714	0.3196447	0	0	0.3196447
10	Clamshell Barge dump scow	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
10	Clamshell Tugboat propulsion engine	0.4158559	0.3701118	0.41585591	8.1336523	0.0067515	6.115528	0.4507756	0.3617301	3.8836E-06	1.71988E-05	0.3669524
10	Clamshell Tugboat auxiliary engine	0.0308775	0.027481	0.0308775	1.1314398	0.0012175	1.2130446	0.0627056	0.0652281	5.40233E-07	3.10134E-06	0.0661658
10	Clamshell Tugboat propulsion engine	7.4854063	6.6620116	7.48540633	146.40574	0.1215278	110.0795	8.1139603	6.5111411	6.99049E-05	0.000309579	6.6051432
10	Clamshell Tugboat auxiliary engine	0.555795	0.496575	0.55579497	20.365916	0.0219142	21.834802	1.1287005	1.1741058	9.72419E-06	5.5824E-05	1.1909844
10	Clamshell Crew boat propulsion engine	0.2761194	0.2457462	0.27611938	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
10	Clamshell Crew boat auxiliary engine	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
10	Clamshell Survey boat propulsion engine	0.2463834	0.2192813	0.24638345	4.8189703	0.0040001	3.623286	0.2670724	0.2143153	2.30093E-06	1.01898E-05	0.2174094
11	Standby Area (clam shell dredge 118,000 CY)											
11	Marine Clamshell Dredge											
11	Clamshell Dredge hoist	0.4365079	0.4365079	0.43650794	13.269841	0.0145332	7.5661376	0.7354286	0.5785377	0	0	0.5785377
11	Clamshell Dredge generator	0.327381	0.327381	0.32738095	9.952381	0.0108999	5.6746032	0.5515714	0.3196447	0	0	0.3196447
11	Clamshell Barge dump scow	0.0462963	0.0462963	0.0462963	0.8796296	0.0015414	0.8024691	0.04875	0.0382277	0	0	0.0382277
11	Clamshell Tugboat propulsion engine	0.4158559	0.3701118	0.41585591	8.1336523	0.0067515	6.115528	0.4507756	0.3617301	3.8836E-06	1.71988E-05	0.3669524
11	Clamshell Tugboat auxiliary engine	0.0308775	0.027481	0.0308775	1.1314398	0.0012175	1.2130446	0.0627056	0.0652281	5.40233E-07	3.10134E-06	0.0661658
11	Clamshell Tugboat propulsion engine	7.4854063	6.6620116	7.48540633	146.40574	0.1215278	110.0795	8.1139603	6.5111411	6.99049E-05	0.000309579	6.6051432
11	Clamshell Tugboat auxiliary engine	0.555795	0.496575	0.55579497	20.365916	0.0219142	21.834802	1.1287005	1.1741058	9.72419E-06	5.5824E-05	1.1909844
11	Clamshell Crew boat propulsion engine	0.2761194	0.2457462	0.27611938	5.4005702	0.0044829	4.0605791	0.2993053	0.240181	2.57863E-06	1.14196E-05	0.2436485
11	Clamshell Crew boat auxiliary engine	0.0117839	0.0104877	0.0117839	0.4317957	0.0004646	0.4629389	0.0239306	0.0248933	2.06171E-07	1.18357E-06	0.0252511
11	Clamshell Survey boat propulsion engine	0.2463834	0.2192813	0.24638345	4.8189703	0.0040001	3.623286	0.2670724	0.2143153	2.30093E-06	1.01898E-05	0.2174094

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.

Table H1.29  
Alternative 5 Emissions by Task

Task ID		Mitigated Emissions										
		Total										
		PM10	PM2.5	DPM	NOX	SOX	CO	VOC	CO2	CH4	N2O	CO2e
Construction Element/Equipment		(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(tonnes)	(tonnes)
8	Pier J Approach (clam shell dredge 1,994,000 CY)											
8	Marine Clamshell Dredge											
8	Clamshell Dredge hoist	144.92063	144.92063	144.92063	4405.5873	4.8250224	2511.9577	244.16229	192.0745	0	0	192.0745
8	Clamshell Dredge generator	108.69048	108.69048	108.69048	3304.1905	3.6187668	1883.9683	183.12171	106.12205	0	0	106.12205
8	Clamshell Barge dump scow	15.37037	15.37037	15.37037	292.03704	0.5117448	266.41975	16.185	12.69161	0	0	12.69161
8	Clamshell Tugboat propulsion engine	138.06416	122.8771	138.06416	2700.3726	2.2415123	2030.3553	149.65749	120.09438	0.001289357	0.005710009	121.8282
8	Clamshell Tugboat auxiliary engine	10.251329	9.1236832	10.251329	375.638	0.4041953	402.7308	20.818253	21.655728	0.000179357	0.001029644	21.967046
8	Clamshell Tugboat propulsion engine	2485.1549	2211.7879	2485.1549	48606.706	40.347221	36546.396	2693.8348	2161.6988	0.023208423	0.102780159	2192.9075
8	Clamshell Tugboat auxiliary engine	184.52393	164.2263	184.52393	6761.484	7.275515	7249.1544	374.72856	389.80311	0.003228431	0.018533584	395.40683
8	Clamshell Crew boat propulsion engine	91.671634	81.587754	91.671634	1792.9893	1.4883159	1348.1123	99.369355	79.740085	0.000856105	0.003791323	80.891302
8	Clamshell Crew boat auxiliary engine	3.9122545	3.4819065	3.9122545	143.35618	0.1542546	153.69571	7.9449506	8.2645595	6.84488E-05	0.000392947	8.3833688
8	Clamshell Survey boat propulsion engine	81.799304	72.801381	81.799304	1599.8982	1.3280358	1202.9309	88.66804	71.152692	0.000763909	0.003383027	72.179931
9	Pier J Approach (clam shell dredge 679,000 CY)											
9	Marine Clamshell Dredge											
9	Clamshell Dredge hoist	49.325397	49.325397	49.325397	1499.4921	1.6422516	854.97354	83.103429	65.374755	0	0	65.374755
9	Clamshell Dredge generator	36.994048	36.994048	36.994048	1124.619	1.2316887	641.23016	62.327571	36.119854	0	0	36.119854
9	Clamshell Barge dump scow	5.2314815	5.2314815	5.2314815	99.398148	0.1741782	90.679012	5.50875	4.3197348	0	0	4.3197348
9	Clamshell Tugboat propulsion engine	46.991718	41.822629	46.991718	919.10271	0.7629244	691.05467	50.93764	40.875497	0.000438847	0.001943467	41.465621
9	Clamshell Tugboat auxiliary engine	3.4891573	3.10535	3.4891573	127.85269	0.1375725	137.07404	7.307705	6.10463E-05	0.000350451	0.000350451	7.4767356
9	Clamshell Tugboat propulsion engine	845.85092	752.80731	845.85092	16543.849	13.732638	12438.984	916.87751	735.75894	0.007899252	0.034982404	746.38118
9	Clamshell Tugboat auxiliary engine	62.804832	55.8963	62.804832	2301.3485	2.4763048	2467.3327	127.54316	132.67395	0.001098833	0.006308117	134.58124
9	Clamshell Crew boat propulsion engine	31.20149	27.769326	31.20149	610.26443	0.5065654	458.84544	33.821497	27.140451	0.000291385	0.00129042	27.532281
9	Clamshell Crew boat auxiliary engine	1.3315806	1.1851067	1.3315806	48.792918	0.0525023	52.312095	2.7041549	2.8129374	2.32973E-05	0.000133744	2.8533755
9	Clamshell Survey boat propulsion engine	27.841329	24.778783	27.841329	544.54365	0.4520122	409.43131	30.179182	24.217633	0.000260005	0.001151452	24.567266
10	Standby Area (clam shell dredge 921,000 CY)											
10	Marine Clamshell Dredge											
10	Clamshell Dredge hoist	99.087302	99.087302	99.087302	3012.254	3.2990364	1717.5132	166.94229	131.32805	0	0	131.32805
10	Clamshell Dredge generator	74.315476	74.315476	74.315476	2259.1905	2.4742773	1288.1349	125.20671	72.559353	0	0	72.559353
10	Clamshell Barge dump scow	10.509259	10.509259	10.509259	199.67593	0.3498978	182.16049	11.06625	8.6776973	0	0	8.6776973
10	Clamshell Tugboat propulsion engine	94.399291	84.015369	94.399291	1846.3391	1.5326003	1388.2249	102.32605	82.112723	0.000881578	0.003904133	83.298194
10	Clamshell Tugboat auxiliary engine	7.0091921	6.238181	7.0091921	256.83683	0.2763624	275.36112	14.234167	14.806778	0.000122633	0.000704003	15.019637
10	Clamshell Tugboat propulsion engine	1699.1872	1512.2766	1699.1872	33234.103	27.586805	24988.048	1841.869	1478.029	0.01586841	0.070274386	1499.3675
10	Clamshell Tugboat auxiliary engine	126.16546	112.28726	126.16546	4623.0629	4.9745238	4956.5002	256.21501	266.52201	0.002207391	0.012672059	270.35347
10	Clamshell Crew boat propulsion engine	62.679099	55.784398	62.679099	1225.9294	1.0176136	921.75146	67.9423	54.521082	0.000585349	0.00259226	55.30821
10	Clamshell Crew boat auxiliary engine	2.6749451	2.3807012	2.6749451	98.017632	0.1054693	105.08713	5.4322403	5.6507681	4.68008E-05	0.000268671	5.7320022
10	Clamshell Survey boat propulsion engine	55.929042	49.776848	55.929042	1093.9063	0.9080245	822.48592	60.625437	48.649581	0.000522311	0.002313094	49.351941
11	Standby Area (clam shell dredge 118,000 CY)											
11	Marine Clamshell Dredge											
11	Clamshell Dredge hoist	23.571429	23.571429	23.571429	716.57143	0.7847928	408.57143	39.713143	31.241033	0	0	31.241033
11	Clamshell Dredge generator	17.678571	17.678571	17.678571	537.42857	0.5885946	306.42857	29.784857	17.260815	0	0	17.260815
11	Clamshell Barge dump scow	2.5	2.5	2.5	47.5	0.0832356	43.333333	2.6325	2.064298	0	0	2.064298
11	Clamshell Tugboat propulsion engine	22.456219	19.986035	22.456219	439.21722	0.3645833	330.23851	24.341881	19.533423	0.000209715	0.000928736	19.81543
11	Clamshell Tugboat auxiliary engine	1.6673849	1.4839726	1.6673849	61.097747	0.0657426	65.504407	3.3861015	3.5223173	2.91726E-05	0.000167472	3.5729533
11	Clamshell Tugboat propulsion engine	404.21194	359.74863	404.21194	7905.91	6.5624998	5944.2933	438.15386	351.60162	0.003774864	0.016717255	356.67773
11	Clamshell Tugboat auxiliary engine	30.012928	26.711506	30.012928	1099.7594	1.1833669	1179.0793	60.949826	63.401711	0.000525106	0.003014499	64.313159
11	Clamshell Crew boat propulsion engine	14.910446	13.270297	14.910446	291.63079	0.2420755	219.27127	16.162485	12.969773	0.000139246	0.000616661	13.157019
11	Clamshell Crew boat auxiliary engine	0.6363306	0.5663342	0.6363306	23.31697	0.0250896	24.9987	1.292251	1.3442356	1.11332E-05	6.3913E-05	1.36356
11	Clamshell Survey boat propulsion engine	13.304706	11.841188	13.304706	260.2244	0.2160058	195.65744	14.42191	11.573028	0.00012425	0.000550251	11.740109

Note: clamshell dredge would be electric with mitigation; assume 90 percent reduction in diesel exhaust emissions.



## Appendix H2 Criteria Pollutant Dispersion Modeling Analysis

### H2.1 Introduction

This appendix describes the methods and results of the air dispersion modeling performed to evaluate ground-level concentrations of criteria pollutants resulting from construction activities of All Action Alternatives. The Action Alternatives are described in detail in Section 4 (Plan Formulation). The No Action Alternative is also described in detail in Section 4 (Plan Formulation), is assessed qualitatively in Sections 5.5 (Air Quality Environmental Consequences) and 5.6 (Greenhouse Gas Environmental Consequences) of the DEIS/DEIR, and therefore is not included in this appendix. Implementation of the No Action and Action Alternatives would not result in operational activities and would therefore not result in operational impacts.

The air dispersion modeling was performed using the U.S. Environmental Protection Agency's (USEPA) AERMOD Modeling System, version 18081 (USEPA 2019a), which was the most recent version available at the time of the analysis. The following pollutants and averaging times were modeled:

- Nitrogen dioxide (NO<sub>2</sub>) - 1-hour and annual
- Carbon monoxide (CO) - 1-hour and 8-hour
- Sulfur dioxide (SO<sub>2</sub>) - 1-hour and 24-hour
- Particulate matter less than 10 microns in diameter (PM<sub>10</sub>) - 24-hour and annual
- Particulate matter less than 2.5 microns in diameter (PM<sub>2.5</sub>) - 24-hour

For CEQA impacts, the predicted ground-level concentrations were compared to applicable South Coast Air Quality Management District (SCAQMD) ambient air quality thresholds (SCAQMD 2019a) and the federal 1-hour NO<sub>2</sub> standard (USEPA 2019b) to determine their significance. SCAQMD also has ambient air quality thresholds for sulfate and lead; however, these pollutants were not modeled because impacts from the Action Alternatives would be well below the thresholds due to the low sulfur and lead levels in modern diesel fuel used in marine and other diesel equipment. The predicted ground-level concentrations were compared to the national ambient air quality standards (NAAQS) to determine their significance under NEPA.

### H2.2 Development of Emission Scenarios

#### Construction Emissions

The dispersion modeling analysis included emissions from the following construction sources:

- Marine sources (i.e., diesel engine exhaust from hopper dredge, clamshell dredge, tugboats, crew boats, and survey boats)
- Off-road construction equipment (diesel engine exhaust)
- On-road vehicles driving and idling onsite (diesel engine exhaust)
- Onsite fugitive dust

These construction sources are further described in Section 5.5 of the EIS/EIR. Construction emissions used in the modeling analysis were calculated using the methods described in Appendix H1. The approach to developing the emissions for the various averaging times required for the dispersion modeling analysis is described in the following paragraphs.

Annual emissions were calculated for each year of construction based on the proposed construction schedule and the number of workdays anticipated for each construction activity. Peak daily (i.e., 24-hour) emissions were calculated for each year of construction based on the construction schedule and the

anticipated daily hours of operation for each construction activity and equipment type. The peak daily emissions represent the highest emissions that would occur from the various combinations of overlapping construction activities during each year of construction. Peak 8-hour and 1-hour emission rates were scaled from the peak daily emission rates in proportion to the number of operating hours for each activity or equipment type. For example, equipment that would operate 8 hours per day would have scaling factors of 1.0 (8-hr averaging time/8 hours operation per day) for peak 8-hour and 0.125 (1-hr averaging time/8 hours operation per day) for peak 1-hour emissions (applied to the peak daily emission rates). Equipment that would operate 4 hours per day would have scaling factors of 1.0 (i.e., all emissions) for peak 8-hour and 0.25 (1-hr averaging time/4 hours operation per day) for peak 1-hour emissions. This approach conservatively assumes that all equipment that operates on the peak day would also operate during the peak 8-hour and 1-hour periods.

The construction schedule and activity assumptions were developed by USACE, the Port, and the Port's engineering consultant, AECOM, and are presented in Appendix H1 tables.

For the annual averaging period, the analysis year producing the highest total construction emissions within the modeling domain was selected for modeling. Specifically, the construction period when hopper dredging and clamshell dredging would occur in the same year would produce the highest emissions. For Action Alternatives 2, 3, and 5, this construction period would occur in 2025; for Action Alternative 4, this construction period would occur in 2026.

For short-term averaging periods (24-hour, 8-hour, 1-hour), the combination of overlapping construction tasks, described in Appendix H1, that would produce the highest concentrations was selected for modeling. The following three combinations were considered and evaluated via AERMOD test runs:

- Combination 1: Overlap of construction Task 1 (Electrical Substation Construction, mitigated scenario only), Task 2 (Pier J Breakwater Construction), Task 3 (Pier J Wharf Upgrade), and Task 4 (Pier T Wharf Upgrade)
- Combination 2: Overlap of construction Task 5 (Approach Channel Dredging) and Task 6 (Main Channel Widening)
- Combination 3: Construction Task 7 (Dredging of West Basin). This task would not overlap with other construction tasks but was chosen for consideration because dredging in the West Basin would be closest to land-receptors.

AERMOD test runs showed that for all Action Alternatives, the highest short-term concentrations would occur for Combination 2, during overlap of construction Task 5 (Approach Channel Dredging) and Task 6 (Main Channel Widening). Therefore, Combination 2 was selected for modeling.

The schedule and equipment utilization assumed in this analysis are anticipated to result in conservatively high emission estimates because assumptions reflect an accelerated schedule and the earliest foreseeable construction years. Postponement of construction activities from the assumed schedule would likely result in lower impacts as increasingly stringent regulatory requirements are implemented compared to those assumed in the analysis years. The anticipated construction schedule and equipment utilization for each Action Alternative are included in Appendix H1.

## H2.3 Dispersion Model Selection and Inputs

### Model Selection

AERMOD version 18081 (USEPA 2019a) was used to perform the dispersion modeling for the air quality impact analysis. The AERMOD model was selected for the following reasons:

- AERMOD is a USEPA regulatory default model for dispersion modeling;
- General acceptance by the modeling community and regulatory agencies of its ability to provide reasonable results for large industrial complexes with multiple emission sources;
- Ability of the model to handle the various physical characteristics of Project emission sources, including “point,” “area,” and “volume” source types.

### Temporal Distribution

Construction emission sources were modeled with diurnal emission patterns that reflect the daily cycle of activity associated with the Action Alternatives. The diurnal emission patterns assumed in AERMOD are shown in Table H2.1.

**Table H2.1. Temporal Distribution of Emissions in AERMOD**

Source Category	Time Period	Hours per Day
Hopper dredge	12am-12am	24
Clamshell dredge	12am-12am	24
Tugboats	12am-12am	24
Off-road construction equipment	7am-3pm	8
Crew boats	6am-6pm	12
Construction trucks	7am-3pm	8
Fugitive dust	7am-3pm	8

### Emission Source Representation

AERMOD simulated all construction emissions as a collection of line and polygon-area sources. Polygon area sources simulate emissions emanating from a flat, non-rectangular, area with no thermal buoyancy or velocity (plume rise) associated with the emissions. Polygon area sources were used to model all dredging activities, harbor craft activities during dredging activities, on-site truck emissions, and land-side on-site fugitive dust. Line sources simulate emissions from volume sources moving along a path based on a start-point, end-point, and the path width with no thermal buoyancy or velocity (plume rise) associated with the emissions. Line sources were used to model hopper dredge and tugboat activities during transit to off-shore disposal locations.

Table H2.2 provides the source parameters used in AERMOD for the polygon-area and line sources. The initial vertical dimensions for polygon-area and line sources were determined based on USEPA guidance (USEPA 2019c).

All emission sources were positioned by using the Universal Transverse Mercator 13 coordinate system (NAD-83) referenced to topographic data obtained from the United States Geological Survey (USGS).

Figure H2.1 shows the locations of the construction sources modeled in AERMOD. The figure depicts the sources used to model annual concentrations. For short-term concentrations (1-hour, 8-hour, and 24-

hour averages), the AERMOD sources associated with dredging activities were condensed into reasonable daily work areas conservatively located closest to on-land receptors. For example, the Approach Channel Dredging task ("J" in the figure) was condensed into a 200 meter by 100 meter rectangular source at the far northern end of the dredging area for the short-term modeling.

**Table H2.2. Source Parameters in AERMOD**

Source Category	Source Type	Source Height (m)	Vertical Dispersion Coefficient $\sigma_z$ (m) <sup>h</sup>	Line Source Width (m)
Hopper dredge – transit <sup>a</sup>	Line	21.29	4.95	100
Hopper dredge – dredging <sup>a</sup>	Poly-area	21.29	4.95	n/a
Clamshell dredge <sup>b</sup>	Poly-area	24.23	5.64	n/a
Tugboats – transit <sup>c</sup>	Line	15.2	3.5	100
Tugboats – dredging <sup>c</sup>	Poly-area	15.2	3.5	n/a
Off-road construction equipment <sup>d</sup>	Poly-area	4.6	1.1	n/a
Crew boats <sup>e</sup>	Poly-area	15.2	3.5	n/a
Construction trucks <sup>f</sup>	Poly-area	4.6	1.1	n/a
Fugitive dust <sup>g</sup>	Poly-area	1.0	0.2	n/a

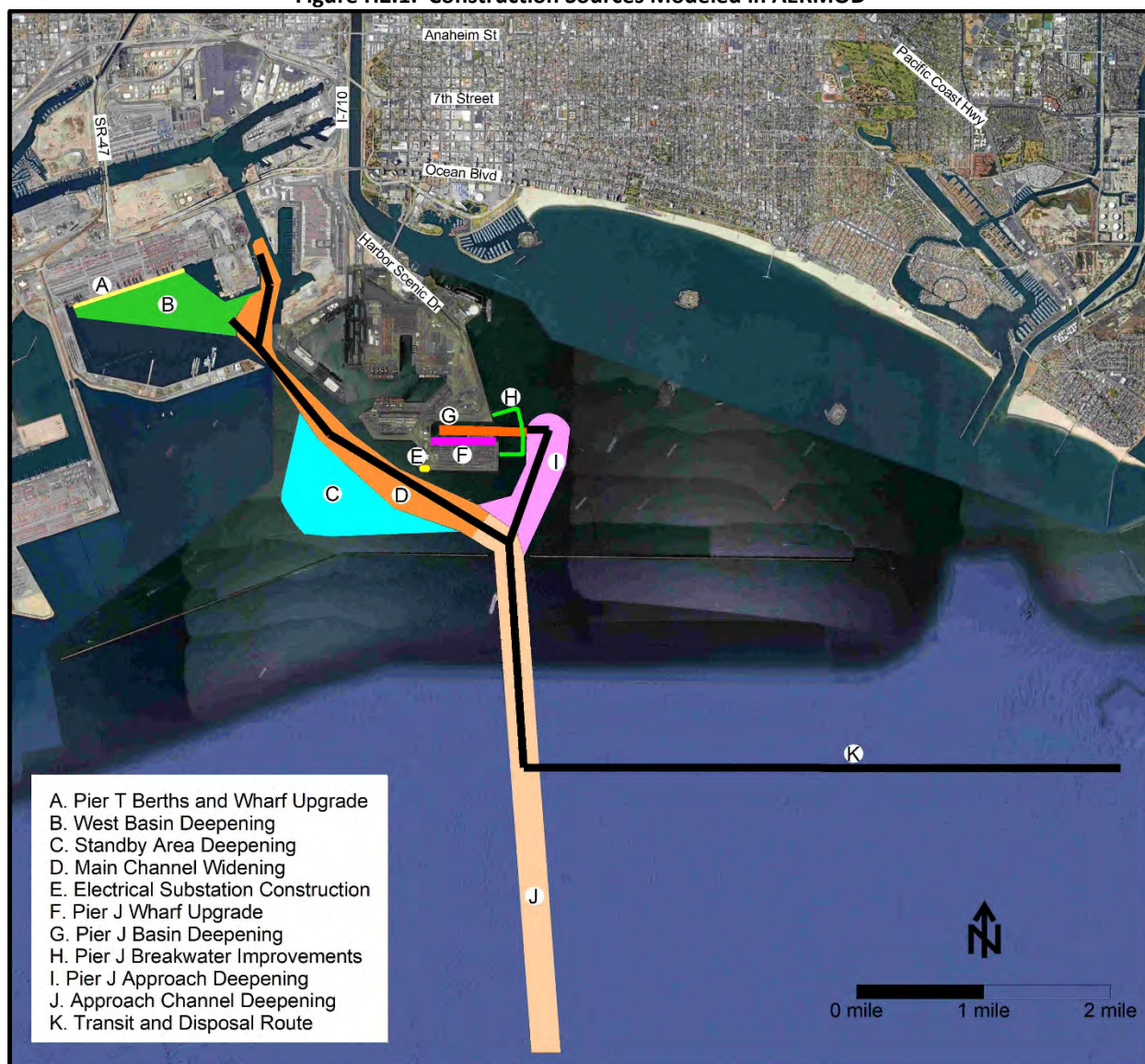
Notes:

- a. Release height (69'10") provided by Dutra Group (dredging contractor) for Stuyvesant hopper dredge (email from Dutra to iLanco 7/26/19). Width assumed to be 100 meters (approximately 50% of channel width).
- b. Release height (79'6") provided by Dutra Group (dredging contractor) for Stuyvesant hopper dredge (email from Dutra to iLanco 7/26/19).
- c. Source height (50') is from the Pier S Marine Terminal + Back Channel Improvements Project FEIS/FEIR (November 2012), Appendix B, Page A-2-7; and the Middle Harbor Redevelopment Project FEIS/FEIR (April 2009), Appendix A-2, Page A-2-6. Width assumed to be 100 meters (approximately 50% of channel width).
- d. Source height (15') is from the Pier S Marine Terminal + Back Channel Improvements Project FEIS/FEIR (November 2012), Appendix B, Page A-2-5; and the Middle Harbor Redevelopment Project FEIS/FEIR (April 2009), Appendix A-2, Page A-2-4.
- e. Source height is assumed to be similar to tugboats and therefore was set to 50'.
- f. Source height (15') is from the Pier S Marine Terminal + Back Channel Improvements Project FEIS/FEIR (November 2012), Appendix B, Page A-2-8; and the Middle Harbor Redevelopment Project FEIS/FEIR (April 2009), Appendix A-2, Page A-2-7.
- g. Fugitive dust source height is set close to ground-level, at a nominal 1 meter.
- h. Vertical dispersion coefficient was calculated by dividing the source height (assumed to be representative of the vertical dimension) by 4.3 in accordance with USEPA AERMOD guidelines (USEPA, 2019c).



1

**Figure H2.1. Construction Sources Modeled in AERMOD**



2

3

#### 4 Meteorological Data

5 Meteorological data recorded at the POLB Gull Park monitoring station was selected to simulate  
6 meteorological conditions within the dispersion modeling domain because of its proximity to the dredging  
7 areas and affected terminals. The AERMOD sources for the construction modeling are located in the  
8 Middle Harbor, Outer Harbor, and Beyond the Breakwater meteorological zones as defined in Figure I-3  
9 of the San Pedro Bay Ports' "Sphere of Influence" analysis (POLB and POLA 2010). According to the  
10 analysis, the four meteorological stations representative of those meteorological zones are Liberty Hill  
11 Plaza, Terminal Island Treatment Plant, Berth 47, and Gull Park. Figure I-3 of the analysis shows that the  
12 Gull Park station is the most centrally located station relative to the AERMOD sources. Therefore,  
13 meteorological data from the Gull Park station were selected for the AERMOD modeling.

14 The Gull Park meteorological data set was processed for use in AERMOD in 2018 (Leidos 2018) using the  
15 most recent available USEPA guidance (USEPA 2015; USEPA 2016). The SCAQMD provided additional input

and guidance on the overall methodology, dataset choice, physical parameter characterization, and seasonality/precipitation parameters. The processing was accomplished using USEPA's AERMET processor (Version 16216) and pre-processor programs AERMINUTE (Version 15272) and AERSURFACE (Version 13016). Consistent with USEPA's *Guideline on Air Quality Models* (USEPA 2017), the data set consists of hourly readings over a period of five calendar years. The five most recent available years meeting USEPA's data completeness requirements for wind speed, wind direction, and temperature were selected. For Gull Park, the selected years were 2011, 2012, 2013, 2015, and 2016. Year 2014 was not selected because it did not meet the data completeness requirement. Per USEPA guidance (USEPA 2017), the five selected years of data do not have to be consecutive.

## Modeling Approach

Standard control parameters were used in AERMOD, including stack-tip downwash, non-screening mode, non-flat terrain, and sequential meteorological data check. Use of these options follows the USEPA modeling guidance (USEPA 2017). Source and receptor elevations were determined using USEPA's AERMAP terrain preprocessor (version 18081) with 1 arcsecond national elevation dataset (NED) files. As recommended by SCAQMD (SCAQMD 2019b), all sources were modeled with urban dispersion coefficients. An urban population of 9,818,605 representative of the Los Angeles County was used in AERMOD.

Consistent with USEPA AERMOD Guidance (USEPA 2019), the conversion of nitrogen oxide (NO<sub>x</sub>) to NO<sub>2</sub> in ambient air was simulated in AERMOD using the Ambient Ratio Method (ARM2). The ARM2 option applies an ambient ratio to the 1-hr modeled NO<sub>x</sub> concentrations based on a formula derived empirically from ambient monitored ratios of NO<sub>2</sub>/NO<sub>x</sub>. The default upper and lower limits on the ambient ratio applied to the modeled NO<sub>x</sub> concentration are 0.9 and 0.5, respectively.

For each combination of pollutant and averaging time except for the federal 1-hour NO<sub>2</sub> concentration, the highest concentration of all modeled off-site receptors is reported in the results tables at the end of this appendix. To be consistent with the federal 1-hour NO<sub>2</sub> standard, the federal 1-hour NO<sub>2</sub> concentration is the 98th percentile (8th highest) of the annual distribution of the daily maximum 1-hour concentrations, averaged over all five years of meteorological data.

The CEQA significance thresholds for ambient concentrations are presented in Section 12.2.3 of the EIS/EIR. The NO<sub>2</sub> and CO thresholds are absolute concentration thresholds, meaning that the modeled concentrations are added to the background concentrations for the Project vicinity, and the resulting total concentrations are compared to the thresholds (SCAQMD 2011, USEPA 2019b). The PM<sub>10</sub> and PM<sub>2.5</sub> thresholds are incremental concentration thresholds, meaning that the modeled concentrations are compared directly to the thresholds without adding the background concentrations (SCAQMD 2011).

The NEPA significance thresholds for ambient concentrations are the NAAQS, as presented in Section 5.5.1 of the EIS/EIR. Therefore, all of the thresholds are absolute concentration thresholds, meaning that the modeled concentrations are added to the background concentrations near the project area, and the resulting total concentrations are compared to the thresholds.

Table H2.3 presents the background concentrations used in the dispersion modeling. The background concentrations were derived from the monitored concentrations near the project area over the last 3 calendar years (2016, 2017, and 2018) of available data. Because it is the most representative site, the POLB Gull Park monitoring station was used for all pollutants except for PM<sub>2.5</sub>. POLB's Superblock station was used for the PM<sub>2.5</sub> background concentration because the Gull Park station has no Federal Reference Method (FRM) PM<sub>2.5</sub> monitor (POLB 2016; POLB 2017; POLB 2018). The Superblock station is located about 2 miles north of the construction site, in a commercial/industrial area adjacent to the Port.

1 **Table H2.3. Background Concentrations**

Pollutant	Averaging Period	Monitored Concentration <sup>a,i,j</sup>			Background Concentration <sup>c</sup>	
		2016	2017	2018	(ppm)	(ug/m <sup>3</sup> ) <sup>d</sup>
NO <sub>2</sub> (ppm)	1-Hour State	0.086	0.096	0.083	0.096	181
	1-Hour Federal <sup>b</sup>	--	--	--	0.075	141
	Annual	0.018	0.018	0.017	0.018	34
CO (ppm)	1-Hour	2.0	2.1	1.9	2.1	2,411
	8-Hour	1.7	1.7	1.5	1.7	1,952
SO <sub>2</sub> (ppm)	1-Hour State	0.012	0.012	0.011	0.012	32
	1-Hour Federal <sup>e</sup>	--	--	--	0.009	24
	24-Hour	0.003	0.005	0.004	0.005	13
PM <sub>10</sub> (ug/m <sup>3</sup> )	24-Hour Federal <sup>f</sup>	51.2	66.4	48.6	--	66.4
PM <sub>2.5</sub> (ug/m <sup>3</sup> )	24-Hour Federal <sup>g</sup>	--	--	--	--	27.2
	Annual Federal <sup>h</sup>	8.7	9.3	9.5	--	9.2

2 ppm = parts per million; ug/m<sup>3</sup> = micrograms per cubic meter.

3 Notes:

- 4 a. All reported values represent the highest recorded concentration during the year unless otherwise noted.
- 5 b. The background concentration reported for the federal 1-hour NO<sub>2</sub> standard represents the three-year average
- 6 (2016-2018) of the 98th percentile of the annual distribution of daily maximum 1-hour average concentrations.
- 7 c. The background concentrations for 1-hour federal NO<sub>2</sub>, 1-hour federal SO<sub>2</sub>, 24-hour federal PM<sub>2.5</sub>, and annual
- 8 federal PM<sub>2.5</sub> are three-year averages. The background concentrations for all other pollutants or averaging
- 9 periods are the maximum of the concentrations for the 3 reported years.
- 10 d. The concentration in micrograms per cubic meter (ug/m<sup>3</sup>) is calculated as follows: ug/m<sup>3</sup> = ppm x MW /
- 11 0.0244. The molecular weights (MW) are 28.01 for CO, 46.0055 for NO<sub>2</sub>, and 64.066 for SO<sub>2</sub>.
- 12 e. The background concentration reported for the federal 1-hour SO<sub>2</sub> standard represents the three-year average
- 13 (2016-2018) of the 99th percentile of the annual distribution of daily maximum 1-hour average concentrations.
- 14 f. The 24-hour federal PM<sub>10</sub> concentration reported for each year is the 2nd highest concentration during the
- 15 year. The background concentration is the highest of the 2nd highest concentrations.
- 16 g. The background concentration reported for the federal 24-hour PM<sub>2.5</sub> standard represents the three-year
- 17 average (2016-2018) of the 98th percentile of the annual distribution of 24-hour average concentrations.
- 18 h. The background concentration reported for the federal annual PM<sub>2.5</sub> concentration is the three-year average
- 19 of the annual mean concentrations.
- 20 i. The concentrations in this table were recorded at POLB's Gull Park monitoring station except for PM<sub>2.5</sub>, which
- 21 was recorded at POLB's Superblock station because the Gull Park station has no Federal Reference Method
- 22 (FRM) PM<sub>2.5</sub> monitor.
- 23 j. Source: Air Quality Monitoring Program at the Port of Long Beach. Annual Summary Reports. Calendar Years
- 24 2016, 2017, and 2018 (POLB 2016; POLB 2017; POLB 2018).

## 26 Receptor Locations

27 Cartesian coordinate receptor grids were used to provide adequate spatial coverage surrounding the

28 Project area to assess ground-level pollution concentrations, identify the extent of significant impacts,

29 and identify maximum-impact locations. Receptors over water were not considered in determining the

30 maximum receptor locations because any human exposure would be brief and transient. The following

31 receptor spacing was used in the modeling:

- 32 • Receptors positioned every 50 m along the site boundary, which, for this project, is considered to
- 33 be the shoreline.

- Receptor grid starting at the site boundary and extending outwards to 500 m, with receptors spaced 50 m apart;
- Receptor grid starting at 500 m and extending outwards to 1 kilometer (km), with receptors placed 100 m apart; and
- Receptor grid starting at 1 km and extending outwards to 5 km, with receptors placed 250 meters (m) apart.

## H2.4 Predicted Air Quality Impacts

Table H2.4 presents the maximum offsite pollutant concentrations for the CEQA analysis associated with all unmitigated Action Alternatives. This table presents the highest modeled concentrations on land. Concentrations at all other modeled on-land receptors would be less than the displayed values.

**Table H2.4. Maximum Pollutant Concentrations for CEQA, Prior to Mitigation – Action Alternatives**

Pollutant	Averaging Time	Maximum Modeled Project Concentration (ug/m3)	Background Concentration (ug/m3)	Total Concentration (ug/m3)	Significance Threshold (ug/m3)	Concentration Above Threshold?
<b>Alternative 2</b>						
NO <sub>2</sub>	1-Hour State	173.2	181.0	354	339	Yes
	1-Hour Federal	133.0	141.4	274	188	Yes
	Annual	2.0	33.9	36	57	No
SO <sub>2</sub>	1-Hour State	0.4	31.5	32	655	No
	1-Hour Federal	0.4	23.6	24	196	No
	24-Hour State	0.05	13.1	13	105	No
CO	1-Hour	197.1	2,410.7	2,608	23,000	No
	8-Hour	57.9	1,951.5	2,009	10,000	No
PM <sub>10</sub>	24-Hour	1.9	n/a	1.9	10.4	No
	Annual	0.1	n/a	0.1	1.0	No
PM <sub>2.5</sub>	24-Hour	1.7	n/a	1.7	10.4	No
<b>Alternative 3</b>						
NO <sub>2</sub>	1-Hour State	173.2	181.0	354	339	Yes
	1-Hour Federal	133.0	141.4	274	188	Yes
	Annual	2.3	33.9	36	57	No
SO <sub>2</sub>	1-Hour State	0.4	31.5	32	655	No
	1-Hour Federal	0.4	23.6	24	196	No
	24-Hour State	0.05	13.1	13	105	No
CO	1-Hour	197.1	2,410.7	2,608	23,000	No
	8-Hour	57.9	1,951.5	2,009	10,000	No



Pollutant	Averaging Time	Maximum Modeled Project Concentration (ug/m3)	Background Concentration (ug/m3)	Total Concentration (ug/m3)	Significance Threshold (ug/m3)	Concentration Above Threshold?
PM <sub>10</sub>	24-Hour	1.9	n/a	1.9	10.4	No
	Annual	0.1	n/a	0.1	1.0	No
PM <sub>2.5</sub>	24-Hour	1.7	n/a	1.7	10.4	No
<b>Alternative 4</b>						
NO <sub>2</sub>	1-Hour State	173.2	181.0	354	339	<b>Yes</b>
	1-Hour Federal	133.0	141.4	274	188	<b>Yes</b>
	Annual	3.0	33.9	37	57	No
SO <sub>2</sub>	1-Hour State	0.4	31.5	32	655	No
	1-Hour Federal	0.4	23.6	24	196	No
	24-Hour State	0.05	13.1	13	105	No
CO	1-Hour	197.1	2,410.7	2,608	23,000	No
	8-Hour	57.9	1,951.5	2,009	10,000	No
PM <sub>10</sub>	24-Hour	1.9	n/a	1.9	10.4	No
	Annual	0.2	n/a	0.2	1.0	No
PM <sub>2.5</sub>	24-Hour	1.7	n/a	1.7	10.4	No
<b>Alternative 5</b>						
NO <sub>2</sub>	1-Hour State	173.2	181.0	354	339	<b>Yes</b>
	1-Hour Federal	133.0	141.4	274	188	<b>Yes</b>
	Annual	2.3	33.9	36	57	No
SO <sub>2</sub>	1-Hour State	0.4	31.5	32	655	No
	1-Hour Federal	0.4	23.6	24	196	No
	24-Hour State	0.05	13.1	13	105	No
CO	1-Hour	197.1	2,410.7	2,608	23,000	No
	8-Hour	57.9	1,951.5	2,009	10,000	No
PM <sub>10</sub>	24-Hour	1.9	n/a	1.9	10.4	No
	Annual	0.1	n/a	0.1	1.0	No
PM <sub>2.5</sub>	24-Hour	1.7	n/a	1.7	10.4	No

- 1
- 2 Table H2.5 presents the maximum offsite pollutant concentrations for the NEPA analysis associated with
- 3 all unmitigated Action Alternatives. This table presents the highest modeled concentrations on land.
- 4 Concentrations at all other modeled on-land receptors would be less than the displayed values.

1 **Table H2.5. Maximum Pollutant Concentrations for NEPA, Prior to Mitigation – Action Alternatives**

<b>Pollutant</b>	<b>Averaging Time</b>	<b>Maximum Modeled Project Concentration (ug/m3)</b>	<b>Background Concentration (ug/m3)</b>	<b>Total Concentration (ug/m3)</b>	<b>NAAQS (ug/m3)</b>	<b>Concentration Exceeds NAAQS?</b>
<i>Alternative 2</i>						
NO <sub>2</sub>	1-Hour	133.0	141.4	274	188	<b>Yes</b>
	Annual	2.0	33.9	36	100	No
SO <sub>2</sub>	1-Hour	0.4	23.6	24	196	No
CO	1-Hour	197.1	2,410.7	2,608	40,000	No
	8-Hour	57.9	1,951.5	2,009	10,000	No
PM <sub>10</sub>	24-Hour	1.9	66.4	68	150	No
PM <sub>2.5</sub>	24-Hour	1.7	27.2	29	35	No
	Annual	0.09	9.2	9.3	12.0	No
<i>Alternative 3</i>						
NO <sub>2</sub>	1-Hour	133.0	141.4	274	188	<b>Yes</b>
	Annual	2.3	33.9	36	100	No
SO <sub>2</sub>	1-Hour	0.4	23.6	24	196	No
CO	1-Hour	197.1	2,410.7	2,608	40,000	No
	8-Hour	57.9	1,951.5	2,009	10,000	No
PM <sub>10</sub>	24-Hour	1.9	66.4	68	150	No
PM <sub>2.5</sub>	24-Hour	1.7	27.2	29	35	No
	Annual	0.1	9.2	9.3	12.0	No
<i>Alternative 4</i>						
NO <sub>2</sub>	1-Hour	133.0	141.4	274	188	<b>Yes</b>
	Annual	3.0	33.9	37	100	No
SO <sub>2</sub>	1-Hour	0.4	23.6	24	196	No
CO	1-Hour	197.1	2,410.7	2,608	40,000	No
	8-Hour	57.9	1,951.5	2,009	10,000	No
PM <sub>10</sub>	24-Hour	1.9	66.4	68	150	No
PM <sub>2.5</sub>	24-Hour	1.7	27.2	29	35	No
	Annual	0.1	9.2	9.3	12.0	No
<i>Alternative 5</i>						
NO <sub>2</sub>	1-Hour	133.0	141.4	274	188	<b>Yes</b>
	Annual	2.3	33.9	36	100	No
SO <sub>2</sub>	1-Hour	0.4	23.6	24	196	No
CO	1-Hour	197.1	2,410.7	2,608	40,000	No
	8-Hour	57.9	1,951.5	2,009	10,000	No
PM <sub>10</sub>	24-Hour	1.9	66.4	68	150	No
PM <sub>2.5</sub>	24-Hour	1.7	27.2	29	35	No
	Annual	0.1	9.2	9.3	12.0	No

2

3 Figure H2.2 shows the areas where the modeled 1-hour federal NO<sub>2</sub> concentration (presented in both

4 Tables H2.4 and H2.5) would exceed the threshold, and the location of the maximum on-land receptor.

5 Figure H.2.3 shows the areas where the modeled 1-hour state NO<sub>2</sub> concentration (presented in Table H2.4

6 only) would exceed the threshold, and the location of the maximum receptor. Both figures apply to all

7 Action Alternatives because short-term activities (24-hour, 8-hour, and 1-hour) would be nearly identical

and would therefore result in the same concentrations for all Action Alternatives. In all cases, the exceedance areas are over Port property and open water.

Section 5.5.5 of the EIS/EIR identifies five mitigation measures to reduce construction emissions, of which three are quantified. The following three measures were quantified in the dispersion modeling. The remaining mitigation measures were assessed qualitatively in the EIS/EIR.

**MM-AQ-1: Electric clamshell dredge.** The use of an electric clamshell dredge shall be required for project clamshell dredging activities during the entire construction period of the project, and the construction of an electrical substation at Pier J is also required to provide electric power to the clamshell dredge. This mitigation measure would reduce significant Impacts AQ-1, AQ-3, and AQ-4.

**MM-AQ-2: Construction-Related Harbor Craft.** Construction-related harbor craft (tugboats, crew boats, and survey boats) with Category 1 or Category 2 marine engines shall meet USEPA Tier 3 emission standards for marine engines. In addition, the construction contractor shall require all construction-related tugboats that home fleet in the San Pedro Bay Ports: 1) to shut down their main engines and 2) to refrain from using auxiliary engines while at dock and instead use electrical shore power, if feasible. This mitigation measure would reduce significant Impacts AQ-1, AQ-3, and AQ-4.

**MM-AQ-3: Off-Road Construction Equipment.** Self-propelled, diesel-fueled off-road construction equipment 25 hp or greater shall meet USEPA/CARB Tier 4 emission standards for non-road equipment. This mitigation measure would reduce significant Impacts AQ-1, AQ-3, and AQ-4.

**Figure H2.2. Location of Maximum Concentration and Area of Exceedance of the 1-Hour Federal NO<sub>2</sub> Threshold, Without Mitigation**





**Figure H2.2. Location of Maximum Concentration and Area of Exceedance of the 1-Hour State NO<sub>2</sub> Threshold, Without Mitigation**



- 1 Table H2.6 presents the maximum offsite pollutant concentrations for the CEQA analysis associated with  
2 all mitigated Action Alternatives. This table presents the highest modeled concentrations on land.  
3 Concentrations at all other modeled on-land receptors would be less than the displayed values.

4 **Table H2.6. Maximum Pollutant Concentrations for CEQA, After Mitigation – Action Alternatives**

Pollutant	Averaging Time	Maximum Modeled Project Concentration (ug/m3)	Background Concentration (ug/m3)	Total Concentration (ug/m3)	Significance Threshold (ug/m3)	Concentration Above Threshold?
<b>Alternative 2</b>						
NO <sub>2</sub>	1-Hour State	138.8	181.0	320	339	No
	1-Hour Federal	114.9	141.4	256	188	<b>Yes</b>
	Annual	0.9	33.9	35	57	No
SO <sub>2</sub>	1-Hour State	0.1	31.5	32	655	No
	1-Hour Federal	0.1	23.6	24	196	No
	24-Hour State	0.02	13.1	13	105	No
CO	1-Hour	129.7	2,410.7	2,540	23,000	No
	8-Hour	44.0	1,951.5	1,995	10,000	No
PM <sub>10</sub>	24-Hour	1.9	n/a	1.9	10.4	No
	Annual	0.05	n/a	0.05	1.0	No
PM <sub>2.5</sub>	24-Hour	1.7	n/a	1.7	10.4	No
<b>Alternative 3</b>						
NO <sub>2</sub>	1-Hour State	138.8	181.0	320	339	No
	1-Hour Federal	114.9	141.4	256	188	<b>Yes</b>
	Annual	1.2	33.9	35	57	No
SO <sub>2</sub>	1-Hour State	0.1	31.5	32	655	No
	1-Hour Federal	0.1	23.6	24	196	No
	24-Hour State	0.02	13.1	13	105	No
CO	1-Hour	129.7	2,410.7	2,540	23,000	No
	8-Hour	44.0	1,951.5	1,995	10,000	No
PM <sub>10</sub>	24-Hour	1.9	n/a	1.9	10.4	No
	Annual	0.06	n/a	0.06	1.0	No
PM <sub>2.5</sub>	24-Hour	1.7	n/a	1.7	10.4	No
<b>Alternative 4</b>						
NO <sub>2</sub>	1-Hour State	138.8	181.0	320	339	No
	1-Hour Federal	114.9	141.4	256	188	<b>Yes</b>

Pollutant	Averaging Time	Maximum Modeled Project Concentration (ug/m3)	Background Concentration (ug/m3)	Total Concentration (ug/m3)	Significance Threshold (ug/m3)	Concentration Above Threshold?
	Annual	1.9	33.9	36	57	No
SO <sub>2</sub>	1-Hour State	0.1	31.5	32	655	No
	1-Hour Federal	0.1	23.6	24	196	No
	24-Hour State	0.02	13.1	13	105	No
CO	1-Hour	129.7	2,410.7	2,540	23,000	No
	8-Hour	44.0	1,951.5	1,995	10,000	No
PM <sub>10</sub>	24-Hour	1.9	n/a	1.9	10.4	No
	Annual	0.1	n/a	0.1	1.0	No
PM <sub>2.5</sub>	24-Hour	1.7	n/a	1.7	10.4	No
<b>Alternative 5</b>						
NO <sub>2</sub>	1-Hour State	138.8	181.0	320	339	No
	1-Hour Federal	114.9	141.4	256	188	<b>Yes</b>
	Annual	1.2	33.9	35	57	No
SO <sub>2</sub>	1-Hour State	0.1	31.5	32	655	No
	1-Hour Federal	0.1	23.6	24	196	No
	24-Hour State	0.02	13.1	13	105	No
CO	1-Hour	129.7	2,410.7	2,540	23,000	No
	8-Hour	44.0	1,951.5	1,995	10,000	No
PM <sub>10</sub>	24-Hour	1.9	n/a	1.9	10.4	No
	Annual	0.06	n/a	0.06	1.0	No
PM <sub>2.5</sub>	24-Hour	1.7	n/a	1.7	10.4	No

1

2

- 1 Table H2.7 presents the maximum offsite pollutant concentrations for the NEPA analysis associated with  
2 all mitigated Action Alternatives. This table presents the highest modeled concentrations on land.  
3 Concentrations at all other modeled on-land receptors would be less than the displayed values.

4 **Table H2.7. Maximum Pollutant Concentrations for NEPA, After Mitigation – Action Alternatives**

Pollutant	Averaging Time	Maximum Modeled Project Concentration (ug/m3)	Background Concentration (ug/m3)	Total Concentration (ug/m3)	NAAQS (ug/m3)	Concentration Exceeds NAAQS?
<i>Alternative 2</i>						
NO <sub>2</sub>	1-Hour	114.9	141.4	256	188	Yes
	Annual	0.9	33.9	35	100	No
SO <sub>2</sub>	1-Hour	0.1	23.6	24	196	No
CO	1-Hour	129.7	2,410.7	2,540	40,000	No
	8-Hour	44.0	1,951.5	1,995	10,000	No
PM <sub>10</sub>	24-Hour	1.9	66.4	68	150	No
PM <sub>2.5</sub>	24-Hour	1.7	27.2	29	35	No
	Annual	0.04	9.2	9.2	12.0	No
<i>Alternative 3</i>						
NO <sub>2</sub>	1-Hour	114.9	141.4	256	188	Yes
	Annual	1.2	33.9	35	100	No
SO <sub>2</sub>	1-Hour	0.1	23.6	24	196	No
CO	1-Hour	129.7	2,410.7	2,540	40,000	No
	8-Hour	44.0	1,951.5	1,995	10,000	No
PM <sub>10</sub>	24-Hour	1.9	66.4	68	150	No
PM <sub>2.5</sub>	24-Hour	1.7	27.2	29	35	No
	Annual	0.06	9.2	9.2	12.0	No
<i>Alternative 4</i>						
NO <sub>2</sub>	1-Hour	114.9	141.4	256	188	Yes
	Annual	1.9	33.9	36	100	No
SO <sub>2</sub>	1-Hour	0.1	23.6	24	196	No
CO	1-Hour	129.7	2,410.7	2,540	40,000	No
	8-Hour	44.0	1,951.5	1,995	10,000	No
PM <sub>10</sub>	24-Hour	1.9	66.4	68	150	No
PM <sub>2.5</sub>	24-Hour	1.7	27.2	29	35	No
	Annual	0.1	9.2	9.3	12.0	No
<i>Alternative 5</i>						
NO <sub>2</sub>	1-Hour	114.9	141.4	256	188	Yes
	Annual	1.2	33.9	35	100	No
SO <sub>2</sub>	1-Hour	0.1	23.6	24	196	No
CO	1-Hour	129.7	2,410.7	2,540	40,000	No
	8-Hour	44.0	1,951.5	1,995	10,000	No
PM <sub>10</sub>	24-Hour	1.9	66.4	68	150	No
PM <sub>2.5</sub>	24-Hour	1.7	27.2	29	35	No
	Annual	0.06	9.2	9.2	12.0	No



Figure H2.3 shows the area where the mitigated modeled 1-hour federal NO<sub>2</sub> concentration (presented in both Tables H2.6 and H2.7) would exceed the threshold, and the location of the maximum on-land receptor. The figure applies to all Action Alternatives because short-term activities (24-hour, 8-hour, and 1-hour) would be nearly identical and would therefore result in the same concentrations for all Action Alternatives. The exceedance area is over Port property and open water. There is no figure for the 1-hour state NO<sub>2</sub> concentration because the mitigation measures would reduce the modeled on-land concentrations to less than significant.

**Figure H2.3. Location of Maximum Concentration and Area of Exceedance of the 1-Hour Federal NO<sub>2</sub> Threshold, With Mitigation**



## References for Appendix H2

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## Appendix H3. Potential Impacts of Criteria Pollutant Emissions on Public Health

### H3.1. Potential Impact of Significant Regional Emissions on Public Health

In *Sierra Club v. County of Fresno (2018)*, the California Supreme Court ruled that an EIR for a proposed master-planned, mixed-use development in Fresno County known as Friant Ranch did not adequately relate the expected adverse air quality impacts to likely health consequences or explain in meaningful detail why it is not feasible at the time of drafting to provide such an analysis. The specific language in the Court's decision is provided below.

*The EIR fails to provide an adequate discussion of health and safety problems that will be caused by the rise in various pollutants resulting from the Project's development. At this point, we cannot know whether the required additional analysis will disclose that the Project's effects on air quality are less than significant or unavoidable, or whether that analysis will require reassessment of proposed mitigation measures. Absent an analysis that reasonably informs the public how anticipated air quality effects will adversely affect human health, an EIR may still be sufficient if it adequately explains why it is not scientifically feasible at the time of drafting to provide such an analysis.*

In response to the Court's decision, this section provides a discussion of the potential health effects associated with the TSP's significant construction emissions identified in Impact AQ-1.

Impact AQ-1 concluded that the TSP's mitigated construction emissions would exceed the SCAQMD's daily emission thresholds for PM<sub>2.5</sub>, NO<sub>x</sub>, CO, and VOC with mitigation. The SCAQMD's daily emission thresholds relate to *regional* air quality impacts. An exceedance of a daily emission threshold means the TSP would make a significant contribution to regional air pollutant emissions in the SCAB. However, a daily emission threshold exceedance does not necessarily mean that the TSP would contribute to a violation of the CAAQS or NAAQS or cause adverse health effects. Further analysis, discussed below, would be necessary to determine the downwind ambient concentrations of the emitted pollutant (or secondary pollutants formed from that pollutant) in the atmosphere where the general population would be exposed.

The pollutants evaluated for potential regional health effects associated with TSP construction are PM<sub>2.5</sub>, NO<sub>2</sub>, CO, and ozone. PM<sub>2.5</sub> would be both directly emitted ("primary" PM<sub>2.5</sub>) and would form through secondary reactions of precursor pollutants NO<sub>x</sub> and VOC ("secondary" PM<sub>2.5</sub>). NO<sub>2</sub> would be directly emitted as one of the NO<sub>x</sub> components and would form through secondary photochemical reactions between nitric oxide (NO) and other air pollutants (CARB, 2019a). CO would be directly emitted. Ozone would not be directly emitted, but would form through secondary photochemical reactions between precursor pollutant NO<sub>x</sub> and VOC. Primary pollutants typically reach their peak ambient concentrations in close proximity to the emission sources. Secondary pollutants typically reach their peak ambient concentrations farther downwind of the sources, sometimes many miles downwind, as the secondary reactions can take a considerable amount of time.

## **Approach and Limitations**

This analysis links TSP emissions to regional health effects qualitatively because technical and scientific limitations prevent the accurate quantification of regional health effects. The quantification of regional health effects would not be possible for some pollutants and would produce an unacceptably high level of uncertainty for other pollutants.

Health effects quantification would require a two-stage process consisting of (a) regional modeling of emissions to estimate ambient pollutant concentrations in the region and to determine the exposed population; and (b) applying available methodologies to estimate the quantities of adverse health outcomes for the exposed population at the predicted concentration levels. There are modeling tools that could theoretically carry out these steps for ozone and secondary PM<sub>2.5</sub>. For example, the Community Multiscale Air Quality Modeling System (CMAQ) (USEPA 2019a) and Comprehensive Air Quality Model with Extensions (CAMx) (Ramboll Environ 2019) are air quality modeling systems that can estimate ozone and secondary PM concentrations on a regional scale. The Environmental Benefits Mapping and Analysis Program (BenMAP) (USEPA 2019b) is a regional-scale health effects estimation model for ozone and PM. CARB also developed a methodology (CARB 2010) for estimating premature mortality associated with regional exposure to PM. Currently, there is no reliable methodology available to quantify health effects associated with regional exposure to CO and NO<sub>2</sub> concentrations.

The SCAQMD and San Joaquin Valley Air Pollution Control District (SJVAPCD) filed separate *amicus curiae* briefs with the California Supreme Court for the Friant Ranch case (SCAQMD 2015, SJVAPCD 2015). Both districts concluded that currently available regional modeling tools are not well suited to analyze relatively small changes in pollutant concentrations associated with individual projects. Regional modeling tools are generally designed to be used at the national, state, regional, and/or city levels. They are not equipped to analyze whether and to what extent the criteria pollutant emissions of an individual project directly impact human health in a particular area (SJVAPCD 2015). For example, running a photochemical grid model used for predicting ozone attainment with the emissions solely from an individual project is not likely to yield valid information given the relative scale involved (SJVAPCD 2015). SCAQMD stated that it does not currently know of a way to accurately quantify ozone-related health impacts caused by NO<sub>x</sub> or VOC emissions from relatively small projects. The primary author of the CARB methodology (CARB 2010) for PM mortality has reported that this methodology is not suited for small projects and may yield unreliable results due to various uncertainties (SCAQMD 2015). Therefore, quantification of regional health effects associated with the TSP's criteria pollutant emissions is not feasible for this analysis. As a result, this document provides a qualitative discussion of the potential for the TSP's construction emissions to cause regional adverse health effects.

The qualitative regional health effects discussion follows a two-step approach. The first step determines whether the TSP's significant regional emissions would likely contribute to a violation of the CAAQS or NAAQS outside of the local Port area. If so, then the TSP is presumed to contribute to regional adverse health effects. If not, then the TSP is presumed not to contribute to regional adverse health effects because the CAAQS and NAAQS were established by CARB and USEPA to protect public health and welfare. Specifically, the CAAQS were established to protect public health, including the most sensitive groups (CARB 2019b). The NAAQS were established to protect public health with an adequate margin of safety (Title 42 United States Code [U.S.C.] Chapter 85, Subchapter I, Part A, Section 7409). The final step

describes the general types of adverse health effects that could be associated with the TSP's significant regional pollutant impacts.

A discussion of the TSP's *local* contributions to adverse health effects in the Port vicinity is provided below as part of Impact AQ-2.

#### ***Identification of Potential Regional Adverse Health Effects***

**PM2.5.** The SCAB is currently nonattainment of the CAAQS and NAAQS for PM2.5. The state standard for PM2.5 is 12 µg/m3 for an annual average. The federal standards for PM2.5 are 35 µg/m3 for a 3-year average of the 98th percentile of the 24-hour concentrations, and 12 µg/m3 for a 3-year annual average. The highest annual PM2.5 concentration recorded in the SCAB over the last 3 available years (2016-2018) is 14.73 µg/m3, which is 1.2 times the state standard. This concentration occurred in 2016 at a station adjacent to Route 60 in Ontario. Exceedances of the annual standard occurred at several stations in the SCAB in each year of the 3-year period. The highest 3-year average of the 98th percentile of the 24-hour PM2.5 concentrations recorded in the SCAB over the last 3 available years (2016-2018) is 35.9 µg/m3, which is 1.03 times the federal standard. This concentration occurred at the Mira Loma (Jurupa Valley) station in Riverside County. The 24-hour PM2.5 concentration threshold of 35 µg/m3 was exceeded somewhere in the SCAB on 3 percent of days over the 3-year period. The highest 3-year annual average PM2.5 concentration recorded in the SCAB over the last 3 available years (2016-2018) is 14.5 µg/m3, which is 1.2 times the federal standard. This concentration occurred at a station adjacent to Route 60 in Ontario (SCAQMD 2019). Therefore, because (a) the region is nonattainment for PM2.5 and (b) construction of the TSP would exceed the SCAQMD's daily emission threshold for PM2.5, the TSP would potentially contribute to regional violations of the PM2.5 standards and to regional adverse health effects related to PM2.5.

Table 5.5-31 shows that the TSP's mitigated peak daily construction emissions would be 0.04 ton per day of PM2.5 (reported emissions were converted from pounds to tons). By comparison and for context, the most recent USEPA-approved SCAB emissions inventory estimated total anthropogenic emissions within the SCAB in 2012 to be 66 tons per day of PM2.5 (SCAQMD 2017). This estimate shows that the TSP's direct maximum regional PM2.5 contribution would be equivalent to about 0.06 percent of the total SCAB emissions. This emissions comparison shows that the TSP's contribution to regional violations of the PM2.5 standards would be relatively small. The TSP's VOC and NOx emissions, described below under ozone, would also contribute to secondary PM2.5 formation in the region.

The following summary of adverse health effects associated with PM10 and PM2.5 exposure was compiled in the 2016 AQMP (SCAQMD 2017). Appendix I of the 2016 AQMP provides an expanded discussion of the adverse health effects.

*Several studies have found correlations between elevated ambient particulate matter levels (PM) and an increase in mortality rates, respiratory infections, number and severity of asthma attacks, and the number of hospital admissions in different parts of the United States and in various areas around the world. In recent years, studies have reported an association between long-term exposure to PM2.5 and increased total mortality (reduction in life-span and increased mortality from lung cancer). Higher levels of PM2.5 have also been related to increased mortality due to cardiovascular or respiratory diseases, hospital admissions for acute respiratory conditions, school absences, lost work days, a decrease in respiratory function in children, and increased medication*

*use in children and adults with asthma. Long-term exposure to PM has been found to be associated with reduced lung function growth in children, and increased risk of cardiovascular diseases in adults. Elderly persons, young children, and people with pre-existing respiratory and/or cardiovascular disease appear to be more susceptible to the effects of PM<sub>10</sub> and PM<sub>2.5</sub>. In its most recent review, USEPA concluded that both short-term and long-term exposures to PM<sub>2.5</sub> are causally related to increased mortality risk (USEPA 2009).*

**Nitrogen Dioxide.** The SCAB is currently in attainment of the CAAQS and NAAQS for NO<sub>2</sub>. The most stringent state and federal NO<sub>2</sub> standards are 0.18 ppm for a 1-hour average (state 1-hour standard), 0.100 ppm for a 3-year average of the 98th percentile of the annual distributions of daily maximum 1-hour average concentrations (federal 1-hour standard), and 0.030 ppm for an annual average. The highest NO<sub>2</sub> concentrations recorded anywhere in the SCAB over the last 3 available years (2016-2018) are 0.1155 ppm for the state 1-hour average, 0.079 ppm for the federal 1-hour average (3-year average), and 0.0321 ppm for an annual average (SCAQMD 2019). These pollutant levels are 64, 79, and 107 percent of the state 1-hour, federal 1-hour, and state annual standards, respectively. The exceedance of the state annual standard of 0.030 ppm occurred in all 3 years at a single monitoring station adjacent to Route 60 in Ontario. This station is one of four near-road sites in the SCAB purposely placed by the SCAQMD to capture impacts from heavily traveled roadways (SCAQMD 2016). In November 2018, CARB proposed to separate the area surrounding this monitor from the remainder of the SCAB and reclassify the area as nonattainment. CARB is currently working with the SCAQMD to define the specific boundary of the nonattainment area. The remainder of the SCAB will remain classified as attainment (CARB 2018).

Table 5.5-31 shows that the TSP's mitigated peak daily construction emissions would be 0.8 ton per day of NO<sub>x</sub>. By comparison and for context, the most recent EPA-approved SCAB emissions inventory estimated total anthropogenic emissions within the SCAB in 2012 to be 540 tons per day of NO<sub>x</sub> (SCAQMD, 2017). This estimate shows that the TSP's maximum regional NO<sub>x</sub> contribution would be equivalent to about 0.1 percent of the total SCAB emissions. Therefore, given (a) the attainment status of the region and (b) the relatively small increase in regional NO<sub>x</sub> emissions contributions from the TSP, the TSP would not contribute to a regional violation of the NO<sub>2</sub> standards and would not contribute to regional adverse health effects related to NO<sub>2</sub> outside of the local Port area. Adverse health effects related to the TSP's NO<sub>2</sub> emissions are also addressed on a *local* level in Impact AQ-2.

**Carbon Monoxide.** The SCAB is currently in attainment of the CAAQS and NAAQS for CO. The most stringent CAAQS or NAAQS for CO are 20 ppm for a 1-hour average and 9.0 ppm for an 8-hour average. The highest CO concentrations recorded anywhere in the SCAB over the last 3 available years (2016-2018) are 8.4 ppm for a 1-hour average and 4.6 ppm for an 8-hour average (SCAQMD 2019). These pollutant levels are 42 and 51 percent of the 1-hour and 8-hour standards, respectively.

Table 5.5-31 shows that the TSP's mitigated peak daily construction emissions would be 0.5 ton per day of CO. By comparison and for context, the most recent EPA-approved SCAB emissions inventory estimated total anthropogenic emissions within the SCAB in 2012 to be 2,123 tons per day of CO (SCAQMD, 2017). This estimate shows that the TSP's maximum regional CO contribution would be equivalent to about 0.02 percent of the total SCAB emissions. Therefore, given (a) the attainment status of the region and (b) the relatively small regional emissions contribution from the TSP, the TSP would not contribute to a regional violation of the CO standards and would not contribute to regional adverse health effects related to CO.

**Ozone.** VOC and NO<sub>x</sub> are precursors to ozone, for which the SCAB is currently in nonattainment of the CAAQS and NAAQS (also referred to as state and federal standards). The most stringent state and federal ozone standards are 0.09 ppm for a 1-hour average, 0.070 ppm for the 3-year average of the fourth-highest 8-hour concentration each year (known as the federal 8-hour standard), and 0.07 ppm for an 8-hour average (known as the state 8-hour standard). The highest 1-hour ozone concentration recorded in the SCAB over the last three available years (2016-2018) is 0.163 ppm, which is 1.8 times the standard. This concentration occurred in 2016 at the Crestline station in the central San Bernardino Mountains. The standard was exceeded somewhere in the SCAB on 25 percent of days during the 3-year period. The highest federal 8-hour ozone concentration (3-year average) recorded in the SCAB over the last three available years (2016-2018) is 0.112 ppm, which is 1.6 times the standard. This concentration occurred at both the Crestline and San Bernardino stations. The threshold of 0.070 ppm was exceeded somewhere in the SCAB on 38 percent of days during the 3-year period. The highest state 8-hour ozone concentration recorded in the SCAB over the last three available years (2016-2018) is 0.136 ppm, which is 1.9 times the standard. This concentration occurred in 2017 at the San Bernardino station. The standard was exceeded somewhere in the SCAB on 38 percent of days during the 3-year period (SCAQMD 2019). Therefore, because (a) the region is nonattainment for ozone and (b) construction of the TSP would exceed the SCAQMD's daily emission thresholds for NO<sub>x</sub> and VOC, the TSP would potentially contribute to regional violations of the ozone standards and to regional adverse health effects related to ozone.

Table 5.5-31 shows that the TSP's mitigated peak daily construction emissions would be 0.05 ton per day of VOC and 0.8 ton per day of NO<sub>x</sub>. By comparison and for context, the most recent EPA-approved SCAB emissions inventory estimated total anthropogenic emissions within the SCAB in 2012 to be 470 tons per day of VOC and 540 tons per day of NO<sub>x</sub> (SCAQMD, 2017). These estimates show that the TSP's maximum regional VOC and NO<sub>x</sub> contributions would be equivalent to about 0.01 and 0.1 percent, respectively, of the total SCAB emissions. These emissions comparisons show that the TSP's contribution to regional violations of the ozone standards would be relatively small.

The following summary of adverse health effects associated with ozone exposure was compiled by the SCAQMD in its Final 2016 AQMP (SCAQMD 2017). Appendix I of the 2016 AQMP provides an expanded discussion of the adverse health effects:

*Short-term exposures (lasting for a few hours) to ozone at levels typically observed in Southern California can result in breathing pattern changes, reduction of breathing capacity, increased susceptibility to infections, inflammation of the lung tissue, and some immunological changes. Individuals working outdoors, children (including teenagers), older adults, people with pre-existing lung disease, such as asthma, and individuals with certain nutritional deficiencies are considered to be the subgroups most susceptible to ozone effects. Elevated ozone levels are associated with increased school absences and daily hospital admission rates, as well as increased mortality. An increased risk for asthma has been found in children who participate in multiple sports and live in high-ozone communities. Ozone exposure under exercising conditions is known to increase the severity of respiratory symptoms. Although lung volume and airway resistance changes observed after a single exposure diminish with repeated exposures, biochemical and cellular changes appear to persist, which can lead to subsequent lung structural changes.*



In summary, construction of the TSP would potentially contribute to regional adverse health effects associated with exposure to PM<sub>2.5</sub> and ozone in the SCAB. The TSP would not contribute to regional adverse health effects associated with exposure to CO or NO<sub>2</sub>. Impacts would be temporary, occurring only during the construction period.

### **H3.2. Potential Impact of Significant Local Ambient Concentrations on Public Health**

In response to the California Supreme Court's recent decision on *Sierra Club v. County of Fresno (2018)*, this section provides a discussion of the potential health effects associated with the significant local ambient pollutant concentrations identified in Impact AQ-2 for TSP construction. These pollutant concentrations are considered local impacts because they were determined through dispersion modeling of the TSP's primary pollutant emissions in the local Port area, and because the maximum pollutant concentrations predicted by the dispersion model would be located very close to the construction activities. By definition, a modeled exceedance of a SCAQMD ambient concentration threshold means that the TSP would contribute to a local violation of the CAAQS or NAAQS and therefore would contribute to local adverse health effects in the modeled exceedance area. If no modeled exceedance is predicted, the TSP is presumed not to contribute to local adverse health effects because the CAAQS and NAAQS were established by CARB and USEPA to protect public health and welfare.

Tables 5.5-32 and 5.5-33 show that construction of the TSP would produce significant local NO<sub>2</sub> concentrations with mitigation. The local concentrations would be less than significant for SO<sub>2</sub>, CO, PM<sub>10</sub>, and PM<sub>2.5</sub>. Therefore, construction of the TSP would potentially contribute to local adverse health effects associated with exposure to NO<sub>2</sub>.

#### ***Analysis Approach and Limitations***

There is currently no reliable methodology available that can quantify health effects associated with local exposure to NO<sub>2</sub> concentrations. Therefore, this document provides a qualitative discussion of the potential for the TSP's local NO<sub>2</sub> impacts to cause adverse health effects. The qualitative discussion (a) identifies the local area where NO<sub>2</sub> concentrations are predicted to exceed the standards, which is presumed to be the area where project-related adverse health effects could potentially occur; and (b) describes the general types of adverse health effects that could be associated with exposure to elevated NO<sub>2</sub> levels.

A discussion of the TSP's *regional* contributions to adverse health effects in the SCAB is provided as part of Impact AQ-1.

#### ***Identification of Potential Local Adverse Health Effects***

**Nitrogen Dioxide.** Table 5.5-32 shows that construction of the TSP with mitigation would produce local ambient NO<sub>2</sub> concentrations that exceed the 1-hour NAAQS. The maximum concentration on land is predicted to be 256 ug/m<sup>3</sup> (Project plus background), which is 1.4 times the standard. Therefore, construction of the TSP would potentially contribute to local adverse health effects associated with short-term exposure to NO<sub>2</sub>.

Appendix A, Figure A2.4 shows the area where the modeled NO<sub>2</sub> concentration would exceed the federal 1-hour NO<sub>2</sub> standard during TSP construction, after mitigation. This is the area where the potential for adverse health effects associated with NO<sub>2</sub> exposure during construction is presumed to exist. Most of



the impact area is over water, but a portion of the area covers Pier J, which is a POLB container terminal. The significant impact area would not extend over any existing residences.

The following summary of adverse health effects associated with NO<sub>2</sub> exposure was compiled in the 2016 AQMP. Appendix I of the 2016 AQMP provides an expanded discussion of the adverse health effects.

*USEPA noted the respiratory effects of NO<sub>2</sub>, and evidence suggestive of impacts on cardiovascular health, mortality and cancer (USEPA 2016). Evidence for low-level nitrogen dioxide (NO<sub>2</sub>) exposure effects is derived from laboratory studies of asthmatics and from epidemiological studies. Additional evidence is derived from animal studies. USEPA cited the coherence of the results from a variety of studies, and a plausible biological mechanism to support the determination of a causal relationship between short term NO<sub>2</sub> exposures and asthma exacerbations (“asthma attacks”). The long-term link with respiratory outcomes was strengthened by recent experimental and epidemiological studies, and the strongest evidence available is from studies of asthma development. Experimental studies have found that NO<sub>2</sub> exposures increase responsiveness of airways, pulmonary inflammation, and oxidative stress, and can lead to the development of allergic responses. These biological responses provide evidence of a plausible mechanism for NO<sub>2</sub> to cause asthma. Additionally, results from controlled exposure studies of asthmatics demonstrate an increase in the tendency of airways to contract in response to a chemical stimulus (airway responsiveness) or after inhaled allergens. Animal studies also provide evidence that NO<sub>2</sub> exposures have negative effects on the immune system, and therefore increase the host’s susceptibility to respiratory infections. Epidemiological studies showing associations between NO<sub>2</sub> levels and hospital admissions for respiratory infections support such a link, although the studies examining respiratory infections in children are less consistent.*

In summary, construction of the TSP would potentially contribute to local adverse health effects associated with exposure to NO<sub>2</sub>. The area of impact would occur on POLB property. The TSP would not contribute to local adverse health effects associated with exposure to SO<sub>2</sub>, CO, PM<sub>10</sub>, or PM<sub>2.5</sub>. Impacts would be temporary, occurring only during the construction period.

### H3.3. References

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## **Appendix H4. Health Risk Evaluation**

### **H4.1. Introduction**

This appendix describes the methods and results of a health risk evaluation of toxic air contaminant (TAC) emissions from construction activities associated with all Action Alternatives. The Action Alternatives are described in detail in Section 4 (Plan Formulation). The No Action Alternative is also described in detail in Section 4 (Plan Formulation), is assessed qualitatively in Sections 5.5 (Air Quality Environmental Consequences) and 5.6 (Greenhouse Gas Environmental Consequences) of the EIS/EIR, and therefore is not included in this appendix. TACs are compounds that are known or suspected to cause adverse carcinogenic or non-carcinogenic human health effects after short-term (acute) or long-term (chronic) exposure. This evaluation assesses the individual cancer risks and non-cancer chronic impacts associated with construction of the Action Alternatives to residential/sensitive receptors and offsite workers.<sup>1</sup>

Individual cancer risk represents the chance that a person would contract cancer resulting from long-term exposure to the TACs of concern. A non-cancer chronic hazard index represents the potential for non-cancer health impacts resulting from long-term exposure to TACs. An acute non-cancer hazard index represents the potential for non-cancer health impacts resulting from a short-term (i.e., one-hour) exposure to TACs. Population cancer burden is the potential increase in the number of cancer cases in the affected population.

### **H4.2. Health Risk Estimation Approach**

Since the Action Alternatives would produce TAC emissions only during temporary construction activities and because emissions would occur at a considerable distance from the nearest residential and sensitive receptors, a detailed health risk assessment was not performed. Instead, results of the PM<sub>10</sub> dispersion modeling, detailed in Appendix H2, and CARB's Hotspots Analysis and Reporting Program (HARP) were used to estimate maximum cancer risks. HARP's Risk Assessment Standalone Tool (RAST), which calculates potential health impacts using ground level TAC concentrations, was used to estimate health impacts (CARB 2019a).

TAC-related cancer risk in the Port area is dominated by emissions of diesel particulate matter (DPM), a TAC and component of diesel exhaust. This health risk evaluation used the annual PM<sub>10</sub> concentrations predicted by AERMOD (Appendix H2) during construction as a proxy for DPM. Although conservative, the approach is appropriate because more than 99 percent of PM<sub>10</sub> emissions associated with construction of the Action Alternatives would be from diesel exhaust. Non-exhaust PM<sub>10</sub> (i.e., fugitive dust, entrained road dust, tire wear, brake wear) would be limited to the project's minimal land-based construction activities.

Cancer risk at the maximally-impacted residential/sensitive receptor was calculated by HARP assuming the exposure period would start in the receptor's third trimester of gestation ("3TM") and continue for the duration of construction. Cancer risks were calculated separately for the period of the third trimester until just before the second birthday (referred to as "3TM < 2") and the period of the second birthday until just before the sixth birthday ("2 < 6") due to different risk sensitivity assumptions in HARP. The two resulting risk values were then added together to produce the final risk result. The receptor age period 3TM < 2 was conservatively modeled with the average PM<sub>10</sub> concentration during the two consecutive years with the greatest construction emissions because this age period has the greatest cancer risk sensitivity according to OEHHA guidelines (OEHHA 2015). The receptor age period 2 < 6 was modeled with the average PM<sub>10</sub> concentration during all other years of construction. The average PM<sub>10</sub> concentrations

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<sup>1</sup> Sensitive receptors were conservatively evaluated with residential exposure assumptions.

during these two exposure periods were estimated by scaling the PM<sub>10</sub> concentration during the year of maximum emissions (Appendix H2) by the ratio of DPM emissions from the respective periods. Residential cancer risk was calculated by HARP using the “RMP derived” option in accordance with SCAQMD's *AB 2588 and Rule 1402 Supplemental Guidelines* (SCAQMD 2018).

Cancer risk at the maximally-impacted occupational receptor was calculated by HARP assuming an average PM<sub>10</sub> concentration over the entire construction period. The average PM<sub>10</sub> concentration was estimated by scaling the PM<sub>10</sub> concentration during the year of maximum emissions (Appendix H2) by the ratio of DPM emissions from the respective periods. Occupational cancer risk was estimated using the “OEHHA derived” option in accordance with SCAQMD's *AB 2588 and Rule 1402 Supplemental Guidelines*.

Chronic hazard indices at the maximally-impacted residential/sensitive and occupational receptors were directly calculated by dividing the PM<sub>10</sub> concentration during the year of maximum emissions (Appendix H2) by the Chronic Reference Exposure Level of 5.0 ug/m3 as published in CARB's *Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values* (CARB 2019b).

Acute non-cancer impacts and population cancer burden are addressed qualitatively. Past Port projects have consistently shown that the non-cancer acute hazard index and population cancer burden would not exceed SCAQMD thresholds. For example, the residential cancer risk for the Port's recent Pier B On-Dock Rail Support Facility project (POLB 2016) was estimated to be 8.7 in a million with mitigation, and the associated population cancer burden was estimated to be only 0.27 (POLB 2016), about one-half of the significance threshold of 0.5.

Table H4-1 shows that the Action Alternatives would produce maximum cancer risks roughly similar to Pier B; however, most activities associated with the Action Alternatives would occur over water and further from population centers than the Pier B project. Therefore, the population cancer burden for the Action Alternatives would likely be lower than 0.27 calculated for Pier B. Similarly, acute non-cancer impacts would also likely be lower than the 0.07 acute hazard index calculated for Pier B and therefore below the SCAQMD threshold of 1.

### **H4.3. Predicted Air Quality Impacts**

Table **H4-1** presents the estimated residential cancer risk, off-site occupational cancer risk, residential chronic hazard index, and off-site occupational chronic hazard index associated with each Action Alternative using the methodology described above. The table shows that the cancer risk at the maximally-impacted residential/sensitive receptor would exceed the significance threshold for Alternative 4, both without and with mitigation. The residential/sensitive cancer risks associated with Alternatives 2, 3, and 5 would be below the threshold, both without and with mitigation. The occupational cancer risks and residential and occupational chronic hazard indices would be well below the thresholds for all Action Alternatives, both without and with mitigation.

**Table H4-1. Estimated Cancer Risks Associated with Construction of the Action Alternatives**

Alternative	Construction DPM Emissions <sup>a</sup>				Estimated DPM Concentration at the Maximum Residential Receptor			Estimated DPM Concentration at the Maximum Occupational Receptor		Estimated Individual Cancer Risk		Estimated Chronic Hazard Index <sup>m</sup>	
	Maximum Year (lb/yr) <sup>b</sup>	Average Years 1-2 (lb/yr) <sup>c</sup>	Average Years 3-6 (lb/yr) <sup>d</sup>	Average Years 1-6 (lb/yr) <sup>e</sup>	Maximum Year (ug/m3) <sup>f</sup>	Average Years 1-2 (ug/m3) <sup>g</sup>	Average Years 3-6 (ug/m3) <sup>h</sup>	Maximum Year (ug/m3) <sup>i</sup>	Average Years 1-6 (ug/m3) <sup>j</sup>	Maximum Residential Receptor <sup>k</sup>	Maximum Occupational Receptor <sup>l</sup>	Maximum Residential Receptor	Maximum Occupational Receptor
Alt 2 Unmitigated	12,645	9,405	107	3,207	2.3E-02	1.7E-02	1.9E-04	9.4E-02	2.4E-02	5.8E-06	3.7E-07	0.005	0.02
Alt 2 Mitigated	8,529	5,656	67	1,930	1.2E-02	7.7E-03	9.1E-05	4.6E-02	1.0E-02	2.6E-06	1.6E-07	0.002	0.009
Alt 3 Unmitigated	19,263	13,335	723	4,927	2.9E-02	2.0E-02	1.1E-03	1.1E-01	2.8E-02	6.9E-06	4.4E-07	0.006	0.02
Alt 3 Mitigated	15,108	9,225	344	3,305	2.0E-02	1.2E-02	4.6E-04	6.1E-02	1.3E-02	4.2E-06	2.1E-07	0.004	0.01
Alt 4 Unmitigated	27,035	19,484	5,077	9,879	5.0E-02	3.6E-02	9.4E-03	1.5E-01	5.4E-02	1.3E-05	8.4E-07	0.01	0.03
Alt 4 Mitigated	26,824	17,324	2,472	7,422	4.7E-02	3.0E-02	4.3E-03	1.0E-01	2.8E-02	1.1E-05	4.3E-07	0.009	0.02
Alt 5 Unmitigated	19,263	13,335	2,253	5,947	2.9E-02	2.0E-02	3.4E-03	1.1E-01	3.4E-02	7.2E-06	5.3E-07	0.006	0.02
Alt 5 Mitigated	15,108	9,225	1,035	3,765	2.0E-02	1.2E-02	1.4E-03	6.1E-02	1.5E-02	4.3E-06	2.4E-07	0.004	0.01
<b>Threshold</b>										<b>1.0E-05</b>	<b>1.0E-05</b>	<b>1</b>	<b>1</b>

Notes:

a. DPM emissions are from the emission calculations for each alternative, as described in Appendix H1.

b. This emission rate represents the maximum year of construction emissions, which occurs during dredging of the Approach Channel (hopper dredge). It is used in the chronic hazard index calculation.

c. This emission rate includes the two consecutive years with the greatest construction emissions. It is used in the residential cancer risk calculation for receptor age 3TM < 2.

d. This emission rate includes all remaining construction years except for the two consecutive years with the greatest emissions. It is used in the residential cancer risk calculation for receptor age 2 < 6.

e. This emission rate equals total construction emissions averaged over 6 years, which is the exposure duration selected in the HARP analysis to cover the alternative with the longest duration (6 years for Alternative 4). It is used in the occupational cancer risk calculation.

f. To be consistent with HARP HRA methodology, this concentration is the equivalent of the AERMOD "PERIOD" average using a 5-year meteorological data set; the emission rate modeled in AERMOD was the maximum annual PM<sub>10</sub> emissions converted to g/s. This concentration is used to determine the residential chronic hazard index. The dispersion modeling methodology is described in Appendix H2.

g. The estimated Average Years 1-2 Concentration = Maximum Year Concentration x Average Years 1-2 Emissions / Maximum Year Emissions. This concentration is used in the residential cancer risk calculation for receptor age 3TM < 2.

h. The estimated Average Years 3-6 Concentration = Maximum Year Concentration x Average Years 3-6 Emissions / Maximum Year Emissions. This concentration is used in the residential cancer risk calculation for receptor age 2 < 6.

i. To be consistent with HARP HRA methodology, this concentration is the AERMOD "PERIOD" average using a 5-year meteorological data set; the emission rate modeled in AERMOD was the maximum annual PM<sub>10</sub> emissions converted to grams per second. This concentration is used to determine the occupational chronic hazard index. The dispersion modeling methodology is described in Appendix H2.

j. The estimated Avg Years 1-6 Concentration = Maximum Year Concentration x Avg Years 1-6 Emissions / Maximum Year Emissions. This concentration is used in the occupational cancer risk calculation.

- 1 k. Residential cancer risk was calculated using HARP Risk Assessment Standalone Tool (RAST) (run at a unit concentration of 1 ug/m3 and scaled to the Project modeled concentration). The exposure  
2 period was assumed to start in the 3rd trimester of gestation (3TM) and continue for the duration of construction. The risks for receptor age 3TM < 2 and 2 < 6 were calculated separately due to  
3 different exposure parameters, and added together. Residential cancer risk was estimated using RMP derived methodology in accordance with SCAQMD's AB 2588 and Rule 1402 Supplemental  
4 Guidelines (September 2018). The HARP RAST residential cancer risk results at a DPM unit concentration of 1 ug/m3 are 3.42E-04 for receptor age 3TM < 2 (2-year exposure) and 1.14E-04 for  
5 receptor age 2 < 6 (4-year exposure).
- 6 l. Occupational cancer risk was calculated using HARP RAST (run at a unit concentration of 1 ug/m3 and scaled to the Project modeled concentration). The exposure period was assumed to be for the  
7 duration of construction (up to 6 years depending on the alternative). Occupational cancer risk was estimated using OEHHA derived methodology in accordance with SCAQMD's AB 2588 and Rule  
8 1402 Supplemental Guidelines (September 2018). The HARP RAST occupational cancer risk results at a DPM unit concentration of 1 ug/m3 are 1.55E-05 (6-year exposure).
- 9 m. The chronic hazard index was directly calculated by dividing the maximum year concentration by the Chronic Reference Exposure Level of 5.0 ug/m3 as published in CARB's Consolidated Table of  
10 OEHHA/ARB Approved Risk Assessment Health Values. <https://ww3.arb.ca.gov/toxics/healthval/contable.pdf>. (CARB, 2019b).
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1 Table H4-2 presents locations of sensitive receptors in the project vicinity.

2 **Table H4-2. Sensitive Receptors**

Receptor No.	UTM X (m)	UTM Y (m)	Receptor Description	Category	Street Address	City
1	389912	3738586	12th Street Head Start	Child Care	1212 Long Beach Blvd	Long Beach
2	389883	3738053	8th Street Early Head Start	Child Care	820 Long Beach Blvd	Long Beach
3	390048	3737366	A Love 4 Learning Academy	Child Care	306 Elm Avenue	Long Beach
4	389599	3738178	ABC 123 Long Beach Learning Center	Child Care	909 Pine Ave	Long Beach
5	387995	3740853	Agu Family Child Care	Child Care	4400 Boyar Ave	Long Beach
6	389600	3738360	Aspiranet Foster Family Agency	Child Care	1043 Pine Ave	Long Beach
7	390314	3739617	Atlantic Headstart	Child Care	1862 Atlantic Ave	Long Beach
8	390224	3738014	Benford Family Child Care	Child Care	530 E 8th St	Long Beach
9	388691	3740431	Briggs Family Child Care	Child Care	Golden Ave	Long Beach
10	387340	3741495	Brown Family Child Care	Child Care	1831 W Jeanette Pl	Long Beach
11	386680	3739773	Cabrillo Child Development Center	Child Care	2205 San Gabriel Ave.	Long Beach
12	388011	3741615	Carol Daycare	Child Care	2842 Easy Ave	Long Beach
13	386767	3739844	Century Villages at Cabrillo Homeless Housing Community	Child Care	2001 River Ave	Long Beach
14	390062	3738250	Child Care Center At St Mary Medical Center	Child Care	930 Elm Ave	Long Beach
15	388899	3737062	Childtime Learning Center	Child Care	1 World Trade Ctr # 199	Long Beach
16	389481	3741039	Comprehensive Child Development	Child Care	2565 Pacific Ave.	Long Beach
17	387982	3740075	Costa Family Child Care	Child Care	2085 Easy Ave	Long Beach
18	388870	3737870	Edison Child Development Center	Child Care	640 W 7th St	Long Beach
19	389981	3738882	Elm Street Head Start	Child Care	1425 & 1429 Elm Ave	Long Beach
20	388635	3741379	Fords Family Day Care	Child Care	2726 San Francisco Ave	Long Beach
21	388088	3740588	Franklin Day Care Center	Child Care	2333 Fashion Ave	Carson
22	387556	3739981	Gallegos Family Child Care	Child Care	2024 Adriatic Ave	Long Beach
23	387670	3740411	Garfield Head Start	Child Care	2240 Baltic Ave	Long Beach
24	390403	3740229	Garibay Family Child Care	Child Care	2172 Lime Ave	Long Beach
25	388688	3740334	Hernandez Family Child Care	Child Care	2200 Golden Ave	Long Beach
26	388894	3740733	Hernandez Family Child Care	Child Care	5322 Elm Ave	Long Beach
27	388832	3740311	Herrera Family Child Care	Child Care	737 W Hill St	Long Beach
28	387501	3739748	Job Corp Head Start	Child Care	1903 Santa Fe Ave.	Long Beach
29	390444	3739033	Jones Family Child Care	Child Care	2275 Baltic Ave	Long Beach
30	390594	3738247	Kelly's Care	Child Care	943 N Washington Pl	Long Beach



Receptor No.	UTM X (m)	UTM Y (m)	Receptor Description	Category	Street Address	City
31	388725	3741155	Kelly's Kids Daycare Center	Child Care	855 W Willow St	Long Beach
32	390195	3739970	Kim Family Child Care	Child Care	2035 Linden Ave	Long Beach
33	388192	3740542	Lara Family Day Care	Child Care	1303 W 253rd St	Harbor City
34	383107	3737969	Lil Cowpoke Preschool	Child Care	445 N Avalon Blvd	Wilmington
35	389577	3738176	Little Lighthouse Educational Childcare Center	Child Care	911 Pine Avenue	Long Beach
36	389940	3740373	Long Beach Blvd Head Start	Child Care	2236 Long Beach Blvd	Long Beach
37	390373	3740260	Long Beach Center for Child Development	Child Care	622 E. Hill St	Long Beach
38	390533	3740347	Long Beach Child Development Center	Child Care	2222 Olive Ave	Long Beach
39	389282	3739139	Long Beach Day Nursery - West Branch	Child Care	1548 Chestnut Ave	Long Beach
40	388917	3737693	Loves Family Child Care	Child Care	527 Daisy Ave	Long Beach
41	388856	3738266	Lucy's Baby Care	Child Care	940 Maine Ave	Long Beach
42	390021	3738204	Montessori On Elm Preschool + Kindergarten	Child Care	930 Elm Ave	Long Beach
43	389217	3739222	N2 Lil Folkz	Child Care	1624 Chestnut Ave	Long Beach
44	389533	3741212	Oakwood Children's Center	Child Care	2650 Pacific Ave	Long Beach
45	389020	3739872	P.A.L. Family Day Care	Child Care	1980 Daisy Ave	Long Beach
46	389472	3740264	Pacific Head Start	Child Care	2179 Pacific Ave	Long Beach
47	387188	3740575	Patterson Family Child Care	Child Care	2133 Canal Ave	Long Beach
48	389579	3738221	Pine Head Start	Child Care	927 Pine Ave	Long Beach
49	390399	3739915	Poole Family Child Care	Child Care	2002 Lime Ave	Long Beach
50	389621	3738176	Progressive Steps Children Center	Child Care	911 Pine Ave	Long Beach
51	389036	3741241	Ruiz Family Daycare	Child Care	2670 Daisy Ave	Long Beach
52	389765	3740701	Sandford Family Child Care	Child Care	215 E Burnett St	Long Beach
53	390098	3740230	Sar Family Child Care	Child Care	2171 Pasadena Ave	Long Beach
54	390623	3740004	Smart & Manageable	Child Care	2054 Myrtle Ave	Long Beach
55	389894	3738960	Un Mundo De Amigos Preschool	Child Care	1480 Long Beach Blvd	Long Beach
56	389193	3738664	West Anaheim Child Care Center	Child Care	440 W. Anaheim St	Long Beach
57	387505	3740187	West Child Development Center/Westside Neighborhood Clinic	Child Care	2125 Santa Fe Ave.	Long Beach
58	384704	3739154	Wilmington Park Children's Center	Child Care	1419 E Young St	Wilmington
59	390296	3737362	YMCA GLB Fairfield 3rd Street Preschool	Child Care	607 E. 3rd St	Long Beach
60	389492	3740248	YMCA Play & Learn Preschool	Child Care	2179 Pacific Ave	Long Beach
61	389517	3739600	Young Horizons Child Development Center	Child Care	1840 Pacific Ave	Long Beach
62	389536	3740757	Young Horizons Child Development Center	Child Care	2418 Pacific Ave	Long Beach



Receptor No.	UTM X (m)	UTM Y (m)	Receptor Description	Category	Street Address	City
63	390248	3737686	Young Horizons Child Development Center	Child Care	501 Atlantic Ave	Long Beach
64	389459	3737689	Young Horizons/El Jardin de la Felicidad	Child Care	507 Pacific Ave	Long Beach
65	388854	3740055	Zarate Family Child Care	Child Care	2496 Oregon Ave	Long Beach
66	390353	3741373	Akin's Post Acute Rehab Hospital; Atlantic Memorial Healthcare Center	Elder Care	2750 Atlantic Ave	Long Beach
67	383100	3738224	American AAA Health Care Center	Elder Care	629 N Avalon Blvd	Wilmington
68	387401	3740832	Aquarius Home	Elder Care	1765 Aquarius St	Long Beach
69	387445	3739252	Bay Breeze Care	Elder Care	1653 Santa Fe Ave	Long Beach
70	389740	3736892	Breakers Of Long Beach, The	Elder Care	210 E Ocean Blvd	Long Beach
71	387440	3740697	Burnett Home Care	Elder Care	1740 West Burnett St.	Long Beach
72	390386	3740307	Caruthers Royale Care	Elder Care	2204 Lime Ave.	Long Beach
73	389587	3740686	Deluxe Guest Home	Elder Care	3260 Pine Ave	Long Beach
74	389586	3740722	Deluxe Guest Home II	Elder Care	3266 Pine Ave	Long Beach
75	389401	3740862	Garden, The	Elder Care	2485 Cedar Ave	Long Beach
76	389119	3738782	Harbor View Rehabilitation Center	Elder Care	490 W. 14th Street	Long Beach
77	387192	3740865	Hayes Home	Elder Care	2470 Hayes Ave	Long Beach
78	389645	3737994	Healthview Pine Villa Assisted Living	Elder Care	117 East 8th Street	Long Beach
79	389498	3740798	Heritage Board & Care #2	Elder Care	1509 E 4th St	Long Beach
80	387231	3740475	Loram Manor	Elder Care	1925 Gemini St	Long Beach
81	390455	3738345	Olive Tree Home	Elder Care	1035 Olive Street	Long Beach
82	390278	3738221	Padua House	Elder Care	940 Atlantic Ave	Long Beach
83	387154	3741415	Pioneer Homes Of California	Elder Care	2041 W Carolyn Pl	Long Beach
84	387349	3740831	Reliable Residential Care	Elder Care	1840 Aquarius St	Long Beach
85	390005	3740389	Right At Home	Elder Care	2245 Elm Ave	Long Beach
86	389478	3741347	Royal Care Skilled Nursing Center	Elder Care	2725 Pacific Avenue	Long Beach
87	390388	3740918	Serra Project Long Beach	Elder Care	1043 Elm Ave	Long Beach
88	390475	3738176	Villa Maria Care Center	Elder Care	723 E 9th St	Long Beach
89	389978	3741459	Earl & Lorraine Miller Children's Hospital; Long Beach Memorial Medical Center and Hospital	Hospital	2801 Atlantic Ave	Long Beach
90	389449	3739338	Long Beach Doctors Hospital	Hospital	1725 Pacific Ave	Long Beach
91	389539	3741329	Pacific Hospital of Long Beach (Hospital and Convalescent/Nursing Home)	Hospital	2776 Pacific Ave	Long Beach
92	390100	3738380	St Mary Medical Center	Hospital	1050 Linden Ave	Long Beach
93	389215	3739462	Tom Redgate Memorial Hospital	Hospital	1775 Chestnut Ave	Long Beach

Receptor No.	UTM X (m)	UTM Y (m)	Receptor Description	Category	Street Address	City
94	387362	3740183	Admiral Kidd Park	Recreational	2125 Santa Fe Ave	Long Beach
95	388669	3737500	Cesar Chavez Park	Recreational	401 Golden Avenue	Long Beach
96	388060	3738639	City of Long Beach Multi-Service Center	Recreational	1301 W. 12th Street	Long Beach
97	387306	3739448	Harbor Japanese Community Cultural Center	Recreational	1766 Seabright Ave	Long Beach
98	386955	3740430	Hudson Park	Recreational	2335 Webster Ave	Long Beach
99	387067	3741097	Khemara Buddhikaram Cambodian Buddhist Temple	Recreational	2100 W Willow Street	Long Beach
100	387129	3740300	Pramuan Simsriwatna Place of Worship	Recreational	2015 W Hill Street	Long Beach
101	386856	3739792	VA Long Beach Clinic and Veteran's Support Services	Recreational	2001 River Ave, Building 28	Long Beach
102	382237	3737492	Wilmington Waterfront Park	Recreational	S. C Street	Wilmington
103	383262	3736996	Wilmington Waterfront Promenade	Recreational	Water Street	Wilmington
104	384770	3739365	Apostolic Faith Center/Apostolic Faith Academy	School	1530 E Robidoux St	Wilmington
105	389454	3738592	Artesia Well Preparatory Academy	School	1235 Pacific Ave	Long Beach
106	386739	3740042	Bethune School/Program for the Homeless	School	2101 San Gabriel Ave	Long Beach
107	390228	3740326	Burnett Elementary	School	565 East Hill St.	Long Beach
108	387438	3739936	Cabrillo High School	School	2001 Santa Fe Ave.	Long Beach
109	389562	3740833	Cambodian Christian	School	2474 Pacific Ave	Long Beach
110	388744	3737296	Cesar Chavez Elementary	School	730 West Third St.	Long Beach
111	389879	3739303	Colegio New City	School	1637 Long Beach Blvd	Long Beach
112	390505	3737788	Constellation Community Charter Middle	School	620 Olive Ave.	Long Beach
113	388749	3737794	Edison Elementary	School	625 Maine Ave.	Long Beach
114	386969	3740593	Elizabeth Hudson Elementary School and Development Center Daycare	School	2335 Webster Ave	Long Beach
115	389624	3738317	First Baptist Church School	School	1000 Pine Ave	Long Beach
116	390180	3738228	First Lutheran Day Care, Preschool and Elementary School	School	946 Linden Ave	Long Beach
117	382757	3737606	Gang Alternative Program	School	231 Island Ave	Wilmington
118	382820	3738093	George de la Torre Jr. Elementary School	School	500 Island Ave	Wilmington
119	389389	3738887	George Washington Middle School	School	1450 Cedar Ave	Long Beach
120	384377	3739369	Holy Family Preschool and Elementary School	School	1122 E Robidoux St	Wilmington
121	389544	3740927	Holy Innocents Elementary School	School	2500 Pacific Ave	Long Beach
122	387067	3740604	Hudson Development Center Daycare and Elementary School	School	2335 Webster Ave	Long Beach
123	389714	3737893	International Elementary	School	700 Locust Ave	Long Beach
124	389686	3741436	Jackie Robinson Academy	School	2750 Pine Ave	Long Beach
125	387724	3740376	James Garfield Elementary School / LBUSD Child Development Center	School	2240 Baltic Ave	Long Beach

Receptor No.	UTM X (m)	UTM Y (m)	Receptor Description	Category	Street Address	City
126	387255	3739936	Juan Rodriguez Cabrillo High School	School	2001 Santa Fe Ave	Long Beach
127	389235	3740749	Lafayette Elementary School	School	2445 Chestnut Ave	Long Beach
128	390207	3737910	Long Beach Montessori School	School	525 E. 7th St	Long Beach
129	390337	3739143	Polytechnic High School	School	1600 Atlantic Ave.	Long Beach
130	389106	3738800	Regency High School	School	490 W. 14th Street	Long Beach
131	387111	3740236	Reid Continuation High School	School	2153 W Hill St	Long Beach
132	389785	3738088	Renaissance High School for the Arts	School	235 East 8th St.	Long Beach
133	390160	3739058	Roosevelt Elementary	School	1574 Linden Ave.	Long Beach
134	390534	3737794	Saint Anthony High School	School	620 Olive Ave.	Long Beach
135	390580	3737582	Saint Anthony Preschool / Elementary	School	855 East 5th St.	Long Beach
136	387406	3740569	Saint Lucy School	School	2320 Cota Ave.	Long Beach
137	387022	3740319	Savannah Academy	School	2152 Hill St.	Long Beach
138	390248	3737371	Select Community Day School	School	5869 Atlantic Ave.	Long Beach
139	390538	3737763	St. Anthony High School/Constellation Community Charter Middle	School	620 Olive Ave.	Long Beach
140	387420	3740551	St. Lucy School	School	2320 Cota Ave	Long Beach
141	387250	3741600	Stephens Middle School	School	1830 West Columbia Street	Long Beach
142	390365	3737647	Stevenson Elementary; Stevenson Child Development Centers/Preschool	School	515 Lime Ave.	Long Beach
143	389624	3738615	The New City School	School	1230 Pine Ave	Long Beach
144	390276	3738162	True Social Justice Academy	School	630 Magnolia Ave	Long Beach
145	387129	3741587	William Logan Stephens Middle School	School	1830 W Columbia St	Long Beach
146	384625	3739124	Wilmington Park Elementary School/Mahar House	School	1140 Mahar Ave	Wilmington

Note: Individual residences are not included in the table and accompanying figure.

- 1
- 2 The locations of sensitive receptors in Table H4-2 are shown on Figure 3-4 in Section 3.5.

1    **H4.4. References for Appendix H4**

- 2    CARB 2019a. Hotspots Analysis and Reporting Program (HARP). Risk Assessment Standalone Tool  
3    (RAST). Version 19044. <https://ww3.arb.ca.gov/toxics/harp/harp.htm>. February 13.
- 4    CARB 2019b. *Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values*.  
5    <https://ww3.arb.ca.gov/toxics/healthval/contable.pdf>. September 19.
- 6    OEHHA 2015. Office of Environmental Health Hazard Assessment. *Air Toxics Hot Spots Program Guidance*  
7    *Manual for Preparation of Health Risk Assessments*. March 2015.
- 8    POLB 2016. Port of Long Beach. *Pier B On-Dock Rail Support Facility Draft EIR*, Appendix A, Table A3-7.  
9    December 2016. Available: <http://www.polb.com/environment/docs.asp>. Accessed: September 2019.
- 10    SCAQMD 2018. *AB 2588 and Rule 1402 Supplemental Guidelines*. September.