# PORT OF LONG BEACH
# DEEP DRAFT NAVIGATION FEASIBILITY STUDY

*Los Angeles County, California*

## Draft Integrated Feasibility Report and Environmental Impact Statement / Environmental Impact Report (EIS/EIR)

October 2019

## Volume 2: Technical Appendices H to M

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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
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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 ($NO_x$), particulate matter less than 10 microns ($PM_{10}$), particulate matter less than 2.5 microns ($PM_{2.5}$), and sulfur oxides ($SO_x$). Emissions of diesel particulate matter (DPM), a subset of $PM_{10}$, 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 ($CO_2$), nitrous oxide ($N_2O$), and methane ($CH_4$), 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, $CO_2$ is assigned a GWP of 1. In comparison, $CH_4$ has a GWP of 25, which means that it has a global warming effect 25 times greater than $CO_2$ on an equal-mass basis. $N_2O$ has a GWP of 298 (IPCC, 2007). To account for their GWP, GHG emissions are reported in the emission tables as carbon dioxide

equivalent ($CO_2e$). $CO_2e$ 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 $CO_2e$ 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, $NO_2$, $PM_{10}$ and $PM_{2.5}$ (including precursors) emission rates for each Action Alternative were first calculated for the applicable analysis years. For purposes of this evaluation, emissions of $NO_2$ are assumed to equal emissions of $NO_x$ since $NO_2$ is the predominant form of $NO_x$. 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 where 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.** $PM_{10}$ and $PM_{2.5}$ 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). $PM_{10}$ and $PM_{2.5}$ 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**

**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 | | | | Rating | | |
|---|---|---|---|---|---|---|---|---|
| | | Quantity | Number of Engines | (hr/day) | Load | (hp) | (kw) | Engine Tier |
| **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 concurently 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 occures; 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) |
|---|---|---|---|---|---|---|
| ***Electrical Substation Construction at Pier J*** | | | | | | |
| 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 | |
| ***Pier J Breakwater Construction*** | | | | | | |
| 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 | |
| ***Pier J Wharf Upgrade*** | | | | | | |
| 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 | |
| ***Pier T Wharf Upgrade*** | | | | | | |
| 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 | |

**Notes:**

1-way transit distance multiplied by 2 for total transit distance. Telephone conversation with Naser Khan (AECom) 5/21/19.

**Source:**

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**

| | | | | g/kw-hr | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Engine Displacement** | **(kW)** | **EPA Tier** | **MY** | **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 N20 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**
**Habor 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) Uncontrolled PM10 Emission Factor (g/VMT) | (E) Uncontrolled 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: https://ww3.arb.ca.gov/ei/areasrc/fullpdf/full7-9_2016.pdf. 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 x (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 Adminstration. Highway Statistics 2016 - Urbanized Areas - 2016 Miles and Daily
Last accessed February 2019. https://www.fhwa.dot.gov/policyinformation/statistics/2016/

**Composite Paved Road Dust Emission Factors for Project Trips**

| | Fraction of Travel by Roadway Type | | | | | Composite EF | |
|---|---|---|---|---|---|---|---|
| Road Type | 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 Emision 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/ft2) | 6.015E-05 |
| Source: CalEEMod, Appendix A, Section 4.8. | | | |

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**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 | MdlYr | 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_Activity_hpy | Total_Population | Horsepower_Hours_hhpy |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | 0.000259989 | 0.000309409 | 0.008606927 | 0.001722874 | 1.589834 | 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 | 8.78006E-07 | 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-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 | 0.0724763 | 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 | 0.010227138 | 0.012374837 | 0.014727078 | 0.070919069 | 0.13264119 | 22.212489 | 0.005532029 | 0.005089467 | 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 | 0.00593684 | 0.006453087 | 0.00036672 | 0.000324085 | 1288255.2 | 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 | 0.000231213 | 0.000251319 | 6.306E-06 | 5.57787E-06 | 22172.354 | 2334.8086 | 5.5937202 | 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 | 0.004728884 | 0.7420076 | 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 | 0.000793599 | 0.000960255 | 0.001142782 | 0.019037587 | 0.011339025 | 3.029392 | 0.000420387 | 0.000386756 | 0.000420387 | 2.79844E-05 | 2.47255E-05 | 98285.289 | 45684.545 | 117.28582 | 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 | 113.3268 | 5472037.01 |
| South Coast | 2024 | ConstMin - Bore/Drill Rigs | Aggregated | 300 | Diesel | 0.001173139 | 0.001419498 | 0.00168932 | 0.012973941 | 0.013711353 | 6.437411 | 0.000444948 | 0.000409352 | 0.000444948 | 5.94819E-05 | 5.25413E-05 | 208854.71 | 38539.793 | 116.79094 | 8081075.955 |
| South Coast | 2024 | ConstMin - Bore/Drill Rigs | Aggregated | 600 | Diesel | 0.001554492 | 0.001880935 | 0.002238468 | 0.018645424 | 0.014595768 | 9.9165954 | 0.00052562 | 0.00048357 | 0.00052562 | 9.16372E-05 | 8.09379E-05 | 321733.02 | 31270.72 | 92.541974 | 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 | 0.000239261 | 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-08 | 3.81139E-08 | 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 | 0.205672734 | 0.129200323 | 31.273571 | 0.005594634 | 0.005147063 | 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 | 0.007740368 | 0.008413443 | 0.000619241 | 0.00054714 | 2174913.8 | 753439.12 | 1245.2846 | 110081748.9 |
| South Coast | 2024 | ConstMin - Excavators | Aggregated | 300 | Diesel | 0.018874332 | 0.022837941 | 0.027179038 | 0.179374516 | 0.183938627 | 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 | 0.007505882 | 0.008158568 | 0.001401063 | 0.001237611 | 4919577.8 | 738096.09 | 1125.3437 | 249471503.6 |
| South Coast | 2024 | ConstMin - Excavators | Aggregated | 750 | Diesel | 0.00057652 | 0.000697589 | 0.000830189 | 0.005593627 | 0.007306292 | 1.8945769 | 0.000289998 | 0.000266798 | 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 | 32540.51 | 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 | 0.00120362 | 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 | 0.627377742 | 120.20099 | 0.03587931 | 0.033008965 | 0.03587931 | 0.001109668 | 0.000981064 | 3899788.7 | 4558134.9 | 5848.8124 | 375713959.6 |
| South Coast | 2024 | Industrial - Forklifts | Aggregated | 175 | Diesel | 0.013475249 | 0.016305051 | 0.019404358 | 0.229756629 | 0.13538041 | 38.198857 | 0.006967114 | 0.006409745 | 0.006967114 | 0.000352763 | 0.000311774 | 1239319.9 | 844249.57 | 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 | 269934.64 | 123583.15 | 161.08397 | 25946815.34 |
| South Coast | 2024 | Industrial - Forklifts | Aggregated | 600 | Diesel | 0.000771931 | 0.000934036 | 0.00111158 | 0.004956592 | 0.007541408 | 2.1019464 | 0.000285909 | 0.000263036 | 0.000285909 | 1.94104E-05 | 1.71558E-05 | 68195.337 | 18394.169 | 24.894795 | 6519863.032 |
| South Coast | 2024 | Industrial - Forklifts | Aggregated | 9999 | Diesel | 2.78196E-05 | 3.36617E-05 | 4.00602E-05 | 0.000325499 | 0.000760618 | 0.1663868 | 7.03585E-06 | 6.47298E-06 | 7.03585E-06 | 1.53749E-06 | 1.35803E-06 | 5398.2354 | 590.32449 | 0.7321998 | 519485.5481 |
| South Coast | 2024 | OFF - Light Commercial - Generator Sets | Aggregated | 25 | Diesel | 0.02121002 | 0.025241677 | 0.030542429 | 0.133197229 | 0.202293488 | 26.255631 | 0.00834676 | 0.007679019 | 0.00834676 | 0.000366459 | 0.000219883 | 874047.25 | 1437665.7 | 4258.77 | 20672851.75 |
| South Coast | 2024 | OFF - Light Commercial - Generator Sets | Aggregated | 50 | Diesel | 0.018458294 | 0.021966895 | 0.026579943 | 0.208124013 | 0.1965088 | 31.085386 | 0.006015189 | 0.005533974 | 0.006015189 | 0.000401856 | 0.000260655 | 1036118.2 | 741690.95 | 2197.08 | 24475801.35 |
| South Coast | 2024 | ConstMin - Rubber Tired Loaders | Aggregated | 25 | Diesel | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| South Coast | 2024 | ConstMin - Rubber Tired Loaders | Aggregated | 50 | Diesel | 0.002718664 | 0.003289583 | 0.003914876 | 0.019523559 | 0.014568556 | 1.9122025 | 0.000933331 | 0.000858665 | 0.000933331 | 1.75977E-05 | 1.56071E-05 | 62039.305 | 71581.408 | 81.429742 | 2967204 |
| South Coast | 2024 | ConstMin - Rubber Tired Loaders | Aggregated | 75 | Diesel | 0.000208588 | 0.000252391 | 0.000300366 | 0.000865126 | 0.00195542 | 0.0993576 | 0.000175097 | 0.000161089 | 0.000175097 | 9.12353E-07 | 8.10944E-07 | 3223.5495 | 2345.2452 | 4.4016077 | 174427.6092 |
| South Coast | 2024 | ConstMin - Rubber Tired Loaders | Aggregated | 100 | Diesel | 0.02867256 | 0.034693798 | 0.041288487 | 0.339598613 | 0.291967625 | 46.383324 | 0.019201809 | 0.017665664 | 0.019201809 | 0.000427977 | 0.000378574 | 1504855.9 | 943929.68 | 1000.8155 | 81118397.57 |
| South Coast | 2024 | ConstMin - Rubber Tired Loaders | Aggregated | 175 | Diesel | 0.043073681 | 0.052119154 | 0.0620261 | 0.6912983 | 0.399254028 | 110.47658 | 0.021380367 | 0.019669938 | 0.021380367 | 0.001020119 | 0.000901695 | 3584291 | 1281985.7 | 1333.6871 | 192101453 |
| South Coast | 2024 | ConstMin - Rubber Tired Loaders | Aggregated | 300 | Diesel | 0.050310658 | 0.060875896 | 0.072447347 | 0.368737462 | 0.562927377 | 166.21495 | 0.018666486 | 0.017173167 | 0.018666486 | 0.00153523 | 0.001356624 | 5392660.8 | 1371060 | 1252.8076 | 288830495.4 |
| South Coast | 2024 | ConstMin - Rubber Tired Loaders | Aggregated | 600 | Diesel | 0.069419209 | 0.083997243 | 0.099963662 | 0.5161172 | 0.687779611 | 201.47439 | 0.026029491 | 0.023947132 | 0.026029491 | 0.001860648 | 0.001644407 | 6536614.8 | 1056605.6 | 1067.3899 | 350564257.6 |
| South Coast | 2024 | ConstMin - Rubber Tired Loaders | Aggregated | 750 | Diesel | 0.005914509 | 0.007156556 | 0.008516893 | 0.055872518 | 0.047384456 | 19.107969 | 0.001715892 | 0.00157862 | 0.001715892 | 0.000176485 | 0.000155957 | 619937.03 | 51273.308 | 51.168689 | 33237564.36 |
| South Coast | 2024 | ConstMin - Rubber Tired Loaders | Aggregated | 9999 | Diesel | 0.004770226 | 0.005771973 | 0.006869125 | 0.031649189 | 0.101131032 | 14.314569 | 0.002096418 | 0.001928705 | 0.002096418 | 0.000132202 | 0.000116834 | 464420.43 | 25882.558 | 21.457837 | 24784347.74 |
| South Coast | 2024 | OFF - ConstMin - Cement and Mortar Mixers | Aggregated | 25 | Diesel | 0.00083898 | 0.000998456 | 0.001208131 | 0.005871732 | 0.007576109 | 1.0280532 | 0.000295881 | 0.000272211 | 0.000295881 | 1.54066E-05 | 8.61663E-06 | 34251.6 | 103638.1 | 345.19 | 1069574.1 |
| South Coast | 2024 | ConstMin - Pavers | Aggregated | 25 | Diesel | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| South Coast | 2024 | ConstMin - Pavers | Aggregated | 50 | Diesel | 0.000894062 | 0.001081815 | 0.00128745 | 0.005641957 | 0.004784583 | 0.6708561 | 0.000317712 | 0.000292295 | 0.000317712 | 6.17558E-06 | 5.47544E-06 | 21765.186 | 23489.024 | 64.727137 | 909960.9803 |
| South Coast | 2024 | ConstMin - Pavers | Aggregated | 75 | Diesel | 0.001142034 | 0.001381861 | 0.001644529 | 0.006000588 | 0.010371064 | 0.776833 | 0.001000061 | 0.000920056 | 0.001000061 | 7.14795E-06 | 6.34041E-06 | 25203.491 | 16531.624 | 46.387781 | 1181453.775 |
| South Coast | 2024 | ConstMin - Pavers | Aggregated | 100 | Diesel | 0.002211828 | 0.002676311 | 0.003185032 | 0.036988361 | 0.029262745 | 5.6880144 | 0.001560137 | 0.001435326 | 0.001560137 | 5.25222E-05 | 4.64248E-05 | 184541.36 | 106751.56 | 265.92065 | 8614366.98 |
| South Coast | 2024 | ConstMin - Pavers | Aggregated | 175 | Diesel | 0.002721805 | 0.003293384 | 0.003919399 | 0.050529022 | 0.031072553 | 8.863986 | 0.001478319 | 0.001360053 | 0.001478319 | 8.18703E-05 | 7.23467E-05 | 287582.26 | 84677.461 | 214.67834 | 13361041.79 |
| South Coast | 2024 | ConstMin - Pavers | Aggregated | 300 | Diesel | 0.001409079 | 0.001704986 | 0.002029074 | 0.013215103 | 0.019379495 | 6.9182465 | 0.000627429 | 0.000577234 | 0.000627429 | 6.39203E-05 | 5.64658E-05 | 224454.89 | 47355.571 | 103.02403 | 10434925.44 |
| South Coast | 2024 | ConstMin - Pavers | Aggregated | 600 | Diesel | 0.000204541 | 0.000247495 | 0.000294539 | 0.002353635 | 0.002360001 | 1.2732926 | 6.63257E-05 | 6.10196E-05 | 6.63257E-05 | 1.17661E-05 | 1.03924E-05 | 41310.576 | 5094.9923 | 11.327249 | 1923521.386 |
| South Coast | 2024 | ConstMin - Pavers | Aggregated | 750 | Diesel | 2.37991E-05 | 2.87969E-05 | 3.42707E-05 | 0.000465306 | 0.000128362 | 0.2594833 | 4.41859E-06 | 4.0651E-06 | 4.41859E-06 | 2.39834E-06 | 2.11787E-06 | 8418.6504 | 522.48251 | 1.0787856 | 391861.8823 |
| South Coast | 2024 | OFF - Light Commercial - Pumps | Aggregated | 25 | Diesel | 0.011601955 | 0.013807285 | 0.016706815 | 0.071496026 | 0.10368016 | 13.478816 | 0.004414417 | 0.004061264 | 0.004414417 | 0.000192725 | 0.000112954 | 448997.45 | 965687.8 | 2399.3 | 10612929.8 |
| South Coast | 2024 | OFF - Light Commercial - Pumps | Aggregated | 50 | Diesel | 0.011890183 | 0.0141503 | 0.017121863 | 0.127856018 | 0.116552114 | 18.193843 | 0.003744271 | 0.00344473 | 0.003744271 | 0.000235201 | 0.000152688 | 606943.9 | 387177.4 | 961.89 | 14325563.8 |

**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 | MdlYr | 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_Activity_hpy | Total_Population | 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 | 0.005668297 | 2.0783996 | 0.000192721 | 0.000177303 | 0.000192721 | 1.92021E-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 | 0.00109877 | 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 | 4.04906E-05 | 3.72513E-05 | 4.04906E-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 | 0.147215904 | 0.067944933 | 23.215059 | 0.003228043 | 0.002969799 | 0.003228043 | 0.00021438 | 0.00018947 | 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 | 0.00063509 | 0.000561393 | 2231570.3 | 170543.34 | 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 | 0.00112541 | 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 | 0.00160158 | 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 | 0.00011280 | 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 | 0.00044176 | 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 | 0.00008234 | 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_RUNEX | TOG_RUNEX | CO_RUNEX | NOx_RUNEX | SOx_RUNEX | CO2_RUNEX | CH4_RUNEX | PM10_RUNEX | PM2_5_RUNEX | N2O_RUNEX | 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_RUNEX | ROG_IDLEX | ROG_STREX | ROG_HOTSOAK | ROG_RUNLOSS | ROG_RESTLOSS | ROG_DIURN | TOG_RUNEX | TOG_IDLEX | TOG_STREX | TOG_HOTSOAK | TOG_RUNLOSS | TOG_RESTLOSS | TOG_DIURN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | 0.0165967 | 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 | 0.1944693 | 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 | 0.0229076 | 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 co | Aggregated | Aggregated | DSL | 4467.8956 | 291328.11 | 20199.182 | 0.0115988 | 0.0497707 | 0 | 0 | 0 | 0 | 0 | 0.0132043 | 0.0566602 | 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 co | Aggregated | Aggregated | DSL | 4547.4396 | 289102.73 | 20558.798 | 0.0110903 | 0.0496598 | 0 | 0 | 0 | 0 | 0 | 0.0126254 | 0.0565339 | 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 co | 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 an

| Region | Calendar Year | Vehicle Category | Model Year | Speed | Fuel | CO_RUNEX | CO_IDLEX | CO_STREX | NOx_RUNEX | NOx_IDLEX | NOx_STREX | CO2_RUNEX | CO2_IDLEX | CO2_STREX | CH4_RUNEX | CH4_IDLEX | CH4_STREX | PM10_RUNEX | PM10_IDLEX | PM10_STREX | PM10_PMTW | PM10_PMBW | PM2_5_RUNEX |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 co | 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 co | 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 co | 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_IDLEX | PM2_5_STREX | PM2_5_PMTW | PM2_5_PMBW | SOx_RUNEX | SOx_IDLEX | SOx_STREX | N2O_RUNEX | 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 co | 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 co | 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 co | 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+LCFS) (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/MWhr) | CH4 (lb CO2/GWhr) | N2O (lb CO2/GWhr) |
|---|---|---|---|
| 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) |
| **3** | | **Approach Channel (hopper dredge 1,144,000 CY)** | | | | | | | | | | | | | | | |
| 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 | 0.22 | 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 |
| **4** | | **Main Channel Widening (clam shell dredge 1,065,000 CY)** | | | | | | | | | | | | | | | |
| 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 |
| **5** | | **West Basin (clam shell dredge 501,000 CY)** | | | | | | | | | | | | | | | |
| 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.

**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) |
| **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 | 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 |
| **4** | | **Main Channel Widening (clam shell dredge 1,065,000 CY)** | | | | | | | | | | | | |
| 4 | | **Marine Clamshell Dredge** | | | | | | | | | | | | |
| 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 |
| **5** | | **West Basin (clam shell dredge 501,000 CY)** | | | | | | | | | | | | |
| 5 | | **Marine Clamshell Dredge** | | | | | | | | | | | | |
| 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) |
| **6** | | **Pier J Basin (clam shell dredge 202,000 CY)** | | | | | | | | | | | | | | | |
| 6 | | **Marine Clamshell Dredge** | | | | | | | | | | | | | | | |
| 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 |
| **7** | | **Pier J Approach (clam shell dredge 270,000 CY)** | | | | | | | | | | | | | | | |
| 7 | | **Marine Clamshell Dredge** | | | | | | | | | | | | | | | |
| 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 |
| **8** | | **Pier J Approach (clam shell dredge 1,699,000 CY)** | | | | | | | | | | | | | | | |
| 8 | | **Marine Clamshell Dredge** | | | | | | | | | | | | | | | |
| 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) |
| **6** | | **Pier J Basin (clam shell dredge 202,000 CY)** | | | | | | | | | | | | |
| 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 |
| **7** | | **Pier J Approach (clam shell dredge 270,000 CY)** | | | | | | | | | | | | |
| 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 |
| **8** | | **Pier J Approach (clam shell dredge 1,699,000 CY)** | | | | | | | | | | | | |
| 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) |
| **6** | | **Pier J Basin (clam shell dredge 202,000 CY)** | | | | | | | | | | | | |
| 6 | | **Marine Clamshell Dredge** | | | | | | | | | | | | |
| 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 |
| **7** | | **Pier J Approach (clam shell dredge 270,000 CY)** | | | | | | | | | | | | |
| 7 | | **Marine Clamshell Dredge** | | | | | | | | | | | | |
| 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 |
| **8** | | **Pier J Approach (clam shell dredge 1,699,000 CY)** | | | | | | | | | | | | |
| 8 | | **Marine Clamshell Dredge** | | | | | | | | | | | | |
| 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) |
| **1** | | **Electrical Substation Construction at Pier J (mitigation only)** | | | | | | | | | | | | | | | |
| 1 | | **Off-Road Equipment** | | | | | | | | | | | | | | | |
| 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 | | **On-Road Vehicles** | | | | | | | | | | | | | | | |
| 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 | | | | | | | | | | | | |
| **2** | | **Pier J Breakwater Construction** | | | | | | | | | | | | | | | |
| 2 | | **Marine Activities** | | | | | | | | | | | | | | | |
| 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 | | **Off-Road Equipment** | | | | | | | | | | | | | | | |
| 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 | | **On-Road Vehicles** | | | | | | | | | | | | | | | |
| 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** | | | | | | | | | | | | |
| 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 | 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** | | | | | | | | | | | | |
| 1 | | 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** | | | | | | | | | | | | |
| 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 | 1.511223352 | 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) |
| **3** | **Approach Channel (hopper dredge 2,600,000 CY)** | | | | | | | | | | | | | | | | |
| 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 |
| **4** | **Main Channel Widening (clam shell dredge 1,065,000 CY)** | | | | | | | | | | | | | | | | |
| 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.

**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.

**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) |
| **5** | **West Basin (clam shell dredge 717,000 CY)** | | | | | | | | | | | | | | | | |
| 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 |
| **6** | **Pier J Basin (clam shell dredge 258,000 CY)** | | | | | | | | | | | | | | | | |
| 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 | | | | | | | | | | |
| | | | | 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** | | **West Basin (clam shell dredge 717,000 CY)** | | | | | | | | | | | | |
| 5 | | **Marine Clamshell Dredge** | | | | | | | | | | | | |
| 5 | | Clamshell Dredge hoist | Marine Equipment | 0.44 | 0.44 | 0.44 | 13.27 | 0.01 | 7.57 | 0.7354 | 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 |
| **6** | | **Pier J Basin (clam shell dredge 258,000 CY)** | | | | | | | | | | | | |
| 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.

**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) |
| **7** | **Pier J Basin (clam shell dredge 46,000 CY)** | | | | | | | | | | | | | | | | |
| 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 |
| **8** | **Pier J Approach (clam shell dredge 1,994,000 CY)** | | | | | | | | | | | | | | | | |
| 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) |
| **7** | **Pier J Basin (clam shell dredge 46,000 CY)** | | | | | | | | | | | | | |
| 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 |
| **8** | **Pier J Approach (clam shell dredge 1,994,000 CY)** | | | | | | | | | | | | | |
| 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.

**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) |
| 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) |
| 9 | Pier J Approach (clam shell dredge 679,000 CY) | | | | | | | | | | | | | |
| 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 ConstructionTugboat 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 ConstructionTugboat 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 | | | | | | | | | | |
| | | | | 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 | 0.016 | 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 ConstructionTugboat 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 ConstructionTugboat 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 | | | | | | | | | | |
| | | | | | | | 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) |
| **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 | | | | | | | | | | |
| | | | | 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**

| | | | | 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** | **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 | | | | | | | | | | |
| | | | | | | | 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) |
| **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 | 6376.769 |
| 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 | | | | | | | | | | |
| | | | | | | | 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) |
| **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 | | | | | | | | | | |
| | | | | 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) |
| **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 | | | | | | | | | | |
| | | | | | | | 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) |
| **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 | | | | | | | | | | |
| | | | | 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) |
| **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 | | | | | | | | | | |
| | | | | | | | 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) |
| **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) | (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** | | | | | | | | | | |
| | | | | | | | 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 | | | | | | | | | | |
| | | | | 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) |
| **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 | | | | | | | | | | |
| 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) |
| **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 | 1169.1103 |
| 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 | | | | | | | | | | |
| 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) |
| **8** | | **Pier J Approach (clam shell dredge 1,994,000 CY)** | | | | | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | | | | | | | |
| **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 | 4.36507937 | 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 |
| | | | | | | | | | | | | | | | | | |
| **10** | | **Standby Area (clam shell dredge 921,000 CY)** | | | | | | | | | | | | | | | |
| 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 |
| | | | | | | | | | | | | | | | | | |
| **11** | | **Standby Area (clam shell dredge 118,000 CY)** | | | | | | | | | | | | | | | |
| 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 | | | | | | | | | | |
| | | | 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) | (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 ($NO_2$) - 1-hour and annual
- Carbon monoxide (CO) - 1-hour and 8-hour
- Sulfur dioxide ($SO_2$) - 1-hour and 24-hour
- Particulate matter less than 10 microns in diameter ($PM_{10}$) - 24-hour and annual
- Particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) - 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 $NO_2$ 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.

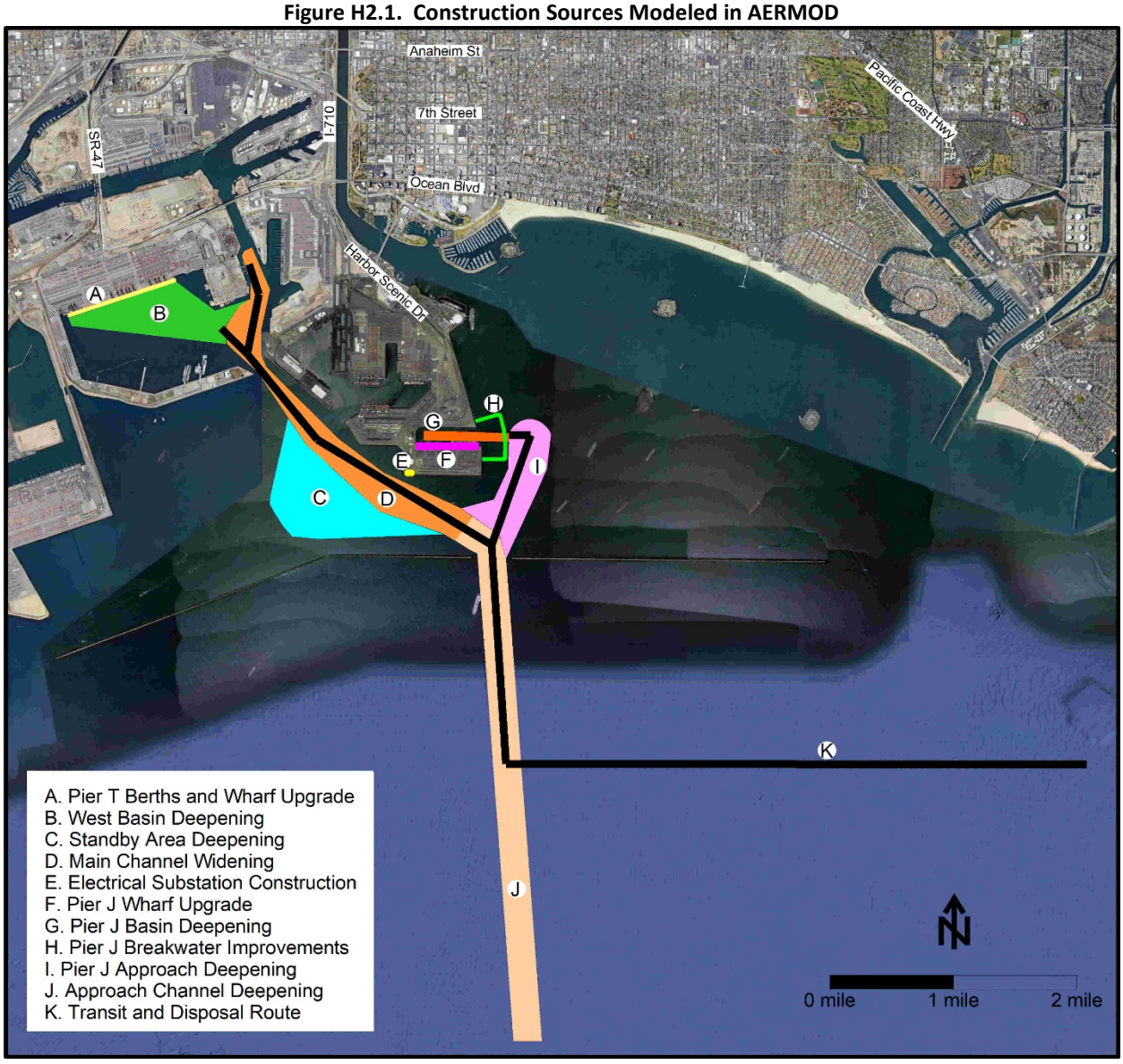
**Table H2.2. Source Parameters in AERMOD**

| Source Category | Source Type | Source Height (m) | Vertical Dispersion Coefficient $\sigma_z$ (m) [h] | Line Source Width (m) |
|---|---|---|---|---|
| Hopper dredge – transit [a] | Line | 21.29 | 4.95 | 100 |
| Hopper dredge – dredging [a] | Poly-area | 21.29 | 4.95 | n/a |
| Clamshell dredge [b] | Poly-area | 24.23 | 5.64 | n/a |
| Tugboats – transit [c] | Line | 15.2 | 3.5 | 100 |
| Tugboats – dredging [c] | Poly-area | 15.2 | 3.5 | n/a |
| Off-road construction equipment [d] | Poly-area | 4.6 | 1.1 | n/a |
| Crew boats [e] | Poly-area | 15.2 | 3.5 | n/a |
| Construction trucks [f] | Poly-area | 4.6 | 1.1 | n/a |
| Fugitive dust [g] | 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 (NOx) to $NO_2$ 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 NOx concentrations based on a formula derived empirically from ambient monitored ratios of $NO_2$/NOx. The default upper and lower limits on the ambient ratio applied to the modeled NOx concentration are 0.9 and 0.5, respectively.

For each combination of pollutant and averaging time except for the federal 1-hour $NO_2$ 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 $NO_2$ standard, the federal 1-hour $NO_2$ 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 $NO_2$ 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 $PM_{10}$ and $PM_{2.5}$ 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 $PM_{2.5}$. POLB's Superblock station was used for the $PM_{2.5}$ background concentration because the Gull Park station has no Federal Reference Method (FRM) $PM_{2.5}$ 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 [a,i,j] | | | Background Concentration [c] | |
|---|---|---|---|---|---|---|
| | | 2016 | 2017 | 2018 | (ppm) | (ug/m³) [d] |
| $NO_2$ (ppm) | 1-Hour State | 0.086 | 0.096 | 0.083 | 0.096 | 181 |
| | 1-Hour Federal [b] | -- | -- | -- | 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 |
| $SO_2$ (ppm) | 1-Hour State | 0.012 | 0.012 | 0.011 | 0.012 | 32 |
| | 1-Hour Federal [e] | -- | -- | -- | 0.009 | 24 |
| | 24-Hour | 0.003 | 0.005 | 0.004 | 0.005 | 13 |
| $PM_{10}$ (ug/m3) | 24-Hour Federal [f] | 51.2 | 66.4 | 48.6 | -- | 66.4 |
| $PM_{2.5}$ (ug/m3) | 24-Hour Federal [g] | -- | -- | -- | -- | 27.2 |
| | Annual Federal [h] | 8.7 | 9.3 | 9.5 | -- | 9.2 |

ppm = parts per million; ug/m3 = 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 $NO_2$ 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 $NO_2$, 1-hour federal $SO_2$, 24-hour federal $PM_{2.5}$, and annual federal $PM_{2.5}$ 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/m3) is calculated as follows: ug/m3 = ppm x MW / 0.0244. The molecular weights (MW) are 28.01 for CO, 46.0055 for $NO_2$, and 64.066 for $SO_2$.

e. The background concentration reported for the federal 1-hour $SO_2$ 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 $PM_{10}$ 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 $PM_{2.5}$ 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 $PM_{2.5}$ 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 $PM_{2.5}$, which was recorded at POLB's Superblock station because the Gull Park station has no Federal Reference Method (FRM) $PM_{2.5}$ 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? |
|---|---|---|---|---|---|---|
| ***Alternative 2*** | | | | | | |
| $NO_2$ | 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 |
| $SO_2$ | 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 |
| $PM_{10}$ | 24-Hour | 1.9 | n/a | 1.9 | 10.4 | No |
| | Annual | 0.1 | n/a | 0.1 | 1.0 | No |
| $PM_{2.5}$ | 24-Hour | 1.7 | n/a | 1.7 | 10.4 | No |
| ***Alternative 3*** | | | | | | |
| $NO_2$ | 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 |
| $SO_2$ | 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? |
|---|---|---|---|---|---|---|
| $PM_{10}$ | 24-Hour | 1.9 | n/a | 1.9 | 10.4 | No |
| | Annual | 0.1 | n/a | 0.1 | 1.0 | No |
| $PM_{2.5}$ | 24-Hour | 1.7 | n/a | 1.7 | 10.4 | No |
| ***Alternative 4*** | | | | | | |
| $NO_2$ | 1-Hour State | 173.2 | 181.0 | 354 | 339 | **Yes** |
| | 1-Hour Federal | 133.0 | 141.4 | 274 | 188 | **Yes** |
| | Annual | 3.0 | 33.9 | 37 | 57 | No |
| $SO_2$ | 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 |
| $PM_{10}$ | 24-Hour | 1.9 | n/a | 1.9 | 10.4 | No |
| | Annual | 0.2 | n/a | 0.2 | 1.0 | No |
| $PM_{2.5}$ | 24-Hour | 1.7 | n/a | 1.7 | 10.4 | No |
| ***Alternative 5*** | | | | | | |
| $NO_2$ | 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 |
| $SO_2$ | 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 |
| $PM_{10}$ | 24-Hour | 1.9 | n/a | 1.9 | 10.4 | No |
| | Annual | 0.1 | n/a | 0.1 | 1.0 | No |
| $PM_{2.5}$ | 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**

| Pollutant | Averaging Time | Maximum Modeled Project Concentration (ug/m3) | Background Concentration (ug/m3) | Total Concentration (ug/m3) | NAAQS (ug/m3) | Concentration Exceeds NAAQS? |
|---|---|---|---|---|---|---|
| *Alternative 2* | | | | | | |
| $NO_2$ | 1-Hour | 133.0 | 141.4 | 274 | 188 | **Yes** |
| | Annual | 2.0 | 33.9 | 36 | 100 | No |
| $SO_2$ | 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 |
| $PM_{10}$ | 24-Hour | 1.9 | 66.4 | 68 | 150 | No |
| $PM_{2.5}$ | 24-Hour | 1.7 | 27.2 | 29 | 35 | No |
| | Annual | 0.09 | 9.2 | 9.3 | 12.0 | No |
| *Alternative 3* | | | | | | |
| $NO_2$ | 1-Hour | 133.0 | 141.4 | 274 | 188 | **Yes** |
| | Annual | 2.3 | 33.9 | 36 | 100 | No |
| $SO_2$ | 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 |
| $PM_{10}$ | 24-Hour | 1.9 | 66.4 | 68 | 150 | No |
| $PM_{2.5}$ | 24-Hour | 1.7 | 27.2 | 29 | 35 | No |
| | Annual | 0.1 | 9.2 | 9.3 | 12.0 | No |
| *Alternative 4* | | | | | | |
| $NO_2$ | 1-Hour | 133.0 | 141.4 | 274 | 188 | **Yes** |
| | Annual | 3.0 | 33.9 | 37 | 100 | No |
| $SO_2$ | 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 |
| $PM_{10}$ | 24-Hour | 1.9 | 66.4 | 68 | 150 | No |
| $PM_{2.5}$ | 24-Hour | 1.7 | 27.2 | 29 | 35 | No |
| | Annual | 0.1 | 9.2 | 9.3 | 12.0 | No |
| *Alternative 5* | | | | | | |
| $NO_2$ | 1-Hour | 133.0 | 141.4 | 274 | 188 | **Yes** |
| | Annual | 2.3 | 33.9 | 36 | 100 | No |
| $SO_2$ | 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 |
| $PM_{10}$ | 24-Hour | 1.9 | 66.4 | 68 | 150 | No |
| $PM_{2.5}$ | 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 $NO_2$ concentration (presented in both Tables H2.4 and H2.5) would exceed the threshold, and the location of the maximum on-land receptor. Figure H.2.3 shows the areas where the modeled 1-hour state $NO_2$ 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 NO2 Threshold, Without Mitigation**

**Figure H2.2. Location of Maximum Concentration and Area of Exceedance of the 1-Hour State $NO_2$ Threshold, Without Mitigation**

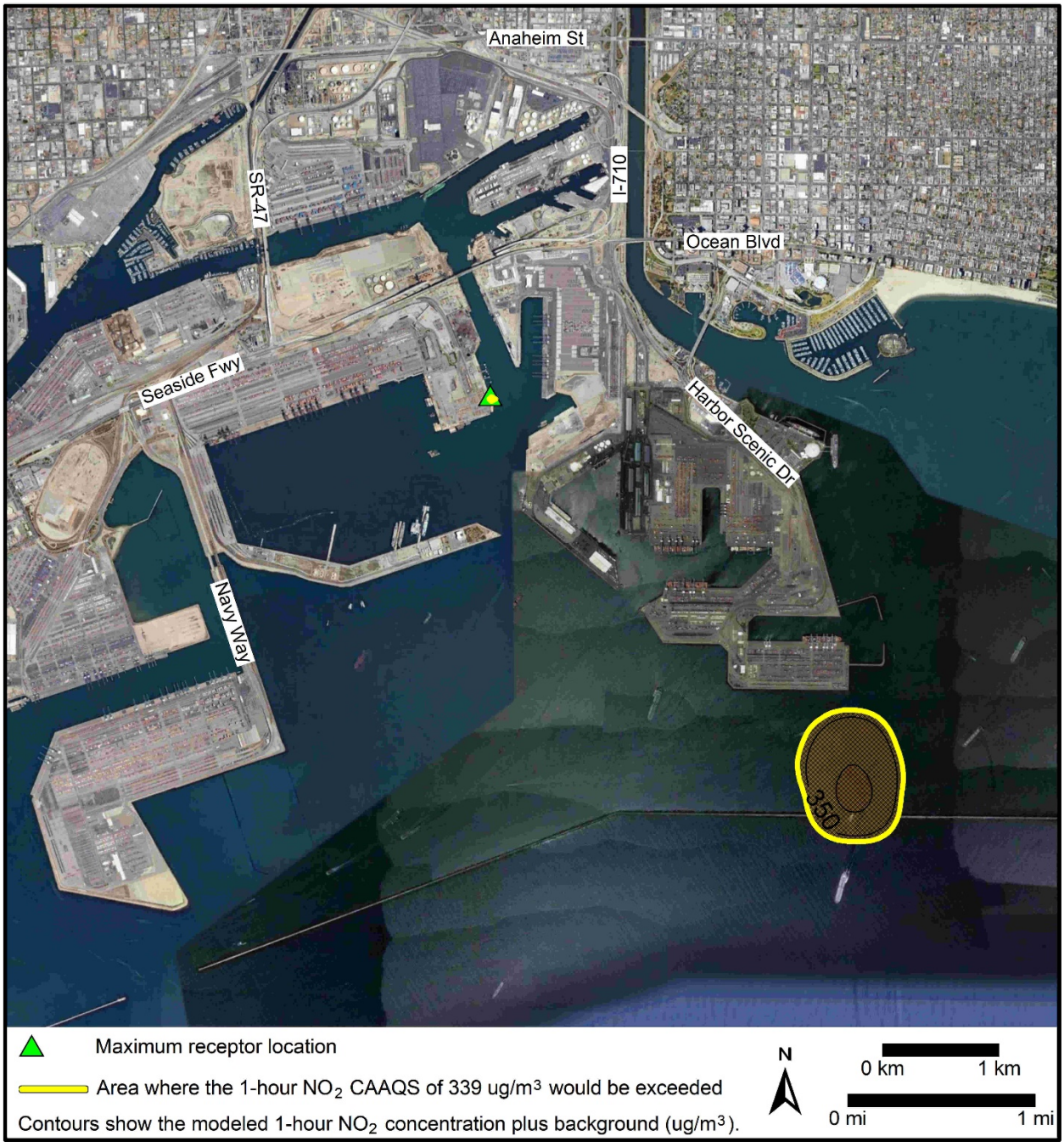


Table H2.6 presents the maximum offsite pollutant concentrations for the CEQA analysis associated with all mitigated Action Alternatives. This table presents the highest modeled concentrations on land. Concentrations at all other modeled on-land receptors would be less than the displayed values.

**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? |
|---|---|---|---|---|---|---|
| ***Alternative 2*** | | | | | | |
| $NO_2$ | 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 |
| $SO_2$ | 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 |
| $PM_{10}$ | 24-Hour | 1.9 | n/a | 1.9 | 10.4 | No |
| | Annual | 0.05 | n/a | 0.05 | 1.0 | No |
| $PM_{2.5}$ | 24-Hour | 1.7 | n/a | 1.7 | 10.4 | No |
| ***Alternative 3*** | | | | | | |
| $NO_2$ | 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 |
| $SO_2$ | 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 |
| $PM_{10}$ | 24-Hour | 1.9 | n/a | 1.9 | 10.4 | No |
| | Annual | 0.06 | n/a | 0.06 | 1.0 | No |
| $PM_{2.5}$ | 24-Hour | 1.7 | n/a | 1.7 | 10.4 | No |
| ***Alternative 4*** | | | | | | |
| $NO_2$ | 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 |
| $SO_2$ | 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 |
| $PM_{10}$ | 24-Hour | 1.9 | n/a | 1.9 | 10.4 | No |
| | Annual | 0.1 | n/a | 0.1 | 1.0 | No |
| $PM_{2.5}$ | 24-Hour | 1.7 | n/a | 1.7 | 10.4 | No |
| ***Alternative 5*** | | | | | | |
| $NO_2$ | 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 |
| $SO_2$ | 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 |
| $PM_{10}$ | 24-Hour | 1.9 | n/a | 1.9 | 10.4 | No |
| | Annual | 0.06 | n/a | 0.06 | 1.0 | No |
| $PM_{2.5}$ | 24-Hour | 1.7 | n/a | 1.7 | 10.4 | No |

1

2

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**

| Pollutant | Averaging Time | Maximum Modeled Project Concentration (ug/m3) | Background Concentration (ug/m3) | Total Concentration (ug/m3) | NAAQS (ug/m3) | Concentration Exceeds NAAQS? |
|---|---|---|---|---|---|---|
| *Alternative 2* | | | | | | |
| $NO_2$ | 1-Hour | 114.9 | 141.4 | 256 | 188 | **Yes** |
| | Annual | 0.9 | 33.9 | 35 | 100 | No |
| $SO_2$ | 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 |
| $PM_{10}$ | 24-Hour | 1.9 | 66.4 | 68 | 150 | No |
| $PM_{2.5}$ | 24-Hour | 1.7 | 27.2 | 29 | 35 | No |
| | Annual | 0.04 | 9.2 | 9.2 | 12.0 | No |
| *Alternative 3* | | | | | | |
| $NO_2$ | 1-Hour | 114.9 | 141.4 | 256 | 188 | **Yes** |
| | Annual | 1.2 | 33.9 | 35 | 100 | No |
| $SO_2$ | 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 |
| $PM_{10}$ | 24-Hour | 1.9 | 66.4 | 68 | 150 | No |
| $PM_{2.5}$ | 24-Hour | 1.7 | 27.2 | 29 | 35 | No |
| | Annual | 0.06 | 9.2 | 9.2 | 12.0 | No |
| *Alternative 4* | | | | | | |
| $NO_2$ | 1-Hour | 114.9 | 141.4 | 256 | 188 | **Yes** |
| | Annual | 1.9 | 33.9 | 36 | 100 | No |
| $SO_2$ | 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 |
| $PM_{10}$ | 24-Hour | 1.9 | 66.4 | 68 | 150 | No |
| $PM_{2.5}$ | 24-Hour | 1.7 | 27.2 | 29 | 35 | No |
| | Annual | 0.1 | 9.2 | 9.3 | 12.0 | No |
| *Alternative 5* | | | | | | |
| $NO_2$ | 1-Hour | 114.9 | 141.4 | 256 | 188 | **Yes** |
| | Annual | 1.2 | 33.9 | 35 | 100 | No |
| $SO_2$ | 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 |
| $PM_{10}$ | 24-Hour | 1.9 | 66.4 | 68 | 150 | No |
| $PM_{2.5}$ | 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 $NO_2$ 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 $NO_2$ 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 $NO_2$ 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 PM2.5, NOx, 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 PM2.5, NO2, CO, and ozone. PM2.5 would be both directly emitted ("primary" PM2.5) and would form through secondary reactions of precursor pollutants NOx and VOC ("secondary" PM2.5). NO2 would be directly emitted as one of the NOx 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 NOx 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 PM2.5. 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 NO2 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 NOx 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 PM10 and PM2.5. In its most recent review, USEPA concluded that both short-term and long-term exposures to PM2.5 are causally related to increased mortality risk (USEPA 2009).*

**Nitrogen Dioxide.** The SCAB is currently in attainment of the CAAQS and NAAQS for NO2. The most stringent state and federal NO2 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 NO2 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 NOx. 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 NOx (SCAQMD, 2017). This estimate shows that the TSP's maximum regional NOx 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 NOx emissions contributions from the TSP, the TSP would not contribute to a regional violation of the NO2 standards and would not contribute to regional adverse health effects related to NO2 outside of the local Port area. Adverse health effects related to the TSP's NO2 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 NOx 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 NOx 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 NOx. 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 NOx (SCAQMD, 2017). These estimates show that the TSP's maximum regional VOC and NOx 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 PM2.5 and ozone in the SCAB. The TSP would not contribute to regional adverse health effects associated with exposure to CO or NO2. 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 NO2 concentrations with mitigation. The local concentrations would be less than significant for SO2, CO, PM10, and PM2.5. Therefore, construction of the TSP would potentially contribute to local adverse health effects associated with exposure to NO2.

### *Analysis Approach and Limitations*

There is currently no reliable methodology available that can quantify health effects associated with local exposure to NO2 concentrations. Therefore, this document provides a qualitative discussion of the potential for the TSP's local NO2 impacts to cause adverse health effects. The qualitative discussion (a) identifies the local area where NO2 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 NO2 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 NO2 concentrations that exceed the 1-hour NAAQS. The maximum concentration on land is predicted to be 256 ug/m3 (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 NO2.

Appendix A, Figure A2.4 shows the area where the modeled NO2 concentration would exceed the federal 1-hour NO2 standard during TSP construction, after mitigation. This is the area where the potential for adverse health effects associated with NO2 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 NO2 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 NO2, and evidence suggestive of impacts on cardiovascular health, mortality and cancer (USEPA 2016). Evidence for low-level nitrogen dioxide (NO2) 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 NO2 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 NO2 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 NO2 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 NO2 exposures have negative effects on the immune system, and therefore increase the host's susceptibility to respiratory infections. Epidemiological studies showing associations between NO2 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 NO2. The area of impact would occur on POLB property. The TSP would not contribute to local adverse health effects associated with exposure to SO2, CO, PM10, or PM2.5. 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.[1]

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 $PM_{10}$ 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 $PM_{10}$ 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 $PM_{10}$ emissions associated with construction of the Action Alternatives would be from diesel exhaust. Non-exhaust $PM_{10}$ (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 $PM_{10}$ 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 $PM_{10}$ concentration during all other years of construction. The average $PM_{10}$ concentrations

[1] Sensitive receptors were conservatively evaluated with residential exposure assumptions.

during these two exposure periods were estimated by scaling the $PM_{10}$ 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 $PM_{10}$ concentration over the entire construction period. The average $PM_{10}$ concentration was estimated by scaling the $PM_{10}$ 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 $PM_{10}$ 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 [a] | | | | Estimated DPM Concentration at the Maximum Residential Receptor | | | Estimated DPM Concentration at the Maximum Occupational Receptor | | Estimated Individual Cancer Risk | | Estimated Chronic Hazard Index [m] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum Year (lb/yr) [b] | Average Years 1-2 (lb/yr) [c] | Average Years 3-6 (lb/yr) [d] | Average Years 1-6 (lb/yr) [e] | Maximum Year (ug/m3) [f] | Average Years 1-2 (ug/m3) [g] | Average Years 3-6 (ug/m3) [h] | Maximum Year (ug/m3) [i] | Average Years 1-6 (ug/m3) [j] | Maximum Residential Receptor [k] | Maximum Occupational Receptor [l] | 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 |
| **Threshold** | | | | | | | | | | **1.0E-05** | **1.0E-05** | **1** | **1** |

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 $PM_{10}$ 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 $PM_{10}$ 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.

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 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/m3 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/m3 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/m3 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/m3 as published in CARB's Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values. https://ww3.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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# DRAFT INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL IMPACT STATEMENT / ENVIRONMENTAL IMPACT REPORT (EIS/EIR)

## APPENDIX I: PLANNING AID REPORT AND ENDANGERED SPECIES ACT

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

October 2019

US Army Corps of Engineers ®

Port of LONG BEACH
The Green Port

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# PLANNING AID REPORT

## *US FISH AND WILDLIFE SERVICE*
## *30 JUNE 2016*

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# United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Carlsbad Fish and Wildlife Office
2177 Salk Avenue, Suite 250
Carlsbad, California 92008

In Reply Refer To:
FWS-LA-15B0128-16CPA0091-E00880

June 30, 2016

Colonel Kirk Gibbs
U.S. Army Corps of Engineers, Los Angeles District
915 Wilshire Boulevard, Suite 930
Los Angeles, California 90017-3409

Attention: Lawrence Smith

Subject: Final Planning Aid Report for the Proposed Port of Long Beach Deep Draft Navigation Project, Los Angeles County, California

Dear Colonel Gibbs:

The U.S. Fish and Wildlife Service (Service) has prepared this Final Planning Aid Report (PAR) for the U.S. Army Corps of Engineers (Corps) on the proposed Port of Long Beach Deep Draft Navigation Project (project) to describe issues and opportunities related to the conservation and enhancement of fish and wildlife resources. The project, as proposed, would involve dredging and deepening portions of the Port of Long Beach (Port), Los Angeles County, California. The purpose of the proposed project is to improve transportation efficiency and safety at the Port for large ships.

The proposed project area would involve portions of the Los Angeles County coast of the eastern Pacific Ocean, within about 3 miles seaward of the historic coastline near the mouth of the Los Angeles River. These existing marine and estuarine areas have been heavily modified over the last century associated with development of Long Beach Harbor/Port of Long Beach and nearby civil engineering and commercial/urban development. Most of the direct project footprint would occur within the boundaries of the Port; exceptions include proposed modifications to portions of the Pier J ship approach area (Corps 2016) and potential (currently undetermined) dredge material disposal areas, both of which are outside the Port harbor district area. The project area is located south of the City of Long Beach and east of the community of San Pedro and the Port of Los Angeles. The depths, widths, and volumes of dredge and disposal material associated with the proposed project are currently undetermined.

This PAR is provided in accordance with the Fish and Wildlife Coordination Act (FWCA) of 1958, as amended (48 Stat. 401; 16 U.S.C. 661 *et seq*.), the Endangered Species Act (ESA) of 1973, as amended (87 Stat. 884; 16 U.S.C. 1531 *et seq*.), and the scope of work agreed upon by the Corps and the Service. This PAR does not constitute the report of the Secretary of the Interior as required by section 2(b) of the FWCA, nor does it constitute a biological opinion under section 7 of the ESA.

The purpose of this PAR is to deliver recommendations for use by the Corps design team in developing goals, objectives, and alternatives for the project.

In October 2015, the Council on Environmental Quality released Memorandum M-16-01 for Executive Departments and Agencies entitled Incorporating Ecosystem Services into Federal Decision Making. The memorandum recognizes that nature provides vital contributions to human economic and social well-being that are often not traded in markets or fully considered in decisions. It directs Federal agencies to incorporate ecosystem services into Federal planning and decision making,[1] and to develop, institutionalize, and implement policies to promote consideration of ecosystem services in planning, investments, and regulatory contexts. Additionally, it calls for integration of assessments of ecosystem services into relevant programs and projects, in accordance with the agency's statutory authority.

In November 2015 the White House released a Presidential Memorandum entitled Mitigating Impacts on Natural Resources from Development and Encouraging Related Private Investment. This memorandum underscores the importance of effectively mitigating adverse impacts to land, water, wildlife, and other ecological resources (EPA 2016). It orders five federal agencies, including the Departments of the Interior and Defense, to streamline regulations for offsetting environmental harm and to promote mitigation efforts. The memorandum establishes a national policy "net benefit goal" for natural resource use from projects. The memo seeks to unify natural resource mitigation goals across agencies; at a minimum, the memorandum calls for "no net loss" of land, water, wildlife and other ecological resources from federal actions including permitting; this extends the no-net-loss national policy standard for wetlands established by the President in 1989. The memorandum also directs that compensatory mitigation is now national policy (White House 2015); the memorandum was designed to ensure consistency and transparency as agencies across the Federal government develop mitigation measures (Bean 2016). Concurrent with the release of the November 2015 Presidential Memorandum, the Department of the Interior issued formal policy and guidance to its bureaus and offices to best implement mitigation measures associated with legal and regulatory responsibilities and the management of Federal lands, waters, and other natural and cultural resources under its jurisdiction, using the best available science (Bean 2016). When assessing appropriate mitigation options, the Service relies upon a long established general mitigation hierarchy – first seeking to avoid impacts, then minimizing them, and then compensating for unavoidable impacts that could impair resource functions or values (Bean 2016).

As of March 2016, the Corps is preparing the Port of Long Beach Deep Draft Navigation Project Feasibility Study. The Corps is currently scoping project alternatives and will likely prepare an Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the project. This feasibility study phase of the project would likely conclude with the distribution of the Draft EIS/EIR for public review, reportedly scheduled by the Corps for 2018 (Corps 2015).

Repeated dredging is often necessary to maintain operations of many marine harbors. The dredging proposed herein would be implemented to increase the design water depths within the Port for ship

[1] Broadly defined, ecosystem services are the benefits that flow from nature to people, e.g., nature's contributions to the production of food and timber; life-support processes, such as water purification and coastal protection; and life-fulfilling benefits, such as places to recreate.

navigation purposes for very large ships (as compared to regular maintenance dredging). Harbor dredging often has effects on the marine environment, and dredged material disposal may affect water quality, mobilize contaminants, and bury or alter habitats, bathymetry, and physical processes (NOAA 2014).

**Introduction**

Vessels of increasingly larger size and deeper drafts[2] have been entering U.S. ports over the last decade-plus (NOAA 2015). The proposed project would be another increment in a series of dredge-and-fill projects over the last several decades that have modernized and reshaped the Port. This project would deepen water depths for access and navigation of very large ships within the Port. The latest generation of large cargo ships being built is twice the size of those that entered the global fleet only 15 years ago; these ships are now calling at the Port (Port 2016). These larger ships are reportedly more cost effective for ocean carriers and decrease transportation diesel consumption (Port 2016). These massive vessels, some with capacity of 14,000 Twenty-foot Equivalent Units (TEUs),[3] can be up to 1,200 feet long (Port 2016). Long Beach is one of only a handful of ports in North America capable of accommodating these larger ships, per the following features (Port 2016):

1. Deep-water main channel;

2. Deep-water terminals;

3. Berths designed to handle vessels that can exceed 156,000 tons fully loaded; and

4. Cranes that can move containers stacked 180 feet high and 24 boxes wide.

A century of harbor dredging and filling associated with development of the Port of Los Angeles and the Port of Long Beach has eliminated thousands of acres of the historic Wilmington Lagoon/Los Angeles River Estuary. In its place, behind manmade breakwaters, remains an open-water marine embayment of relatively high biological diversity and productivity.

Pacific Rim trade is increasing, along with the size of the some of the associated ships entering U.S. ports. The Port is a major center of international commerce on the west coast of the United States. Development of a permanent industrial base within the Port was gradual and began with increased harbor improvements and transportation in the early 1900s. It is the second-busiest container port in the United States, after the adjacent Port of Los Angeles. The Corps, in conjunction with the Port, are now examining options to provide additional channel depths to allow very large ships (with greater drafts than those that can currently be effectively accommodated) into the Port.

[2] The draft of a ship's hull is the vertical distance between the waterline and the bottom of the hull or keel.
[3] TEU or Twenty-Foot Equivalent Unit can be used to measure a ship's cargo carrying capacity. The dimensions of one TEU are equal to that of a standard 20-foot shipping container (20 feet long, 8.5 feet tall and 8 feet wide).

**Fish and Wildlife Coordination Act**

The Fish and Wildlife Coordination Act of 1934 included requirements that were the first formal expressions in U.S. law of a duty to minimize the negative environmental impacts of major water resource development projects and to compensate for those impacts that remained (Bean 2016).

The FWCA was a response to a U.S. era of big dam building and reflected a concern for the impact of those dams, particularly on anadromous fish (Bean 2016). As originally enacted in 1934, it required consultation with the Bureau of Fisheries (as the Service was then known) prior to the construction of any dam to determine if fish ladders or other aids to migration were necessary and economically practical to minimize impacts on fish populations. It required, as well, the opportunity to use the impounded waters for hatcheries to offset impacts that could not otherwise be avoided. The duties imposed by the FWCA were reinforced and expanded by the National Environmental Policy Act of 1969 (NEPA) (Bean 2016). Under NEPA and its implementing regulations, all federal agencies have a duty to assess the impacts of the major actions they propose to undertake and to consider reasonable alternatives to reduce or eliminate those impacts (Bean 2016). The Service, as the federal agency charged by Congress in the Fish and Wildlife Act of 1956 with the responsibility for management, conservation, and protection of fish and wildlife resources, routinely recommends mitigation measures to other federal agencies through the NEPA and FWCA processes (Bean 2016).

The FWCA directs and authorizes consultation, reporting, consideration, and installation/implementation of fish and wildlife conservation features. The authorities of the FWCA are considered to be “supplementary legislation” to the various Federal project authorizations, such as the Corps public works authorizations (Smalley and Mueller 2004). The FWCA conditions or supplements other water development statutes to require consideration of recommendations generated under the FWCA procedures, including portions of the Clean Water Act [*Zabel* v. *Tabb*, 430 F2d 199 (5th Cir. 1970) cert. denied 401 U.S. 910 (1972)]. For Federal water resources development projects, the FWCA requires that fish and wildlife conservation receive equal consideration by Federal agencies with other project purposes, and that such conservation be coordinated with other project features. The FWCA authorizes the project implementation of means and measures for both mitigating losses of fish and wildlife resources, and for enhancing these resources beyond the offsetting of project effects (Smalley and Mueller 2004).

**Project Area History**

In 1542, Juan Rodriquez Cabrillo “discovered” the "Bay of Smokes" that is now called San Pedro Bay, describing it from offshore aboard ship. The smoke he described above the bay may have originated from the several Native American villages that existed near the bay along the Los Angeles River at the time. Much of the south-facing San Pedro Bay along the coast was originally a shallow estuary and mudflat (see Figures 1 – 3).

The area currently occupied by the ports of Los Angeles and Long Beach formerly included several undeveloped islands, and likely included barrier beaches and beach/river-mouth sand spits. These islands and spits likely included unvegetated beach and open areas that historically supported what

are now sensitive species, including California least terns [*Sternula antillarum browni* (*Sterna a. b.*);[4] least tern] and western snowy plovers [*Charadrius alexandrinus nivosus* (*C. alexandrinus n.*); snowy plover].[5] The area of the northern San Pedro Bay was originally largely a marsh, with the Los Angeles River and the Bay sharing a common opening into the ocean.

In 1899 construction of the San Pedro Bay breakwater began near the project area. In 1906, the Los Angeles Dock and Terminal Company started development of Long Beach Harbor by purchasing 800 acres of sloughs and salt marshes associated with the Los Angeles River mouth estuary — an area that later became the inner portion (Inner Harbor) of Long Beach Harbor. In 1907, construction began on the Craig Shipyard in the Inner Harbor; the Craig Shipyard Company was also awarded a contract to dredge a channel from the open ocean to the new Inner Harbor. In 1911, the State of California (State) granted the tidelands areas of what is now the Port of Long Beach to the City of Long Beach (City) for port operations.[6] These tidelands were granted to the City in trust for the people of the State. This tidelands trust not only restricts the use of the tidelands, but the tidelands and tidelands-related revenues of the Port must be used for purposes related to harbor commerce, navigation, marine recreation, and fisheries. The Port currently includes more than 7,600 acres of wharves, cargo terminals, roadways, rail yards, and shipping channels, and is one of the world's busiest seaports (see Figure 3).

An 8.5 mile-long breakwater made of three rock segments stretches across most of San Pedro Bay, with two openings to allow ships to enter the harbor areas of the Ports of Los Angeles and Long Beach behind it. The initial western section of the breakwater, called the San Pedro Breakwater, was constructed between 1899 and 1911 at San Pedro; the Middle Breakwater was completed from 1911 to 1936, and the Long Beach Breakwater was completed after World War II. The San Pedro and Middle Breakwaters protect the Ports of Los Angeles and Long Beach, respectively (Long Beach 2009).

The Los Angeles River is a major river and flood management waterway for the Los Angeles watershed basin. In the 1930s, the Army Corps began channelizing the river for flood damage reduction and by 1954, the entire length of the river was channelized (Long Beach 2009). The river is now maintained by the Corps and the Los Angeles County Department of Public Works (Long Beach 2009). The Los Angeles River continues to discharge into San Pedro Bay at the northeastern edge of the proposed Project Area.

Considerable changes have occurred in the two ports since the 1970s. Some of these changes included deepening of navigational channels and basins; construction of substantial landfills at Piers 300 and 400 in the Port of Los Angeles; construction of a transportation corridor out to Pier 400; expansion of Pier J in the Port of Long Beach; and construction the west basin of the Cabrillo Marina

[4] The California least tern was originally and remains federally- and California State-listed under the generic name of *Sterna antillarum browni*; this original name is now otherwise invalid. The American Ornithologists Union in 2006 changed the valid generic name of the least tern to *Sternula*, with the California least tern then becoming *Sternula a. b.*) (Service 2016).

[5] California least terns typically nest in colonies on relatively open beach areas that are free of vegetation and are near fish prey (Service 2006). Sand spits, dune-backed beaches, beaches at creek and river mouths, and salt pans at lagoons and estuaries are the main coastal habitats for nesting western snowy plovers (Service 2007).

[6] Tidelands in California are defined as those lands and water areas along the coast of the Pacific Ocean seaward of the ordinary high tide line to a distance of three miles.

complex. As part of mitigation for construction and channel deepening, shallow water habitats were created in formerly deepwater areas near Pier 300, near the San Pedro Breakwater, and on the east side of Pier 400. Thus, several areas that were previously aquatic natural communities are now developed land areas, some former deep water areas are now shallow, and water circulation patterns within the Ports have been substantially altered.

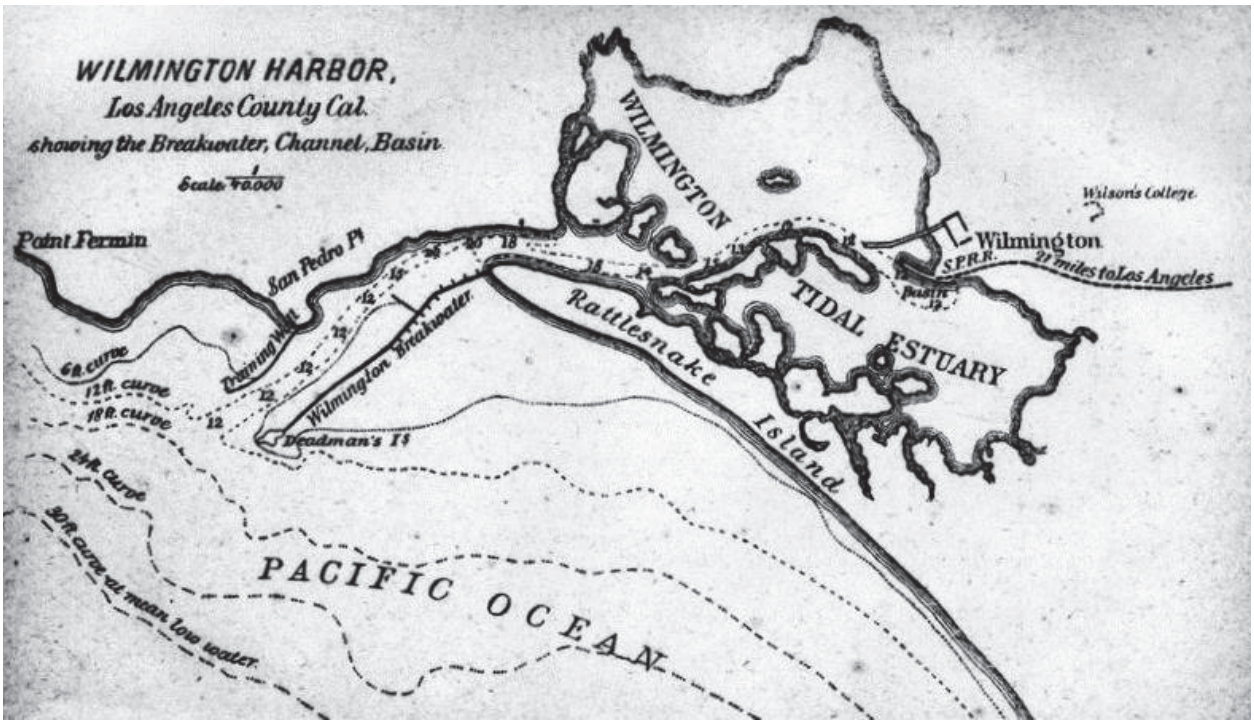


Figure 1. Circa 1880 drawing of Wilmington Harbor. The Future Port of Long Beach is on the east (right) side of the "Wilmington Tidal Estuary." "Rattlesnake Island" would later be expanded to become Terminal Island within the ports of Los Angeles and Long Beach. Wilmington Harbor would later become the Port of Los Angeles. Note the water depths indicated. (Water Power and Associates 2014)

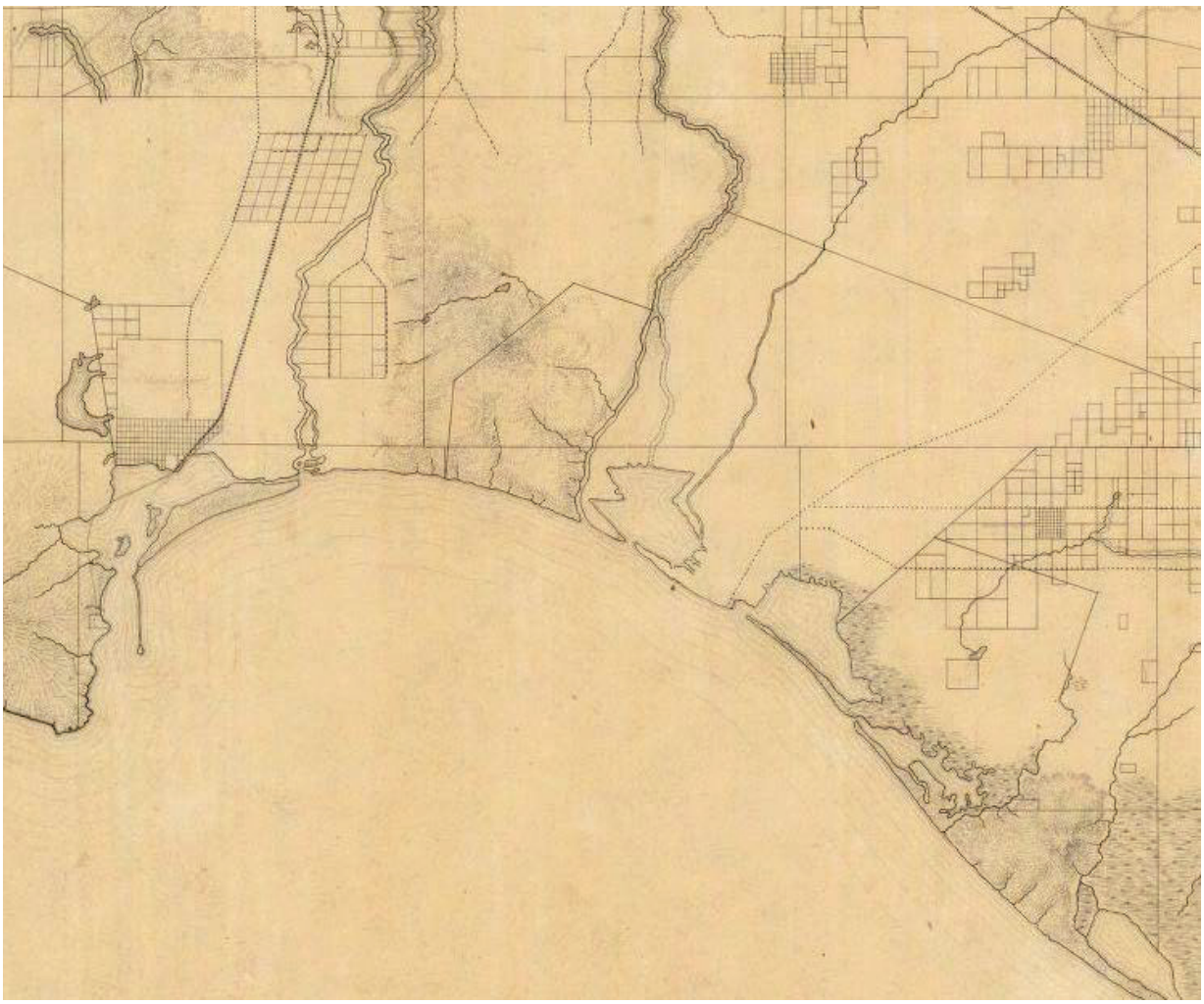

Figure 2. Portion of a circa 1880 drawing by William H. Hall of Los Angeles showing the San Pedro Bay coastline, estuaries, and ocean contours (Hall 1880). The future Port of Long Beach is in the center-left of the drawing.

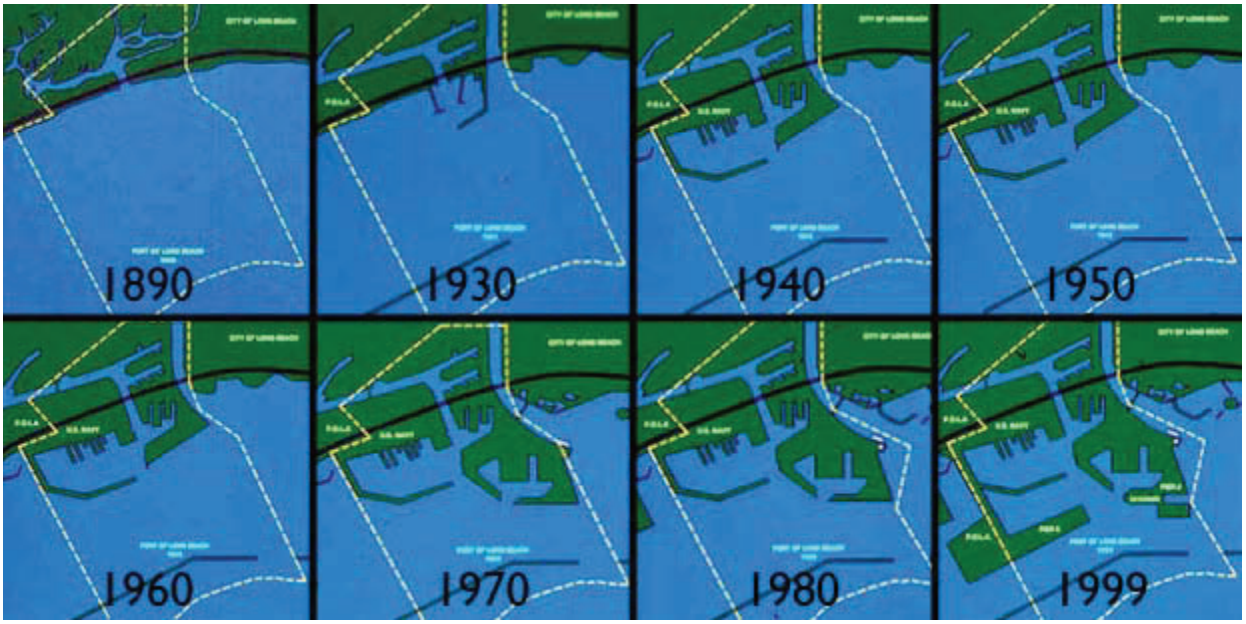


Figure 3. Drawings showing development progression of the Port since 1890 (Port 2014).

**Description of the Project Area**

The main project site is the Port of Long Beach and is located on the Pacific coast of southern California in western San Pedro Bay, at the southern end of the City, in southern Los Angeles County. The Port is less than 2 miles southwest of downtown Long Beach and about 25 miles south of downtown Los Angeles. To the west and northwest of San Pedro Bay are the communities of San Pedro and Wilmington, respectively, and to the east is the community of Seal Beach. Other areas that could be included in the Project area are local beaches or the open ocean for dredge disposal; the project dredge disposal areas are currently undetermined.

Two competing and independent commercial ports, the Port of Los Angeles and the Port of Long Beach, share the San Pedro Bay marine ecosystem. These man-made harbors have been created through over a century of dredging and filling of the former 3,450-acre Wilmington Lagoon and surrounding areas. The Port of Los Angeles and Port of Long Beach encompass 7,500 acres and 7,600 acres of land and water, respectively. The Port consists of: 3,000 acres of land, 4,600 acres of water, 10 piers, and 80 berths. Uses within both ports are largely industrial, although a variety of other uses (e.g., recreation, commercial fishing) are also supported.

The Port of Los Angeles and Port of Long Beach are both considered deep-water constructed ports, and do not have siltation problems like ports located in natural rivers (natural river ports) (LA/LBHSC 2016). The vast majority of sediments deposited in the ports are carried by the Los Angeles River, Dominguez Channel, and several smaller local creek/storm drains (LA/LBHSC 2016). Due to the region's Mediterranean climate, these channels carry significant quantities of storm water on rare occasions during the winter, and most of the silt settles out near the inlet mouths (LA/LBHSC 2016). As such, the ports need only to be dredged occasionally to maintain berth side design water depths (LA/LBHSC 2016).

The Port has 65 deep-water berths; all of these berths lay within three miles of the open sea, and are reached via the Port's Main Channel which has depths of minus 76 feet at Mean-Lower-Low-Water (MLLW) (LA/LBHSC 2016). The maximum ship draft in the Main Channel is currently limited to 65 feet (LA/LBHSC 2016). Dredging outside the Long Beach Breakwater Entrance Channel has deepened that area to minus 76 feet at MLLW (LA/LBHSC 2016). The Port is currently engaged in a capital development program (CDP) that includes but is not limited to dredging, terminal redevelopment, transportation, and public safety projects (LA/LBHSC 2016). Major components of the CDP include capital dredging in the West Basin and Inner Harbor Turning Basin, and in-water fill within the East Basin (LA/LBHSC 2016). The CDP includes the Middle Harbor Redevelopment Program, the replacement of the Gerald Desmond Bridge spanning the Back Channel, several rail infrastructure projects, and proposed security operations and support facilities (LA/LBHSC 2016). Though not a Port project, Caltrans is currently engaged in the replacement of the Commodore Schuyler Heim Bridge (SR-47) spanning the Cerritos Channel; it will be converted from a lift bridge to a fixed bridge (LA/LBHSC 2016).

Port of Long Beach Water Depths (LA/LBHSC 2016):

| Federal Channels in the Port | Current Depth | Current Width |
|---|---|---|
| Main Channel | -76 feet | 360 – 1500 feet |
| Back Channel | -52 feet | 220 feet |
| Inner Harbor (Turning Basin) | -52 feet | 960 feet |
| Cerritos Channel | -50 feet | 325 feet |
| Channel 2 | -37 to -55 feet | 150 – 250 feet |
| Channel 3 | -36 to -45 feet | 150 – 200 feet |

The outer limit of the Port is defined by breakwaters that were constructed during the early to mid 1900's (MEC 2002). The majority of the harbor waters within the Port currently range in water depth from 30 to 60 feet (MEC 2002) with navigation channels dredged to depths of 45 feet and greater (Service 2000). The adjacent Port of Los Angeles contains several hundred acres of waters currently shallower than 20 feet, primarily constructed by sub-aquatic fill of deeper areas performed to increase marine biological functions. The relative bathymetry[7] of the areas within and around the ports of Long Beach and Los Angeles can be seen in Figure 4.

[7] Bathymetry: the measurement of the depths of oceans, seas, or other large bodies of water, and the data derived from such measurement.

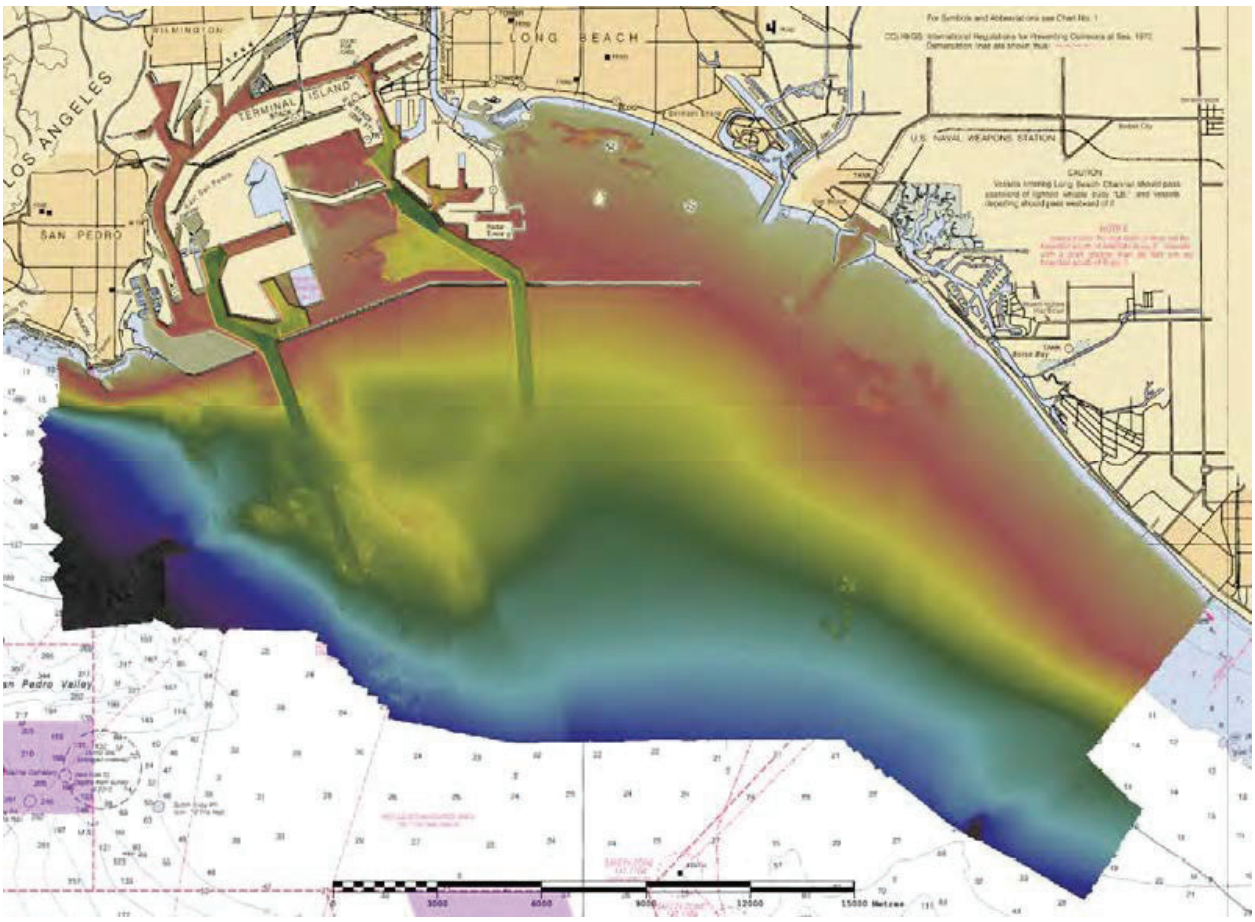


Figure 4. Relative bathymetry of the ports of Long Beach and Los Angeles and environs to highlight the deeper waters in the ports. (NOAA 2015)

**Corps Study/Project Area**

The Corps' study area for the proposed project includes the waters in the immediate vicinity (and shoreward) of the Port breakwaters throughout most of the Port, and the upstream reaches of the Los Angeles River that have direct impact on the San Pedro Bay, as well as the entire Port facility, including Outer Harbor, Inner Harbor, Cerritos Channel, West Basin, and the Back Channel (Corps 2015). The Corps' current Project Area is shown in Figure 5 (Corps 2016).

**Project Description**

The Corps, with the Port as the local sponsor, is considering the feasibility of deepening navigation channels within the harbor to increase water depths necessary to accommodate deeper draft ships in the Port. The proposed channel depths and methods to accomplish this are currently undetermined. The proposed project's proposed footprint areas are shown in Figure 5. Additional details regarding work areas have not been provided to the Service. Other project footprint areas could include areas within and/or outside the Port for dredge material disposal.


Figure 5. Corps Draft Project Area and Areas of Interest (Corps 2016)

The proposed project would require disposal site(s) for dredge materials. These sites are currently undetermined, but are expected to potentially include sites within the Port area, open-ocean, and/or nearby beach areas, depending in-part on sediment qualities and contaminant constituents in dredge materials (as determined through the testing requirements in 40 CFR §230). Re-use of dredge materials for sand replenishment on beaches near the Port is often desired by the Corps and locals where sediments are appropriate.

**Background**

The Port has undergone significant development and expansion in the past century (Corps 2015). In the last three decades, the ports of Los Angeles and Long Beach have undertaken accelerated long-range development efforts to increase the shipping and commercial capacity of the ports; both of the ports have become major transportation and trade centers. International commerce is almost 20 percent of the U.S. gross domestic product, and about 95 percent of these products arrive or leave the country in ships (Gray 2001). The Port provides the shipping terminals for nearly one-third of the waterborne trade moving through the west coast of the United States (Corps 2015).

The Port of Long Beach and the Port of Los Angeles are ranked sixth and eighth in tonnage in the United States respectively, moving a combined 139.2 million metric tons (DOT 2012). Trade currently valued annually at more than $155 billion moves through the Port, making financially it the

second-busiest seaport in the United States (Corps 2015). To handle this high volume of trade, Port facilities include 10 piers, 80 berths, and 66 post-Panamax gantry cranes (Corps 2015). The Port has 22 shipping terminals to process break bulk (e.g., lumber, steel), bulk (e.g., salt, cement, and gypsum), containers, and liquid bulk (e.g., petroleum) (Corps 2015). Each year the Port handles more than 6 million Twenty-foot Equivalent Units (TEUs)[8] and 75 million tons of cargo, and has over 2,000 vessels call (Corps 2015). Items from clothing and shoes to toys, furniture and consumer electronics arrive at the Port before making their way to stores throughout the country (Corps 2015). Specialized terminals also move petroleum, automobiles, cement, lumber, steel and other products (Corps 2015). The Port's top trading partners are China, South Korea, Hong Kong, and Japan. East Asian trade accounts for about 90 percent of the shipments through the Port (Corps 2015). Top imports are crude oil (16 million metric tons annually), electronics, plastics, and furniture (with inbound container tonnage on the order of 22 million tons annually), while top exports are petroleum products, chemicals, and agricultural commodities (Corps 2015). Currently, about one-third of liquid bulk and container cargo by weight is transported on vessels that could potentially experience operating constraints associated with the current channel depths in the Port (Corps 2015).

Under keel clearance for larger ships in the Port is important in terms of the depth of the seafloor and the static draft of the vessel transiting above it (NOAA 2015). This takes into play many elements: water level is the most obvious and important contributor to this equation. The term "tide" captures the astronomic contribution of the rise and fall of the sea's surface, whereas water level takes into account weather effects and riverine runoff contributions (NOAA 2015). In addition to the water levels, the other factors that must be considered include meteorological conditions, the vessel's motion induced by the prevailing sea state, the static draft of the vessel, the variation in this draft due to the vessel's motion through the water (dynamic draft), and the chemical composition of the water the vessel is sailing in, primarily salinity (NOAA 2015).

The large sizes of the many new trade ships are outsizing some of our waterways. Some Ultra Large Crude Carriers (ULCCs) entering the Port of Long Beach are carrying more than a million gallons of crude oil and are loading to drafts of 65 feet (NOAA 2015). Depending on the sea state in the approach channels of the Port, the ship's pitching may bring the hull close to the Port channel floor (NOAA 2015).

The channel leading into the Port of Long Beach currently has an authorized depth of 76 feet and local regulations allow drafts of 69 feet for ships with a displacement of up to 420,000 tons (NOAA 2015). In late 2012, at a Harbor Safety Committee meeting for the ports of Los Angeles and Long Beach, the Jacobsen Pilots[9] noted that during storms and long period swell conditions outside of the breakwater, ULCCs demonstrated significant levels of pitch[10] in high wave situations (NOAA 2015).[11] As a result, the Captain of the Port froze the maximum draft at 65 feet until they understood the effects of the swells on the ULCCs and could better predict their behavior (NOAA 2015). The effect

[8] TEU or Twenty-Foot Equivalent Unit can be used to measure a ship's cargo carrying capacity. The dimensions of one TEU are equal to that of a standard 20-foot shipping container (20 feet long, 8.5 feet tall and 8 feet wide).
[9] Jacobsen Pilots is the sole ship piloting company for the Port of Long Beach.
[10] Pitch is the up/down rotation of a vessel about its lateral/Y (side-to-side or port-starboard) axis.
[11] As a point of reference, a 1,000-foot vessel pitching just 1 degree will experience an increase in draft of more than 10 feet (NOAA 2015).

of reducing the allowed under keel clearance means that ULCCs must wait outside of the sea buoy until conditions are favorable to make the transit into the Port of Long Beach, or lighter to another vessel in order to reduce their draft; both are expensive delays (NOAA 2015).

Presently the largest containerships dock primarily at one of two piers—Pier J or Pier T West Basin (Corps 2015). Access to south berthing area of Pier J is through a secondary channel connected to the Long Beach main access channel; that secondary access channel limits drafts to about 43 feet (Corps 2016). Access to the northern berthing area of Pier J is off the Southeast Basin and does not have this depth limitation (Corps 2016). About 20 years ago a small share of container vessels had to restrict drafts, utilize tides, or both (Corps 2015). However, the impact to operations has increased in the past few years due to the increasing share of larger containerships calling on the port (Corps 2015). Today containerships docking at south berthing area of Pier J have maximum operating drafts of 52 feet and over 7.5 million of the 36.6 million tons of container cargo in 2012 was handled by vessels at or near the 43-foot limit of the secondary access channel (Corps 2016).

Currently, light loading, and tidal delays increase transportation costs for goods transported on containers, and in the future the impact is expected to worsen (Corps 2015; Corps 2016). If sufficiently dredged, containerships with capacities of over 18,000 TEUs (e.g., 1300 feet long, 176 feet beam,[12] drafts approximately 52 feet) would be capable of operating fully loaded in the Port (Corps 2016). Thus, addressing operating constraints to containerships has the potential to significantly lower transportation costs (Corps 2015).

Through agreements with the Service and other resource agencies, the Port has restored some coastal wetlands in southern California in exchange for development approvals of various Port areas. The Port has participated in substantial wetlands restoration projects, including one at the National Wildlife Refuge in Seal Beach. In addition, the Port contributed $39 million toward acquisition of 267 acres of degraded wetlands in Bolsa Chica Lagoon (Bolsa Chica Lowlands Restoration Project) in Huntington Beach (Port 2015).

**Project Goals and Objectives**

The proposed channel deepening project would allow large, deeper draft ships access to terminals within the Port. The Corps' stated planning goal is to provide safe, reliable, and efficient waterborne transportation improvements to the Port that address problems and opportunities as outlined herein. The Corps' planning objectives are specified as follows:

1. Reduce the cost of transporting cargo to and from the Port by improving channel dimensions, vessel operations, and other navigation features such as turning basins, waiting areas, and anchorages; and

2. Reduce expected future vessel re-routings from the Port to alternate facilities by improving channel dimensions, vessel operations, and other navigation features such as turning basins, waiting areas, and anchorages.

[12] The beam of a ship is its width at the widest point as measured at the ship's nominal waterline.

**Description of Biological Resources**

The Port of Long Beach represents a large harbor complex typified by extensive areas of hardened shoreline (riprap and quay wall) and dredge maintained shipping channels (SAIC 2010). The fish and wildlife resources of the Port and San Pedro Bay are reported in substantial detail in a 2000 biological baseline report entitled "Ports of Los Angeles and Long Beach Year 2000 Biological Baseline Study of San Pedro Bay" (MEC 2002). This information was updated with additional survey efforts in 2008 in a report entitled "Final 2008 Biological Surveys of Los Angeles and Long Beach Harbors" (SAIC 2010). A brief summary of the available information is provided herein, based primarily on these two baseline reports. The biological resource groups of San Pedro Bay that are typically considered the most important are the marine fishes and water-associated birds.

The benthic hard substrates in the ports are mostly artificial breakwaters and barriers of riprap (boulders and concrete rubble), and constructed shallow water areas in the ports (LA/LBHSC 2016). Kelp beds typically dominate the hard substrates, with surfgrass natural community potentially existing in waters less than 10 feet deep (LA/LBHSC 2016). Soft bottom substrates comprise the majority of acreage in the two ports (LA/LBHSC 2016). No eelgrass beds were identified within the Port of Long Beach (SAIC 2010). One area just outside the Port's boundary line northeast of Island Grissom[13] was identified as supporting a sizeable eelgrass bed (SAIC 2010). The water column within the ports provides important habitats for many fish, larvae, and plankton, seals, and sea lions (LA/LBHSC 2016).

*Fish*

Fish populations of San Pedro Bay (including the ports of Los Angeles and Long Beach and environs) are diverse and relatively abundant (SAIC 2010). During surveys conducted in 2000, a total of 74 species were recorded and an estimated 44 million fish occupied the 2 ports. Surveys of the 2 ports in 2008 identified total of 62 fish taxa representing 59 unique species of fish (SAIC 2010). Generally, schooling fishes were the most abundant species recorded.

Northern anchovy (*Engraulis mordax*) and white croaker (*Genyonemus lineatus*) were the most abundant species collected in 2000 surveys; white croaker was top ranked in terms of biomass (MEC 2002). From 2008 surveys in the two ports, pelagic fish from lampara[14] net collections were dominated by four species: northern anchovy, topsmelt (*Atherinops affinis*), California grunion (*Leuresthes tenuis*), and Pacific sardine (*Sardinops sagax*). These species accounted for 98 percent of the total lampara net catch in 2008. All of these species are schooling fishes that spend most of their lives in the harbor environment. From 2008 otter trawl[15] surveys, dominant species included northern anchovy, white croaker (*Genyonemus lineatus*), queenfish (*Seriphus politus*), shiner surfperch (*Cymatogaster aggregata*), and white surfperch (*Phanerodon furcatus*). Other species

[13] One of a set of four artificial oil production islands in San Pedro Bay off the coast of Long Beach.
[14] A lampara net is a type of fishing net used for capturing certain pelagic fish, those swimming near the water's surface.
[15] In otter trawling, a large net is dragged along the bottom or up in the water column behind a towing vessel. The mouth of the net is held open by two large "doors" which are attached to either side of the net. For the noted surveys performed in 2000 and 2008, trawl surveys were performed to capture bottom-dwelling demersal fish.

caught in high abundance were specklefin midshipman (*Porichthys myriaster*), California tonguefish (*Symphurus atricauda*), and yellowchin sculpin (*Icelinus quadriseriatus*).

The five most abundant species accounted for 92 percent of the total fish populations in the ports (MEC 2002). These included northern anchovy, white croaker, queenfish, Pacific sardine, and topsmelt. Other relatively abundant species included shiner surfperch, salema (*Xenistius californiensis*), and jacksmelt (*Atherinopsis californiensis*). Less numerous but ecologically and/or recreationally important species recorded were California barracuda (*Sphyraena argentea*), California halibut (*Paralichthys californicus*), barred sand bass (*Paralabrax nebulifer*), California corbina (*Menticirrhus undulatus*), white seabass (*Atractoscion nobilis*), California grunion (*Leuresthes tenuis*), and several species of sharks and rays.

In 2000, generally fewer species were caught in the Inner Harbor than Outer Harbor (MEC 2002). Benthic invertebrates, which represent an important food source for demersal fish,[16] also exhibited a trend of decreasing function of habitats from Outer to Inner Harbor areas (MEC 2002). In 2008 surveys, few differences were observed for pelagic fish between Inner and Outer Harbor areas, with Inner Harbor stations having between 4 and 12 species and Outer Harbor stations typified by between 3 and 11 species (SAIC 2010). This likely indicates that pelagic schooling species move throughout the harbor complex (SAIC 2010). In contrast, Outer Harbor areas generally were typified by a greater number, biomass, and variety of trawl-caught (demersal) fish than Inner Harbor areas (SAIC 2010).

More species of fish were collected in the shallow waters of the ports of Los Angeles and Long Beach, including all three of the created shallow water mitigation sites within the Port of Los Angeles, than at deepwater survey stations in open water, channel, basin, and slip habitats (MEC 2002). The greater diversity is likely partially explained by the greater heterogeneity associated with the shallow water habitats, which were adjacent to rock riprap and/or vegetated areas (e.g., eelgrass beds, kelp bed); this likely results in higher fish nursery function, greater production, and generally higher abundance of fish in shallow waters. For instance, the Cabrillo Shallow Water Habitat area is located alongside the San Pedro Breakwater, which supports giant kelp and other macroalgae; the Long Beach Shallow Water Habitat area is located adjacent to the riprap shoreline along Pier 400 that supports giant kelp and other macroalgae, and extensive eelgrass beds occur within the Pier 300 Shallow Water Habitat. Studies conducted in the shallow areas of the Outer Harbor, including the Pier 300 Shallow Water Habitat (MEC 1988, 1999) created in 1984 and the Cabrillo Shallow Water Habitat (MEC 1999) constructed in 1997, have shown that these areas have both higher diversity and greater abundance of fish and invertebrates than the deeper soft bottom portions of the ports of Los Angeles and Long Beach (MEC 2002). A greater abundance of juvenile fish is also present in these shallow areas; they appear to enter these areas relatively soon after hatching/birth. Long Beach fishing experts often fish adjacent to the four manmade oil production islands located within the overall Port boundaries,[17] due to the abundance of recreational fish found there; the abundance of recreational fish in these areas is reportedly due to shallow water combined with high relief from the riprap placed around the created islands (Ballanti 2007).

[16] Fish dwelling at or near the bottom of a body of water.
[17] The islands are controlled by the City of Long Beach and are not part of the Port's Harbor District.

Forty-four unique species of fish larvae and 13 categories of fish eggs were identified in the ports of Los Angeles and Long Beach during the 2000 surveys (MEC 2002). The most abundant fish larvae were gobies [arrow goby (*Clevelandia ios*), cheekspot goby (*Ilypnus gilberti*), shadow goby (*Acentrogobius nebulosus*), and bay goby (*Lepidogobius lepidus*)], northern anchovy, California clingfish, queenfish, blennies, and white croaker. With the exception of the Pier 300 Shallow Water Habitat (in the Port of Los Angeles) that had high larval abundance and the Long Beach West Basin with low larval abundance, the abundances of larvae were generally higher on the Long Beach side of the two-port complex. This bears some similarity to the abundance pattern indicated for adult fish caught by lampara net surveys, which generally showed higher abundance in the deepwater channel, basins, and slips in the Port of Long Beach (MEC 2002). The larval catch was dominated by benthic associated gobies, which inhabit burrows. The ichthyoplankton surveys provided a good measure of the importance of species inhabiting burrows or associated with rocky and/or vegetated habitats in the Long Beach-Los Angeles port complex (MEC 2002). These species (while poorly represented in the adult fish surveys), are an important part of the overall ecology of the diverse marine habitats in the two ports. The ichthyoplankton results also demonstrate that a wide variety of fish spawn and develop within the ports of Los Angeles and Long Beach. Similar to the previous baseline study (MEC 2002), the only exotic (non-indigenous) fish species collected in the 2008 sampling surveys was the yellowfin goby (*Acanthogobius flavimanus*), collected at three Port of Los Angeles stations and six Port of Long Beach Harbor stations (SAIC 2010).

*Benthic Invertebrates*

Over 400 species of benthic infauna (small organisms that live on and within the sediment) and larger macroinvertebrates were collected during the Year 2000 Baseline Study; over 250 species of benthic infauna and larger macroinvertebrates were collected during the Year 2008 Baseline Study (MEC 2002; SAIC 2010). Small infaunal organisms (which tend to be less motile than larger macroinvertebrates) and larger macroinvertebrates both exhibited spatial variability in species composition that appeared to be tied to a combination of factors including water depth, years since dredging/disposal in the area, and ecological/habitats functions (MEC 2002). Studies in 2008 found little difference in species composition among deepwater stations located in basins, channels, or slips of the Inner and Outer Harbors (SAIC 2010).

Benthic invertebrate assemblages generally differed between shallow and deepwater habitats (SAIC 2010), and differences were apparent between assemblages from areas that have or have not experienced recent dredging (MEC 2002). Areas of recent dredging had fewer species and lower abundance than non-dredged areas, indicating that the recently dredged areas were still in the colonization phase (MEC 2002). Species assemblages of benthic invertebrates can be indicative of habitat function (SAIC 2010). Certain species are tolerant of adverse environmental conditions, such as low oxygen and high pollutant conditions, and others are found only in more pristine areas (SAIC 2010). In the 2008 study, species assemblages indicated that stations in the Outer Harbor had the highest habitat function as indicated by relatively greater abundance of species that typically characterize areas having background to low organic enrichment (i.e., low pollution) (SAIC 2010). The species assemblages found in the Inner Harbor, basins, and slips were indicative of low to moderate organic enrichment compared to the open-water Outer Harbor stations, suggesting that

benthic invertebrate species composition is influenced by tidal circulation in the harbors, with Outer Harbor areas having greater circulation and higher functional habitats (SAIC 2010).

Non-indigenous invertebrates comprise about 15 percent of the infauna and macroinvertebrate species occurring in the ports, with some of these species representing numerical dominants (SAIC 2010). The relative abundance of these species has increased in the harbors since the 1970s (SAIC 2010). A total of 10 non-indigenous (introduced) and 32 cryptogenic species (of unknown origin) were identified among the 313 species of infauna and macroinvertebrates collected during the 2008 study (SAIC 2010). The overall percentage of introduced and cryptogenic species identified in the present study (14 percent) is similar to the 15 percent reported by MEC (2002) in 2000 (SAIC 2010).

In general, ecological/habitats function was highest for benthic invertebrates at the created Cabrillo, Pier 300, and Long Beach Shallow Water Habitat areas and the deep open waters of both ports (MEC 2002). A gradient of decreasing ecological/habitats function was observed in basin and slip habitats and the back channels of the Inner Harbor. Similar to fish, catch abundance was higher in basin habitats in the Port than in the open waters of the Outer Harbor (SAIC 2010). The lowest catch of benthic invertebrates was obtained in the Inner Harbor (SAIC 2010).

A steady improvement in benthic ecological/habitats function within the ports of Los Angeles and Long Beach over time has occurred, as demonstrated by increased diversity and less dominance by pollution tolerant benthic infauna species over the past half century. Many areas in both ports were severely polluted in the 1950s with depauperate benthic faunal assemblages in these areas during that period (MEC 2002) (please see Contaminants below).

*Birds*

Southern California's coastal areas, including its shorelines, estuaries, bays, and developed harbors, provide a variety of natural and artificial communities for large numbers of waterfowl, shorebirds, wading birds, and birds that forage from the air. The predominately open water and hardscape/landscape habitats within the ports of Long Beach and Los Angeles provide opportunities for nesting, foraging, and resting by a moderate diversity of bird species, including one species listed as endangered under the ESA, the California least tern.

Birds that occur in and near the ports of Los Angeles and Long Beach are primarily water-associated species; that is, they are dependent on the marine natural communities for food and other essentials. Over 100 avian species use the various habitats within the Ports seasonally, year-round, or during migration (SAIC 2010). The areas within and near the ports provide very limited areas of trees and/or shrubs for feeding, resting, and/or nesting; most of this small area of vegetation is made up of exotic landscaping. As a result of the high numbers of small fish in the shallow water areas of the ports, substantial numbers of fish-eating birds are found foraging in these areas. The ports provide high-function habitats for many foraging, resting, and breeding birds.

During the 2000-2001 monitoring year, a total of 99 bird species, representing 31 families, were observed within San Pedro Bay (MEC 2002). A total of 96 species representing 30 families were observed within the ports during the 2008 study (SAIC 2010). Of these species from both studies,

69 are considered to be dependent on marine habitats. Gulls comprised 44.5 percent of the birds observed in 2000, with aerial foragers (22.4 percent) and waterfowl (21.4 percent) also common. The remaining 21.7 percent of the birds were small and large shorebirds, wading/marsh birds, raptors, and upland birds. The most abundant birds included several gull species [e.g., Western (*Larus occidentalis*), Heermann's (*L. heermanni*), and California (*L. californicus*)], brown pelican (*Pelecanus occidentalis*), elegant tern (*Thalasseus elegans*), western grebe (*Aechmophorus occidentalis*), Brandt's cormorant (*Phalacrocorax penicillatus*), double-crested cormorant (*Phalacrocorax auritus*), surf scoter (*Melanitta perspicillata*), and rock pigeon (*Columba livia*).

The State and Federal endangered California least tern is a piscivorous (fish eating) sea bird that makes significant breeding use of San Pedro Bay (KBC 2005). The least tern has a long history of nesting on Terminal Island and Pier 400 in the Port of Los Angeles (Figure 4). Pier 400 is near the western portion of the proposed project footprint. This least tern nesting site is typical of those used by the species in highly developed coastal California; the site is a relatively flat, open, barren sandy area near the ocean where the least terns lay and incubate their eggs and chicks fledge. The least tern nesting period extends from April through August; along the California coast least terns typically begin to arrive (from wintering grounds) in the southern most colony breeding sites (e.g., San Diego) in early April and they continue to arrive through the later part of May. During the remainder of the year, the birds are gone from the area.

Least terns nest on sparsely vegetated substrates, including sandy beaches, salt flats, and dredge spoil, in colonies of a few to several hundred nesting pairs. This species relies on sight for foraging and usually requires relatively clear water to locate its preferred baitfish food sources, northern anchovy, topsmelt, and jacksmelt (LSA 2009). Although there is some field evidence to suggest that least terns will forage in turbid waters to which fish are attracted, the majority of foraging occurs in clearer waters (LSA 2009).

The location of the tern nesting site(s) in the ports of Los Angeles and Long Beach previously varied from year to year (KBC 1998) depending largely on development activities in the ports, with most nesting on Pier 400. The Los Angeles Harbor Department manages the Pier 400 nesting site pursuant to a Memorandum of Agreement with the Service, Corps, and California Department of Fish and Wildlife (Department) (LA 2006). A 15.7-acre fenced nesting site is located at the southern tip of Pier. 400, although some nesting by least terns also often occurs outside of this designated area.

Least terns have nested within the ports since the late 1800s and have been observed within the harbor almost every year since annual monitoring studies began in the ports in 1973 (SAIC 2010). Since 1973 the least tern has utilized nesting locations on and around Terminal Island, with nesting at Reeves Field and/or Pier 300 and Pier 400 areas (LAHD 2015). Zero least tern nesting pairs were recorded for the Terminal Island area in 1992 (LAHD 2015). The greatest documented nesting activity for the least tern in the area has occurred since the birds began utilizing the then newly-constructed Pier 400 as a nesting site in 1997. The number of recorded nests at Pier 400 peaked at 1,322 in 2005, then declined to 906 in 2006, and further declined to 710 in 2007 (KBC 2007) and 126 in 2014 (State 2015). The principal foraging areas for least tern in the ports and environs vary somewhat from year to year, but during the chick rearing period, the shallow water areas of the ports are used heavily, probably due to the relatively greater abundances of appropriate prey fish (size and

species) found there (see MEC 1988, 1999). Measures to protect the least tern during channel dredging and landfill construction projects have proven successful (Service 1992). Those measures have included nesting area and predator management, shallow water area conservation/creation, and protection of water quality in the shallow water areas during breeding season.

Least tern nest numbers at Pier 400 increased from approximately 565 during the 2000–2001 to 1,332 in 2005, and then declined to 521 in 2008 (SAIC 2010). The decrease in nest numbers is opined to be related to increases both in upland vegetation and predation at the Pier 400 nesting site (KBC 2008). The majority of least tern observations during 2007–2008 surveys were of individuals foraging or flying in the vicinity of the Pier 400 nesting site; least terns also were observed foraging along the outer breakwater and open-water areas of the Outer Harbor and within Inner Harbor basin and channel areas (SAIC 2010). Least terns foraged most frequently just off the Pier 400 nesting site, off Pier 300, and near Cabrillo Beach (SAIC 2010).

The brown pelican, formerly federally listed as endangered, is found in large numbers in San Pedro Bay (MEC 2002). This bird breeds on the offshore Channel Islands, and forages widely along the southern California coast on small fishes. Brown pelicans make heavy use of the Outer Harbor breakwaters for roosting. The brown pelican is present throughout the year. The peregrine falcon (*Falco peregrinus*), also formerly federally listed as endangered, nests on bridges within the area of the ports (SAIC 2010).

Several piscivorous seabirds began nesting in the adjacent Port of Los Angeles following construction of Pier 400. The royal tern (*Thalasseus maximus*), Caspian tern (*Hydroprogne caspia*), elegant tern, and black skimmer (*Rynchops niger*) had each been recorded nesting on Pier 400 up until 2005 (KBC 2005). No nesting by these species was recorded in 2006 or 2007 (KBC 2007). The landfill area of Pier 400 (constructed in 1996) initially provided a large expanse of suitable bare-dirt nesting habitat for terns adjacent to a well-developed forage base (consisting of small fish) in the Outer Harbor. However, development of Pier 400 is now complete and undeveloped areas in the ports of Los Angeles and Long Beach outside of the Pier 400 nesting site currently contain very little suitable seabird nesting habitats.

No snowy plovers were detected within either the ports of Long Beach or Los Angeles during the 2007–2008 surveys (SAIC 2010). Snowy plovers are occasionally observed during migration at the California least tern nesting site on Pier 400 (SAIC 2010). A few snowy plovers have been observed at nearby Point Fermin and Cabrillo Beach (outside of the breakwater), both south and outside of the Port of Los Angeles (SAIC 2010).

*Mammals*

Most marine mammals are under the jurisdiction of the National Oceanic and Atmospheric Administration (NOAA Fisheries), including all those potentially occurring in or near the ports. All marine mammals are protected under the Marine Mammal Protection Act of 1972 (16 U.S.C. 1361 *et seq*.) and some are also protected by the ESA. Marine mammals that are known to occur sporadically in waters of the ports include pinnipeds [California sea lion (*Zalophus californianus*) and harbor seal (*Phoca vitulina*)] and cetaceans (SAIC 2010). Cetaceans that have been observed in

outer harbor locations in the ports include the gray whale (*Eschrichtius robustus*), Pacific bottlenose dolphin (*Tursiops truncatus*), short-beaked common dolphin (*Delphinus delphis*), and Pacific white-sided dolphin (*Lagenorhynchus obliquidens*) (SAIC 2010). None of these are species are known to breed in the ports (SAIC 2010).

*Riprap-Associated Organisms*

A total of 334 species of invertebrates were identified from three tidal zones within the riprap community in the ports (SAIC 2010). Distinct tidal zonation was observed with increasing numbers of species with increasing depth. Mean total abundance was highest in the lower intertidal, lowest in the upper intertidal, and intermediate in the subtidal zone (SAIC 2010). Across all tidal zones, crustaceans were numerically dominant, followed by polychaetes, echinoderms, molluscs, and other phyla. Past studies have noted relatively greater community development in Outer Harbor compared to Inner Harbor areas (MEC 1988, 2002). However, the 2008 study noted general similarities in these communities throughout the two ports (SAIC 2010). Exceptions were for diversity, which was somewhat greater at Outer Harbor breakwater stations compared to Inner Harbor locations, but these differences were mainly associated with the upper intertidal zone (SAIC 2010). Community summary measures did not show distinct trends among Inner and Outer Harbor stations for the lower intertidal and subtidal zones, suggesting some improvement in ecological function at Inner Harbor stations since the 2000 study (SAIC 2010).

*Kelp and Macroalgae*

Within the ports, the majority of kelp and macroalgae surface canopy is closely associated with the outer breakwaters and with riprap structures in the Outer Harbor and in locations facing the port entrances (SAIC 2010). While algal diversity in the ports is considered relatively low, there is a general pattern of decreasing algal diversity from Outer to Inner Harbor locations (SAIC 2010). During the 2008 study, Macrocystis canopy in the two ports totaled 77.8 acres in spring and decreased to 50.4 acres in the fall (35% decrease) (SAIC 2010). Seasonal declines in kelp canopy cover for both studies are likely due to natural die-offs between winter and fall. Dominant macroalgal communities included the genera *Sargassum*, *Ulva*, *Colpomenia*, *Chondracnathus*, and *Halymenia* (SAIC 2010).

Occurrences of invasive exotic algae within the ports include the brown algae *Sargassum muticum* and *Undaria pinnatifida*. While *Sargassum* has become a commonly observed component of the algal flora in southern California, including the ports, *Undaria* was first reported in the United States in spring 2000 during the previous baseline study of the ports (MEC 2002). Notably, *Undaria* was documented during the present study at all eight Inner Harbor sites studied and at 7 of 12 Outer Harbor locations, indicating an expanded distribution since 2000 (SAIC 2010).

**Contaminants**

The marine biological environment of the ports of Los Angeles and Long Beach has been periodically studied since the 1950s. Early studies documented severe pollution in several of the basins in the harbors. As recently as the late 1960s, dissolved oxygen (DO) levels at some locations

in Los Angeles Harbor were so low that little or no marine life could survive (SAIC 2010). Since that time, regulations have reduced direct waste discharges into the ports, resulting in improved DO levels throughout the port areas (MEC 2002; SAIC 2010). Comprehensive studies in the 1970s reported a dramatic improvement in marine habitats function/quality relative to the 1950s, although areas of pollution are still evident in Inner Harbor and blind-end slip areas (MEC 2002).

Results from studies in 2000 and 2008 indicate a continued trend of water quality improvement since the 1970s, with most DO concentrations in excess of 5 milligrams/liter (MEC 2002; SAIC 2010). Episodic and localized changes in some parameters, such as low DO concentrations coinciding with low transmissivity, suggested minor effects possibly associated with sediment resuspension events (MEC 2002). Water clarity (transmissivity) decreased with increasing depth and was relatively lower in bottom waters at stations with fine sediments and/or in the vicinity of dredging and/or disposal (MEC 2002). Polluted and "semi-healthy" areas still exist in the ports; however, the spatial extent of these areas of relatively poorer ecological/habitats function is not as widespread today. The most polluted area is the Consolidated Slip of the Port of Los Angeles; "semi-healthy" areas exist in the Cerritos Channel of the Inner Harbor and in confined basins and slips in both ports (MEC 2002).

Water quality conditions measured during July 2008 generally were uniform throughout the environments of the ports, with only minor differences that appeared to be unrelated to natural community (SAIC 2010). Further, water quality conditions also were consistent with values reported previously for the ports (MEC 2002), and indicative of well-mixed and well-oxygenated waters (e.g., DO greater than 5 mg/L) for almost all stations (SAIC 2010). Some localized differences, associated with comparatively warmer surface water temperatures, lower surface water salinities, and lower DO concentrations in near-bottom water, were observed, but the magnitude of the differences were considered small (SAIC 2010).

The waters of ports of Los Angeles and Long Beach (including Inner and Outer Harbor, Main Channel, Consolidated Slip, Southwest Slip, Fish Harbor, Cabrillo Marina, Inner Cabrillo Beach), San Pedro Bay, Dominguez Channel, Dominguez Channel estuary, Torrance Lateral Channel (sometimes referred to as Torrance Carson Channel), and Los Angeles River Estuary are impaired by heavy metals and organic pollutants (CRWQCB 2011). More specifically, each of these water bodies are included on the 303(d) list for one or more of the following pollutants: cadmium, chromium, copper, mercury, lead, zinc, chlordane, dieldrin, toxaphene, DDT, PCBs, and certain PAH compounds (CRWQCB 2011). These impairments may exist in one or more environmental media — water, sediments, or tissue (CRWQCB 2011).

Some site specific data are available that suggest varying levels of contamination in the sediments to be dredged. Additional testing will be required to determine what materials from which areas may be re-used for habitat creation or beach replenishment, disposed of at an ocean dumping site, or disposed of at a confined disposal facility or appropriate upland site. The Service will provide additional input on these determinations as information regarding physical and chemical characteristics of the materials to be dredged becomes available.

**San Pedro Bay Landfill Mitigation History**

The agency consensus mitigation goal for San Pedro Bay (ports of Los Angeles and Long Beach) landfill impacts to date has been no net loss of habitat value for in-kind resources, as near to the site of loss as feasible, and in advance of, but not later than concurrently with, the fill (Corps and LAHD 1992). For the last several years, the Service, Department, the National Marine Fisheries Service, the City of Los Angeles Harbor Department, and the Port have been designing and executing mitigation plans for development projects in the ports. The process employs a modified habitat evaluation procedure and involves evaluation of the habitat value in the affected port area and compares that to predicted habitat value increases at conceptual mitigation areas.

Following implementation of measures for avoiding and minimizing impacts to fish and wildlife resources, on-site mitigation has been conducted in the adjacent Port of Los Angeles consisting of creation of shallow water from deep areas. In 1985, as a condition of the Harbor Deepening Project in the Port of Los Angeles, the Corps created 190 acres of shallow water (i.e., water less than -20 feet MLLW) as mitigation for the filling of 190 acres of shallow water to make the land area now called Pier 300. The created shallow water area, now called the Pier 300 Shallow Water Habitat, has been the subject of several biological investigations (MEC 1988, 1999) and shown to provide highly productive habitats for fish. It is also an important foraging area for the California least tern (KBC and Aspen Environmental Group 2004).

**Potential Impacts of the Proposed Project on Biological Resources**

The proposed project would involve deepening of portions of the Port to currently undetermined depths with the disposal of dredge material at currently undetermined locations. The project would involve dredging of only relatively deep (i.e., greater than 20 feet) water areas of San Pedro Bay. These deeper water impacts typically do not involve what is considered significant long-term loss of habitats warranting mitigation.[18] Anticipated potential effects associated with dredging and disposal of dredge materials would depend largely on disposal location; these potentially include: 1) the permanent elimination of fish and wildlife habitats associated with any in-bay landfills; 2) a temporary reduction in available foraging habitat for piscivorous bird species, including the least tern, due to dredging or disposal-associated turbidity generated by the project (depending on locations); 3) the reduction of deep water habitats and creation of shallow water fish habitats with any in-bay subaquatic fill of deeper waters; 4) the reduction of deepwater habitats and creation of island (nesting bird) habitats with any in-bay island fill of deeper waters; and 5) temporary impacts of burying of beach- and nearshore-associated invertebrates and nearshore turbidity associated with disposal of dredge materials through local beach/nearshore replenishment.

The dredging of deeper water areas within the project footprint would impact the invertebrate benthic fauna and demersal fish communities found in these areas. These dredging impacts would be largely temporary, although the resultant areas would then be deeper in the long-term. The replacement benthic fauna that would colonize these dredged areas in the years following project

[18] Historically, mitigation has been required for dredging that deepens shallow water areas, 20 feet deep or less, because the deepening reduces or eliminates the fish nursery and bird foraging values. No such impacts to areas less than 20 feet deep are anticipated with this project.

implementation would likely be different; this fauna would include species combinations adapted to these new deeper areas. The vast majority (if not all) of these areas have been subject to dredging in the past century, with varying levels of recovery since the last dredging event. It is undetermined what areas of the project footprint would be subject to future maintenance dredging.

The dredging and disposal of dredge materials creates temporary turbidity impacts to surrounding waters. When dredge materials are used to create shallow water or island habitats this typically creates long-term benefits due to the typically higher functions and values for fish and wildlife attributable to shallow water and sensitive species nesting areas. The size and duration of the turbidity plume generated by dredging and disposal activities is dependent on grain size of the suspended material and current velocities at the time the activity is conducted (Corps and LAHD 2000). Project dredge material qualities, disposal locations, and associated current velocities are unknown; therefore, turbidity is not readily predictable for the project. The amount of turbidity is generally greater in the immediate vicinity of the filling/disposal operations than at the dredge site because the dredge typically operates with suction, while the filling operation is often by discharge from a pipe (Corps and LAHD 2000). However, based on past dredge disposal operations, the extent of the turbidity plume is not expected to be greater than several hundred feet from the discharge point. Because several hundred acres of high-function shallow water foraging habitat are available for piscivorous bird species within the Port region (e.g., 193-acre Pier 300 Shallow Water Habitat and 326-acre Cabrillo Shallow Water Habitat), the area of disturbance from the project would likely represent a small portion of available foraging habitats for such birds.

**Recommendations**

The Fish and Wildlife Coordination Act states that "...wildlife conservation shall receive equal consideration and be coordinated with other features of water-resource development projects through the effectual and harmonious planning, development, maintenance, and coordination of wildlife conservation...." (16 U.S.C. 661). Consistent with Fish and Wildlife Coordination Act, should the project be implemented, we suggest incorporation of the following planning aid recommendations in order avoid, minimize, and compensate potential impacts to fish and wildlife resources, and suggest the Corps incorporate the project design elements outlined below that would improve fish and wildlife resources:

1. The Corps should use dredge materials, as contaminant levels in the dredge materials allow, to construct areas of shallow water fish habitats (areas of water less than -20 feet MLLW).

2. Within the center of the area of created shallow water fish habitats noted above, the Corps should create a least tern/snowy plover nesting island with dredge materials. We suggest that the Outer Harbor in areas of low shipping traffic would likely be a functional location for this purpose, particularly areas adjacent to (behind) the existing Middle or Long Beach breakwaters.[19] The middle of this island(s) should be at least several acres in size and relatively flat with the surface constructed of typical least tern nesting soil matrix materials.

[19] We suggest these locations so as to minimize conflict with existing shipping traffic routes in the ports. These Outer Harbor areas would likely provide high ecological function for the fish and wildlife species targeted by these measures.

A portion of the island should have a zone of low gradient shoreline slope down to the water within a protected cove(s), likely adjacent to and facing the existing breakwater within the Port for swell protection. Other features such as subaquatic reefs constructed of rock are also suggested, in part to help prevent erosion of the island cove shoreline surface materials from swells. The configuration and slope surface of the noted cove should be constructed of sand and gravel or other compatible materials for snowy plover chick foraging: the configuration should be such that the cove areas remain open to tide-borne deposition of natural beach wrack[20] and would otherwise support snowy plover chick and adult foraging. The remainder of the island (outside of the cove portion) would likely need to be edged by riprap to avoid erosion of the island by swells. Possibly waste rock from other proposed projects in the area (e.g., partial or full removal of the Long Beach Breakwater) could be used/combined for this purpose. It is preferred that the surface of this island not be utilized for human recreation and be protected from unauthorized entry.

3. The Corps should implement a construction schedule for the project that avoids the least tern breeding season, if feasible.

4. Turbidity from dredge and fill activities in the vicinity of the shallow water habitats should not extend over an area greater than 5 acres of shallow waters (i.e., areas less than 20 feet deep) at any one time during the April-to-September breeding season of the California least tern. Monitoring of project-related turbidity, as provided for in measure 5 below, should be based on visually observed differences between ambient surface water conditions and any visible dredging turbidity plume.

5. The Corps should provide a qualified least tern biologist, acceptable to the Service and Department, and approved by the Corps, to help monitor and manage project activities. This program should be carried out during project activities. The biologist should coordinate with the Service and the Department and:

    a. If the areas associated with project activities (such as staging areas) would occur within upland areas of the Port that are capable of supporting sensitive species, the Corps should provide an education program for construction crews, including the identity of the least tern and their nests, restricted areas and activities, and actions to be taken if least tern nesting sites are found outside the designated least tern nesting sites/within project activity areas.

    b. Visually monitor and report to the dredging contractor or Corps contract manager and Service/Department any turbidity from project dredging which extends over an area greater than 5 acres of shallow waters.

6. If least tern or other protected species nests are found within the project's direct footprint in upland areas during construction, then all work in the immediate area should be halted, and the Corps biologist be notified immediately. An appropriate buffer zone around the nest for

[20] Beach wrack consists of organic material such as kelp and sea grass that is cast up onto the beach by surf, tides, and wind. Beach wrack supports a wide variety and large quantity of beach invertebrates.

exclusion of project-related activities should be specified by the biologist in coordination with the Service and the Department.

If you have any questions you have regarding this letter, please contact Jon Avery, Federal Projects Coordinator, at 760-431-9440, extension 309.

Sincerely,

CAROL ROBERTS Digitally signed by CAROL ROBERTS Date: 2016.06.30 15:09:09 -07'00'

Scott A. Sobiech
Deputy Field Supervisor

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# ENDANGERED SPECIES ACT

## *US FISH AND WILDLIFE SERVICE*
## *18 FEBRUARY 2015*

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# United States Department of the Interior

FISH AND WILDLIFE SERVICE
Carlsbad Fish and Wildlife Office
2177 SALK AVENUE - SUITE 250
CARLSBAD, CA 92008
PHONE: (760)431-9440 FAX: (760)431-5901
URL: www.fws.gov/carlsbad/

Consultation Code: 08ECAR00-2015-SLI-0209 February 18, 2015
Event Code: 08ECAR00-2015-E-00451
Project Name: Port of Long Beach Deep Draft Navigation Reconnais

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, and proposed species, designated critical habitat, and candidate species that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment

United States Department of Interior
Fish and Wildlife Service

Project name: Port of Long Beach Deep Draft Navigation Reconnais

# Official Species List

**Provided by:**

Carlsbad Fish and Wildlife Office
2177 SALK AVENUE - SUITE 250
CARLSBAD, CA 92008
(760) 431-9440
http://www.fws.gov/carlsbad/

**Consultation Code:** 08ECAR00-2015-SLI-0209
**Event Code:** 08ECAR00-2015-E-00451

**Project Type:** Dredge / Excavation

**Project Name:** Port of Long Beach Deep Draft Navigation Reconnais
**Project Description:** Port of Long Beach Deep Draft Navigation Reconnaissance Study

**Please Note:** The FWS office may have modified the Project Name and/or Project Description, so it may be different from what was submitted in your previous request. If the Consultation Code matches, the FWS considers this to be the same project. Contact the office in the 'Provided by' section of your previous Official Species list if you have any questions or concerns.

**Project Location Map:**


**Project Coordinates:** MULTIPOLYGON (((-118.2446426 33.7503824, -118.2252448 33.7566624, -118.2230132 33.7520952, -118.2182067 33.7533797, -118.2178634 33.7545215, -118.2199233 33.7575187, -118.2192367 33.7593811, -118.2216399 33.7635127, -118.2252448 33.7679365, -118.2207816 33.7705051, -118.220095 33.7660814, -118.21958 33.7636554, -118.2156318 33.7566624, -118.2151168 33.7566624, -118.2147735 33.7625137, -118.2142585 33.7625137, -118.2137435 33.761372, -118.2134002 33.7563769, -118.2134002 33.7553779, -118.2113402 33.7560915, -118.2103103 33.7566624, -118.208422 33.758375, -118.2087653 33.7596594, -118.2087653 33.762371, -118.2080787 33.7626564, -118.2067054 33.7562342, -118.2149451 33.7519525, -118.2151168 33.7456722, -118.2065337 33.7403907, -118.2051604 33.7419609, -118.2127135 33.7469568, -118.2063621 33.7509534, -118.2060187 33.7442448, -118.1986373 33.7442448, -118.1986373 33.7509534, -118.1974357 33.7508106, -118.1969207 33.7431029, -118.1929725 33.7436738, -118.1921142 33.7431029, -118.1950324 33.7398197, -118.2010406 33.7398197, -118.2034438 33.739106, -118.2031005 33.7381067, -118.2018989 33.7363937, -118.196749 33.7359654, -118.187816 33.732682, -118.1848977 33.7336813, -

118.1850694 33.7361082, -118.1938241 33.7361082, -118.1943391 33.737964, -118.1860994 33.738535, -118.1648477 33.7376785, -118.1617233 33.7156959, -118.2315895 33.7128401, -118.2424041 33.7421077, -118.2305595 33.7395382, -118.2169982 33.7443916, -118.2186805 33.7449625, -118.2310745 33.7411085, -118.2412025 33.7429641, -118.2417175 33.7432496, -118.2446426 33.7503824)))

**Project Counties:** Los Angeles, CA

# Endangered Species Act Species List

There are a total of 6 threatened or endangered species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section further below for critical habitat that lies within your project. Please contact the designated FWS office if you have questions.

| **Birds** | **Status** | **Has Critical Habitat** | **Condition(s)** |
|---|---|---|---|
| California Least tern *(Sterna antillarum browni)* | Endangered | | |
| Coastal California gnatcatcher *(Polioptila californica californica)*<br>Population: Entire | Threatened | Final designated | |
| Least Bell's vireo *(Vireo bellii pusillus)*<br>Population: Entire | Endangered | Final designated | |
| Light-Footed Clapper rail *(Rallus longirostris levipes)*<br>Population: U.S.A. only | Endangered | | |
| western snowy plover *(Charadrius nivosus ssp. nivosus)*<br>Population: Pacific coastal pop. | Threatened | Final designated | |
| **Mammals** | | | |
| Pacific Pocket mouse *(Perognathus longimembris pacificus)*<br>Population: Entire | Endangered | | |

# Critical habitats that lie within your project area

There are no critical habitats within your project area.

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# ENDANGERED SPECIES ACT

## *NATIONAL MARINE FISHERIES SERVICE*
## *29 AUGUST 2014*

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**UNITED STATES DEPARTMENT OF COMMERCE**
**National Oceanic and Atmospheric Administration**
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

**AUG 29 2014**

Josephine Axt
Office of the Chief
Planning Division
U.S. Army Corps of Engineers
Los Angeles District
915 Wilshire Boulevard Suite 930
Los Angeles, California 90017

Dear Ms. Axt:

NOAA's National Marine Fisheries Service (NMFS) has reviewed a letter from the U.S. Army Corps of Engineers (Corps), received August 8, 2014, requesting a current list of any species that are listed as endangered or threatened, or candidate species for listing, under the Endangered Species Act (ESA) that may be found within the vicinity of Port of Long Beach (POLB) areas under study for modifications to accommodate deep draft vessels. The letter also requests a list of any species of concern that may be in this area. NMFS has also reviewed the supporting project description and background information provided by the Corps along with the August 8, 2014, letter. NMFS offers the following response pursuant to the ESA.

**Proposed Project**

The proposed project briefly describes the planning study of a suite of construction and dredging operations that could be undertaken to improve the capability of the Port of Long Beach to efficiently accommodate large container vessels (greater than 43 ft draft). The list of measures under study and consideration includes the deepening of several access channels within POLB, the construction of multiple turning basins near these access channels, the construction of an inner harbor waiting area or deepening of the anchorage along the main channel of POLB, and the deepening of the approach channel into POLB. Given the proposed project, NMFS assumes that the project area includes POLB areas within the Long Beach Breakwater, extending out into open marine waters adjacent to the approach channel of POLB.

**Endangered Species Act Species List**

The following species listed as threatened or endangered under the ESA may be found within the vicinity of the proposed project area:

| **Sea Turtles** | |
|---|---|
| Leatherback sea turtle - *(Dermochelys corieacea)* | Endangered |
| Loggerhead turtle - North Pacific Ocean and South Pacific Ocean DPS(*Caretta caretta*) | Endangered |
| Olive ridley (*Lepidochelys olivacea*) | Endangered/Threatened* |
| Green turtle (*Chelonia mydas*) | Endangered/Threatened* |
| **Marine Mammals** | **Status** |
| Blue whale (*Balaenoptera musculus*) | Endangered |
| Fin whale (*Balaenoptera physalus*) | Endangered |
| Humpback whale (*Megaptera novaeangliae*) | Endangered |
| Gray whale, western North Pacific population (*Eschrichtius robustus*) | Endangered |

* Globally listed as threatened, but populations associated with breeding populations along the Pacific Mexican coast are listed as endangered. Individuals found in southern California are assumed to be part of endangered populations.

As indicated above, there are ESA-listed species of sea turtles and marine mammals that may be found in the vicinity of the project area. Green sea turtles are known to reside and forage year-round in the Long Beach area, including areas within the vicinity of POLB, through observations of free-swimming and stranded animals, as well as through directed scientific research conducted by NMFS. Olive ridley and loggerhead turtles may also occasionally visit coastal areas all along southern California, including the POLB area, as evidenced by stranding records and observations. Several ESA-listed species of whales are also known to occasionally or frequently visit or transit through the coastal waters of Long Beach, as evidenced by observations by an extensive whale watching community, scientific research, and records of stranded individuals. Blue, humpback, and fin whales may seasonally be found in marine waters adjacent to POLB. Gray whales regularly transit through marine waters adjacent to POLB twice a year, during seasonal migrations back and forth from summer foraging grounds in Alaska to winter breeding grounds in Mexico. Most of the gray whales that travel past Long Beach belong to the Eastern North Pacific stock of gray whales, which is not listed under the ESA. However, recent observations have confirmed that individuals from the endangered Western North Pacific stock have been seen migrating along the U.S. west coast, and may pass through marine waters adjacent to POLB. At this time, there are no additional candidate species, species currently proposed for listing, or critical habitats designated under the ESA that occur in the project area.

There may be some additional species in the vicinity of the project area that have been designated as species of concern by NMFS. Based on a review of the current list, it is possible that cowcod (*Sebastes levis*), green abalone (*Haliotis fulgens*), and pink abalone (*Haliotis corrugate*) could be found in the vicinity of POLB and adjacent marine waters. It is also possible that basking sharks *(Cetorhinus maximus)* could occasionally be found in adjacent marine waters. NMFS retains no regulatory authority to protect species of concern, and may not necessarily be the best source of information for all of these species.

Thank you for your consideration of ESA-listed species during the development of your project planning. Upon request, NMFS Protected Resources staff in Long Beach, California is available to help in the determination of how any ESA-listed species may be directly or indirectly affected by the

Project, and assist the Corps with ESA compliance. NMFS staff may also be able to assist in further development of protective measures that can help minimize the potential for adverse effects to ESA-listed species. If you have any questions pursuant to this letter or other ESA issues, please contact Dan Lawson at (562) 980-3209 or Dan.Lawson@noaa.gov.

Sincerely,

William W. Stelle
Regional Administrator

cc: Administrative File: 151422WCR2014PR00212

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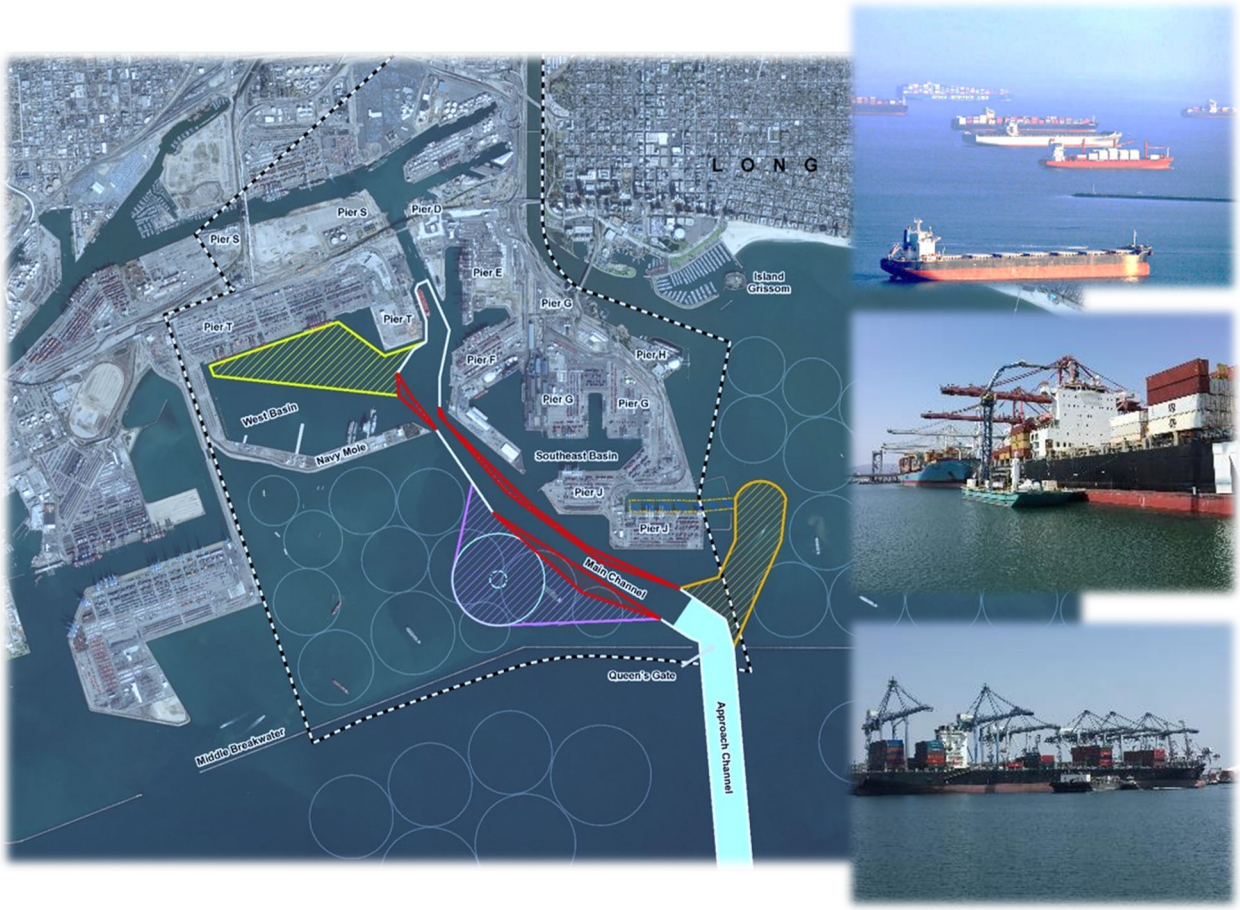
# DRAFT INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL IMPACT STATEMENT / ENVIRONMENTAL IMPACT REPORT (EIS/EIR)

## APPENDIX J: DISTRIBUTION LIST

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

October 2019




US Army Corps of Engineers ®

Port of LONG BEACH
The Green Port

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1

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| **First Name** | **Last Name** | | | | | |
| | | | Office of Planning and Research, State Clearing House | 1400 Tenth Street | Sacramento, CA 95814 | |
| | | | Main Library | 200 West Broadway | Long Beach, CA 90802 | |
| | | | San Pedro Regional Library | 931 S. Gaffey Street | San Pedro, CA 90731 | |
| | | | Wilmington Branch Library | 1300 N. Avalon Boulevard | Wilmington, CA 90744 | |
| Daniel | Garcia | | South Coast Air Quality Management District | 21865 Copley Drive | Diamond Bar, CA 91765 | |
| | | | Southern California Association of Governments Los Angeles Office | 900 Wilshire Blvd., Suite 1700 | Los Angels, CA 90017 | |
| Monique | De La Garza, CMC | City Clerk | City of Long Beach | 411 W. Ocean Blvd. | Long Beach, CA 90802 | |
| Allan | Lowenthal | Congressman | California 47th District | 275 Magnolia Avenue, Suite 1955 | Long Beach, CA 90802 | |
| Allan | Lowenthal | Congressman | California 47th District | 108 Cannon House Office Building | Washington, DC 20515 | |
| Robert | Garcia | Mayor | City of Long Beach | 411 W. Ocean Blvd., 11th Floor | Long Beach, CA 90802 | mayor@longbeach.gov |
| Lena | Gonzalez | Councilmember | City of Long Beach, District 1 | | | |
| Jeannine | Pearce | Councilmember | City of Long Beach, District 2 | | | |
| Suzie | Price | Councilmember | City of Long Beach, District 3 | | | |
| Daryl | Supernaw | Councilmember | City of Long Beach, District 4 | | | |
| Stacy | Mungo | Councilmember | City of Long Beach, District 5 | | | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| Dee | Andrews | Vice Mayor | City of Long Beach, District 6 | | | |
| Roberto | Uranga | Councilmember | City of Long Beach, District 7 | | | |
| Al | Austin | Councilmember | City of Long Beach, District 8 | | | |
| Rex | Richardson | Councilmember | City of Long Beach, District 9 | | | |
| Beth | Collins | | Brownstein Hyatt Farber Schreck, LLP | 1021 Anacapa Street, 2nd Floor | Santa Barbara, CA 93101 | |
| Jessica | Diaz | | Brownstein Hyatt Farber Schreck, LLP | 1021 Anacapa Street, 2nd Floor | Santa Barbara, CA 93101 | |
| Richard "Cutter" | Jordan | | Board of Harbor Commissioners | | | |
| Lou Ann | Bynum | President | Board of Harbor Commissioners | | | |
| Tracy | Egoscue | Vice President | Board of Harbor Commissioners | | | |
| Lou Ann | Guzmán | Secretary | Board of Harbor Commissioners | | | |
| Frank | Colonna | Commissioner | Board of Harbor Commissioners | | | |
| Bonnie | Lowenthal | Commissioner | Board of Harbor Commissioners | | | |
| | | | Los Angeles County Clerk | 12400 Imperial Highway | Norwalk, CA 90650 | |
| Joseph | Ontiveros | Cultural Resource Director | Soboba Band of Luiseño Indians | P.O. Box 487 | San Jacinto, CA 92581 | jontiveros@soboba-nsn.gov |
| Andrew | Salas | Chairperson | Gabrieleno Band of Mission Indians - Kizh Nation | P.O. Box 393 | Covina, CA 91723 | admin@gabrielenoindians.org |
| Anthony | Morales | Chairperson | Gabrieleno/Tongva San Gabriel Band of Mission Indians | P.O. Box 693 | San Gabriel, CA 91778 | GTTribalcouncil@aol.com |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| Sandonne | Goad | Chairperson | Gabrielino/Tongva Nation | 106 1/2 Judge John Aiso Street, #231 | Los Angels, CA 90012 | sgoad@gabrielino-tongva.com |
| Robert | Dorame | Chairperson | Gabrielino Tongva Indians of California Tribal Council | P.O. Box 490 | Bellflower, CA 90707 | gtongva@gmail.com |
| Charles | Alvarez | | Gabrielino-Tongva Tribe | 23454 Vanowen Street | West Hills, CA 91307 | roadkingcharles@aol.com |
| Elizabeth | Yura | | CA Air Resources Board | 1001 I Street | Sacramento, CA 95814 | |
| Terry | Allen | | CA Air Resources Board | 9480 Telstar Ave., No. 4 | El Monte, CA 91731 | terry.allen@arb.ca.gov |
| Allison | Dettmer | | CA Coastal Commission | 45 Fremont St Ste 2000 | San Francisco, CA 94105-2219 | larry_simon@coastal.ca.gov |
| Gary | Timm | | CA Coastal Commission | 200 Oceangate, Ste 1000 | Long Beach, CA 90802 | |
| Dani | Ziff | | CA Coastal Commission | 301 E. Ocean Blvd, Suite 300 | Long Beach, CA 90802 | |
| Shannon | Vaughn | | CA Coastal Commission | 301 E. Ocean Blvd, Suite 300 | Long Beach, CA 90802 | |
| Larry | Simon | | CA Coastal Commission | 45 Fremont Street, Suite 2000 | San Francisco, CA 94105 | |
| Megan | Cooper | | CA Coastal Conservancy | 1515 Clay St., 10th Floor | Oakland, CA 94612-2530 | |
| Kenneth | Carlson | | CA Dept of Conservation Oil Gas Geo | 5816 Corporate Ave Ste 200 | Cypress, CA 90630 | |
| Loni | Adams | | CA Dept of Fish & Wildlife | 3883 Ruffin Road, Ste A | San Diego, CA 92123-4813 | loni.adams@wildlife.ca.gov |
| Marilyn | Fluharty | | CA Dept of Fish & Wildlife | 3883 Ruffin Road | San Diego, CA 92123 | |
| Nader | Gobran, P.E. | | CA Dept of Transportation | 11 Golden Shore, Ste 110 | Long Beach, CA 90802 | nader_gobran@dot.ca.gov |
| Tom | Cota | | CA DTSC | 5796 Corporate Plz | Cypress, CA 90630 | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| Peter | Garcia | | CA DTSC | 5796 Corporate Plz | Cypress, CA 90630 | |
| | | | CA Public Utilities Commission | 505 Van Ness Ave, Rm 3207 | San Francisco, CA 94102-3214 | |
| Michaela | Moser | | CA State Lands Commission | 100 Howe Ave, Ste 1005 | Sacramento, CA 95825-8202 | Michaela.moser@slc.ca.gov |
| Susan | Bransen | | California Transportation Commission | 1120 N Street, MS-52 | Sacramento, CA 95814-5680 | |
| Laura | Pennebaker | | California Transportation Commission | 1120 N Street, MS-52 | Sacramento, CA 95814-5680 | laura.pennebaker@dot.ca.gov |
| Miya | Edmonson | | CA Dept of Transportation, District 7 | 100 S. Main Street | Los Angeles, CA 90012 | |
| John | Christopher | | Department of Toxic Substances Control | 8800 Cal Center Dr | Sacramento, CA 95826-3200 | |
| Roxanne | Johnson | | US EPA, Region 9 | 75 Hawthorne St | San Francisco, CA 94105 | johnson.roxanne@epa.gov |
| Al | Lipski | | Maritime Administration | 1301 Clay Street, Suite 140N | Oakland, CA 94612-5217 | al.lipski@dot.gov |
| Rob | Wood | | Native American Heritage Commission | 1550 Harbor Blvd., Ste 100 | West Sacramento, CA 95691 | |
| Kelly L. | Finn | | Naval Weapons Station Seal Beach | 800 Seal Beach Boulevard | Seal Beach, CA 90740-5000 | |
| Julianne | Polanco | | Office of Historic Preservation | 1725 23rd St., Ste 100 | Sacramento, CA 95816 | |
| Chris | Cannon | | Port of Los Angeles | 425 S Palos Verdes St | San Pedro, CA 90733-0151 | |
| David | Hung | | Regional Water Quality Control Board | 320 W 4th St, Ste 200 | Los Angeles, CA 90013 | |
| Daniel | Garcia | | South Coast Air Quality Management District | 21865 Copley Dr | Diamond Bar, CA 91765-4182 | Planning and Rules Manager |
| Lijin | Sun | | South Coast Air Quality Management District | 21865 Copley Dr | Diamond Bar, CA 91765-4182 | lsun@aqmd.gov |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| Ping | Chang | | Southern California Council of Governments | 900 Wilshire Blvd., Ste. 1700 | Los Angeles, CA 90017 | sunl@scag.co.gov |
| Hamid | Arshadi | | Southern California Edison | 2244 Walnut Grove Ave | Rosemead, CA 91770 | |
| Damon | Hannaman | | Southern California Edison | 7300 Fenwick Lane, Second Floor | Westminster, CA 92683 | |
| Larry | Labrado | | Southern California Edison | 2800 E Willow St | Long Beach, CA 90806 | |
| | | | Third Party Environmental Review, Southern California Edison | 2244 Walnut Grove, Go-1, Quad 2C | Rosemead, CA 91770 | thirdPartyEnvReview@sce.com |
| Carol | Sachs | | US EPA Region 9; ERS, ENF-2-4 | 75 Hawthorne St | San Francisco, CA 94105-3901 | sachs.carol@eps.gov |
| Melissa | Scianni | | US EPA Region 9 | 600 Wilshire Blvd, Ste 940 | Los Angeles, CA 90017 | |
| Johnathan | Bishop | | Water Resources Control Board | 1001 I Street | Sacramento, CA 95814 | |
| | | | US Coast Guard Marine Safety office | 1001 S Seaside Ave, No 20 | San Pedro, CA 90731-7333 | |
| Christine | Medak | | US Fish & Wildlife Service | 2177 Salk Ave, Suite 250 | Carlsbad, CA 92008 | |
| Bryan | Vogel | | US Maritime Administration | 1301 Clay Street, Suite 140N | Oakland, CA 94612-5217 | bryan.vogel@dot.gov |
| Bryant | Chesney | | National Marine Fisheries Service | 501 W Ocean Blvd, Suite 4200 | Long Beach, CA 90802-4221 | |
| James | Callian | | Navy Brac PMO West | 33000 Nixie Way, Building 50 | San Diego, CA 92147 | |
| Dr. Charles | Lester | Executive Director | CA Coastal Commission | 45 Fremont Street, Suite 2000 | San Francisco, CA 94105-2219 | |
| Emily | Duncan | | CA Regional Water Quality Control Board, Los Angeles Region | 320 W 4th St, Suite 200 | Los Angeles, CA 90013 | |
| Jon | Avery | | US Fish & Wildlife Service | 2177 Salk Ave, Suite 250 | Carlsbad, CA 92008 | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| Diana | Tang | Chief of Staff | City of Long Beach, Mayor's Office | 411 W. Ocean Blvd., 11th Floor | Long Beach, CA 90802 | diana.tang@longbeach.gov |
| Nelson | Kerr | | City of Long Beach Dept of Health & Human Svcs | 2525 Grand Ave | Long Beach, CA 90815 | nelson.kerr@longbeach.gov |
| Truong | Huynh | | City of Long Beach Development Serv. | 411 W. Ocean Blvd. | Long Beach, CA 90802 | |
| Craig | Chalfant | | City of Long Beach Development Serv. | 411 W. Ocean Blvd. | Long Beach, CA 90802 | craig.chalfant@longbeach.gov |
| Mike | Conway | | City of Long Beach Economic & Property Dev | 411 W. Ocean Blvd. | Long Beach, CA 90802 | |
| | | | City of Long Beach Engineering Bureau | 411 W. Ocean Blvd. | Long Beach, CA 90802 | |
| Ken | Ayala | | City of Long Beach Fire Department | 3205 Lakewood Blvd | Long Beach, CA 90808 | kenneth.ayala@longbeach.gov |
| Robert | Dowell | | City of Long Beach Gas & Oil Department | 2400 E Spring St | Long Beach, CA 90806 | |
| Elvira | Hallinan | | City of Long Beach Marine Dept | 205 Marina Dr | Long Beach, CA 90802 | elvira.hallinan@longbeach.gov |
| Marie | Knight | | City of Long Beach Parks & Recreation | 2760 Studebaker Rd | Long Beach, CA 90815 | |
| Chief Robert | Luna | | City of Long Beach Police Department | 400 W Broadway | Long Beach, CA 90802 | Julie.Bedard@longbeach.gov |
| Craig | Beck | | City of Long Beach Public Works | 411 W. Ocean Blvd. | Long Beach, CA 90802 | |
| Eric | Widstrand | | City of Long Beach Traffic Engineer | 411 W. Ocean Blvd. | Long Beach, CA 90802 | |
| Dennis | Santos | | City of Long Beach Water Department | 1800 E. Wardlow Rd | Long Beach, CA 90807 | dennis.santos@lbwater.org |
| Mike | Zupanovich | | Magnolia Industrial Group, Inc. | 537 W. Anaheim | Long Beach, CA 90813 | |
| Kat | Janowicz | | 3COTECH | 224 West 8th Street | San Pedro, CA 90731 | kat@3cotech.com |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| Elaine | Silvestro | | ACET (Alameda Corridor Engineering Team) | 3760 Kilroy Airport Way, Ste 200 | Long Beach, CA 90806 | hersh@trenchteam.com |
| John | Doherty | | ACTA | 3760 Kilroy Airport Way, Ste 200 | Long Beach, CA 90806 | |
| Harold W | Coon | | ADL Transport/AB Mobile Welding | 1342 W 11th St | Long Beach, CA 90813 | |
| Jim | Glick | | Air Products | 700 N. Henry Ford Ave. | Wilmington, CA 90744 | glickjh@airproducts.com |
| Daniel and Lisa | Charleston | | AJC Sandblasting | 932 Schley Ave | Wilmington, CA 90744 | dcharleston@ajcsb.com |
| George | Wall | | Al Larson Boat Shop | 1046 Seaside Ave | Terminal Island, CA 90731 | george@larsonboat.com |
| | | | All Ports Logistics | 1789 Pier B Street | Long Beach, CA 90813 | |
| Lisa | Olsen | | Allied Packing & Rubber, Inc. | 1335 W. 11th Street | Long Beach, CA 90813 | lisa@alliedpackingandrubber.com |
| Environmental | Manager | | Andeavor Wilmington Calciner | 2450 Pier B St. | Long Beach, CA 90813 | |
| Chung | Liu | | AQMD | 21865 Copley Dr | Diamond Bar, CA 91765-4178 | cliu@aqmd.com |
| | | Building Manager | Arco Center Building | 200 Oceangate | Long Beach, CA 90802 | |
| Allen | Reyno | | ATSI | 1941 W. 9th Street | Long Beach, CA 90802 | allenreyno@atsicontainer.com |
| Robert M. | Orr | | Attorney at Law | 6700 E. Pacific Coast Highway, Suite 285 | Long Beach, CA 90803 | RMOrrEsq@gmail.com |
| Harrison | Pollak | | Attorney General's office, California Department of Justice | 1515 Clay Street, 20th Floor | Oakland, CA 94612-0550 | harrison.pollak@doj.ca.gov |
| | | | Attorney General's office, California Department of Justice | 600 W. Broadway St., Ste. 1800 | San Diego, CA 92101-3702 | |
| Mitch E. | Bright | | Baker Commodities Inc | 4020 Bandini Blvd | Los Angeles, CA 90058 | mebright@bakercommodities.com |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| Dan | Berns | | Berns Company | 1250 W 17th St | Long Beach, CA 90813 | dan.m.berns@gmail.com |
| Steven | Fukuto | | Berth 55 Landing of Long Beach, Inc (DBA Long Beach Sportfishing) | 555 Pico Ave | Long Beach, CA 90802 | steve@longbeachsportfishing.com |
| Steven G. | Martin | | Best Best & Krieger Attorneys At Law | 655 West Broadway, 15th Floor | San Diego, CA 92101 | STEVEN.MARTIN@BBKLAW.COM |
| Rick | Armstrong | | BETA Offshore | 111 W Ocean Blvd Ste 1240 | Long Beach, CA 90802 | rick.armstrong@amplifyenergy.com |
| Bruce | Harrison | | Biltmore Metal Fabricators | 1348 W. 11th St | Long Beach, CA 90813 | bruceh@biltmf.com |
| Gilbert and Hilda | Urrutia | | Border Valley Trading | 604 Mead Rd | Brawley, CA 92227 | gemm2006@gmail.com |
| Rob | Streed | | BP Pipelines North America | 4 Centerpointe Drive | La Palma, CA 90623 | |
| Kimberly | Kesler | | BRAC PMO/NAVFAC SW | 33000 Nixie Way, Bldg 50, Ste 207 | San Diego, CA 92147 | |
| Kara | Karibian | | Breathe California | 5858 Wilshire Blvd, Ste 300 | Los Angeles, CA 90036 | |
| Walt | Smith | | Burlington Northern Santa Fe | 740 E Carnegie Dr | San Bernardino, CA 92408 | |
| Chuck | Taylor | | Butterfield Communication, Inc. | 1410 Brett Pl #131 | San Pedro, CA 90732 | |
| Don | Holland | | Cabrillo Boat Shop | 1500 Pier C Street | Long Beach, CA 90813 | |
| Chris | Marrs | | Cacao D/Amour, LLC | 1667 W. 9th Street | Long Beach, CA 90813-2609 | |
| Frank | Komin | | California Resources Company | 111 W Ocean Blvd Ste 800 | Long Beach, CA 90802 | |
| George | Lang | | California United Terminals | 2525 Navy Way | Terminal Island, CA 90731 | |
| Christian | Bushong | | CalTrans HQ | 1120 N. St., MS-32 | Sacramento, CA 95814 | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| Wilkin | Mes | | Carnival Cruises | 231 Windsor Way | Long Beach, CA 90802 | wmes@carnival.com |
| Greg | Bombard | | Catalina Express | Berth 95 | San Pedro, CA 90733 | |
| | | | Catalina Water Company | 1500 Pier C Street | Long Beach, CA 90813-4043 | |
| Bill | Bayes | | Cemex | 16888 North E Street | Victorville, CA 92394-2900 | |
| | | | Cemex | 601 Pier D St | Long Beach, CA 90802 | |
| Joann | Goeman | | Cerritos Yacht Anchorage | Berth 205C | Wilmington CA 90744 | |
| Michelle N. | Black | | Chatten-Brown & Carstens, LLP | 2200 Pacific Coast Highway, Ste. 318 | Hermosa Beach, CA 90254 | |
| Vince | Godfrey | | Chemoil Marine Terminal | 2365 E. Sepulveda Blvd | Long Beach, CA 90810-1944 | vince.godfrey@gelncore-us.com |
| Craig | Smith | | Chemoil Marine Terminal | 1004 Pier F Ave | Long Beach, CA 90802 | |
| Subir | Bector | | Chevron Usa Inc | 324 El Segundo | El Segundo, CA 90245 | |
| Steven | Lohr | | Chief of Land Use Planning, CSU Chancellor's office | 401 Golden Shore | Long Beach, CA 90802-4210 | |
| Elia | Rocha | | Children Today | 2591 Long Beach Blvd. | Long Beach, CA 90806-3157 | |
| | | Director of Planning | City of Bell | 6330 Pine Ave | Bell, CA 90201 | |
| Planning | Manager | | City of Carson | 701 E Carson St | Carson, CA 90745 | jsigno@carson.ca.us |
| Gina | Nila | | City of Commerce | 2535 Commerce Way | Commerce, CA 90040 | ginan@ci.commerce.ca.us |
| | | Planning & Zoning Dept | City of Compton | 205 S Willowbrook | Compton, CA 90220 | |
| | | Director of Planning | City of Cudahy | 5220 Santa Ana St | Cudahy, CA 90201-6024 | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| | | Planning Department | City of El Segundo | 350 Main St | El Segundo, CA 90245 | |
| | | Planning Department | City of Hawthorne | 4455 W 126th St | Hawthorne, CA 90250 | |
| | | Director of Public Works | City of Huntington Park | Civic Center, 6550 Miles Ave | Huntington Park, CA 90255 | |
| Mindy | Wilcox | | City of Inglewood | One West Manchester Blvd, 4th Fl | Inglewood, CA 90301 | |
| | | Planning Department | City of Lawndale | 14717 Burin Ave | Lawndale, CA 90260 | |
| | | Director of Planning | City of Maywood | 4319 E Slauson Ave | Maywood, CA 90270 | |
| | | Director of Comm Development | City of Paramount | 16400 Colorado Ave | Paramount, CA 90723 | |
| Sebastian | Hernandez | | City of Pasadena | 221 E. Walnut St., Ste. 199 | Pasadena, CA 91101 | |
| | | Harbor Director | City of Redondo Beach | 415 Diamond Ave | Redondo Beach, CA 90277 | |
| Gregory | Priamos | | City of Riverside, Office of the City Attorney | 3900 Main Street | Riverside, CA 92522 | |
| | | Community Development Department | City of South Gate | 8650 California Ave | South Gate, CA 90280 | |
| | | Community Development Department | City of Torrance | 3031 Torrance Blvd | Torrance, CA 90503 | jgibson@torranceca.gov |
| | | Director of Community Services | City of Vernon | 4305 Santa Fe Ave | Vernon, CA 90058 | |
| Victor | Hovsepian | | City Paper and Metal | 1452 W. 11th St. | Long Beach, CA 90813-2717 | citymetal@juno.com |
| Greg | Roche | | Clean Energy | 4675 Macarthur Ct., Ste 800 | Newport Beach, CA 92660 | |
| Patricia | Castellanos | | Coalition For A Clean & Safe Ports | 464 Lucas Ave, Ste 202 | Los Angeles CA 90017 | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| Jesse | Marquez | | Coalition For A Safe Environment | 1601 N. Wilmington Blvd. Suite B | Wilmington, CA 90744 | jnmhev@yahoo.com |
| Nidia | Erceg | | Coalition For Clean Air | 660 South Figueroa, Ste. 1140 | Los Angeles, CA 90017 | |
| Bill | Magavern | | Coalition For Clean Air | 1107 9th St, Ste 440 | Sacramento, CA | |
| Loara | Cadavona | | Community Hospital Foundation | 1720 Termino Ave | Long Beach, CA 90804 | |
| David | Scott | | Connolly Pacific Co | 1925 Pier D St | Long Beach, CA 90802 | david.scott@conpaco.com |
| | | | Cooper T Smith Stevedoring | Berth 207 - Pier F | Long Beach, CA 90802-6242 | |
| | | | County of Los Angeles | 500 W. Temple St. | Los Angeles, CA 90012-2713 | |
| Steven | Chew | | Curtin Maritime | 1500 Pier C Street, Berth 57 | Long Beach, CA 90813 | stevec@curtinmaritime.com |
| Jim | Crane | | Crane Marketing | 11712 Leland Ave | Whittier, CA 90605 | CRANEMKT@GMAIL.COM |
| Joshua | Ellis | | Crowley Marine Services | 300 South Harbor Blvd | San Pedro, CA 90731 | |
| Bill | Terry | | Eagle Rock Aggregates, Inc | 700 Wright Ave | Richmond, CA 94804 | bterry@eagleaggregates.com |
| Taylor | Thomas | | East Yard Communities For Environmental Justice | 2448 Santa Fe Ave. | Long Beach, CA 90810 | tbthomas@eycej.org |
| Tony | Rivera | | Easy Roll-off Services | 2145 W. 16th St. | Long Beach, CA 90813 | |
| Eddie | Umana | | Eddie's Auto | 1411 W. 11th St | Long Beach, CA 90813 | umana_eduardo@yahoo.com |
| Hung | Nguyen | | Energia Logistics, Ltd | 2700 Nimitz Rd | Long Beach, CA 90802-1047 | hung.p.nguyen@sea-launch.com |
| Jim | Doty | | Engineering Services Program, Environmental Mng G | 1149 S Broadway, Suite 600 MS-939 | Los Angeles, CA 90015 | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| Planning Team | Leader | | Federal Highway Administration - CA Division | 650 Capitol Mall, Suite 4-100 | Sacramento, CA 95814-4708 | |
| Ed | McCain | | Foss Maritime Company | Pier D Berth D-35 & D49 | Long Beach, CA 90801 | |
| Bill | McCord | | Friction Materials Co. | 1600 W. Anaheim St | Long Beach, CA 90813 | bill@frictionmaterials.net |
| | | | Friends of The La River | 570 W Avenue, 26 Ste 250 | Los Angeles, CA 90065-1011 | |
| Elizabeth | Warren | | Future Ports | P.O. Box 768 | San Pedro CA 90733-0768 | EWARREN@FUTUREPORTS.ORG |
| Andrew | Salas | | Gabrieleno Band of Mission Indians - Kizh Nation | P.O. Box 393 | Covina CA 91723 | admin@gabrielenoindians.org |
| Anthony | Morales | | Gabrieleno/Tongva San Gabriel Band of Mission Indians | P.O. Box 693 | San Gabriel, CA 91778 | GTTribalcouncil@aol.com |
| Charles | Alvarez | | Gabrielino Tongva Tribe | 23454 Vanowen Street | West Hills, CA 91307 | roadkingcharles@aol.com |
| | | | Gabrielino - Tongva Tribe | 1999 Avenue of the Stars, Ste. 1100 | Los Angeles, CA 90067-4618 | |
| Robert | Dorame | | Gabrielino Tongva Indians of CA Tribal Council | P.O. Box 490 | Bellflower, CA 90707 | gtongva@gmail.com |
| Joseph | Ontiveros | | Soboba Band of Luiseno Indians | Po Box 487 | San Jacinto, CA 92581 | JONTIVEROS@SOBOBA-NSN.GOV |
| Goad | Sandonne | | Gabrielino/Tongva Nation | 106 1/2Judge John Aiso St., #231 | Los Angeles, CA 90012 | sgoad@gabrielino-tongva.com |
| Sam | Dunlap | | Gabrielino Tongva Nation | Po Box 86908 | Los Angeles, CA 90086 | samdunlap@earthlink.net |
| Robert | Stein | | Gambol Industries, Inc | 1825 W. Pier D St | Long Beach, CA 90802 | |
| Nancy | Pfeffer | | Gateway Cities COG | 16401 Paramount Blvd | Paramount, CA 90723 | |
| | | | Georgia-Pacific Gypsum, LLC | 1401 Pier D St | Long Beach, CA 90802 | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| Gilbert and Hilda | Haddad | | Gil's Long Beach Plating | 3772 Hackett Ave. | Long Beach, CA 90808-4216 | |
| Sotiria | Contos | | Golden Star Restaurant No. 1 | 1560 West Pacific Coast Highway | Long Beach, CA 90810 | |
| Patrick | Kennedy | | Greater LB Interfaith Community Organization | 5600 Linden Avenue | Long Beach, CA 90805 | |
| John | Whitcombe | | Greenberg, Whitcombe, Takeuchi, Gibson & Grayver, LLP | 21515 Hawthorne Blvd, Suite 450 | Torrance, CA 90503-6531 | |
| Henry | Rogers | | Harbor Association of Industry & Commerce | 6216 E. Pacific Coast Highway #407 | Long Beach, CA 90803 | |
| Manny | Elefante | | Harbor Cogeneration Company | P.O. Box 550 | Wilmington CA 90748 | StahnJ@SouthwestGen.com; FudalskiI@SouthwestGen.com |
| | | | Harbor Cogeneration Company | 505 Pier B St. | Wilmington, CA 90744 | |
| Tamara | Kim | | Harbor Community Clinic | 593 W 6th Street | San Pedro, CA 90731 | |
| Kirsten | James | | Heal The Bay | 1444 9th Street | Santa Monica, CA 90401 | kjames@healthebay.org |
| Manny | Aschemeyer | | Intl Seafarers Center of LB | 120 S Pico Ave | Long Beach, CA 90802-6247 | |
| Michael | Fogarty | | Intl Transportation Service | 1281 Pier G Way | Long Beach, CA 90802 | |
| Whitney | Bagge | | Island Express Helicopters Inc | 1175 Queens Hwy | Long Beach, CA 90802 | Whitney@islandexpress.com |
| Peter | Ruiz | | Island Express Helicopters Inc | 900 Queensway Drive | Long Beach, CA 90802 | pruiz@islandexpress.com |
| Bob | Rollins Sr | | Island Yacht Anchorage | 1500 Anchorage Rd #205D | Wilmington, CA 90744 | |
| Tom | Jacobsen | | Jacobsen Pilot Services Inc | 1259 Pier F Ave | Long Beach, CA 90802 | |
| Jon | Farguson | | Jon's Body Shop | 1556 W. 11th St. | Long Beach, CA 90813 | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| Peter | Wu | | Kair Trucking | 1129 Canal Ave | Long Beach, CA 90813 | peterw@laharborexpress.com |
| Scott | Lebbin | | Koch Carbon Inc | 1020 Pier F Ave Berth F211 | Long Beach, CA 90802-6275 | |
| Kathy | Bowes | | L.G. Everist, Inc. | 350 S. Main Ave., Ste 400 | Sioux Falls, SD 57104 | |
| Gloria | Cuevas | | LA City Native American Indian Comm | 3175 W. 6th Street, Rm 403 | Los Angeles, CA 90020 | |
| Richard | Bruckner | | LA Co Regional Planning | 320 W Temple St, 13th Floor | Los Angeles, CA 90012 | |
| Sheheryar | Kaoosji | | Laane | 464 Lucas Ave, Ste 202 | Los Angeles, CA 90017 | skaoosji@laane.org |
| John | Donaldson | | Lan Logistics, Inc. | 1520 W. 11th St. | Long Beach, CA 90813-2618 | john@lanlogistics.us |
| Theral | Golden | | LB Assoc. | 3549 Fashion Avenue | Long Beach, CA 90810 | theralTG@msn.com |
| Ricardo | Vilchis | | LB Transport | 1532 1/2 W. Anaheim St. | Long Beach, CA 90813 | rdovilchis@Hotmail.com |
| Hank | Bruzza | | Lengner & Sons Express | 1916 W Anaheim St | Long Beach, CA 90813-1106 | family trust-midghome@yahoo.com |
| Barbara R. | Gleason | | Lighthouse Yacht Landing | 1300 Anchorage Rd, Berth 205-B | Wilmington, CA 90744 | barbara@lighthouseyachtmarina.com |
| Chris | Luckey | | Lineage Logistics | 1710 Pier B St | Long Beach, CA 90813 | cluckey@lineagelogistics.com |
| Sylvia | Betancourt | | Long Beach Alliance For Children With Asthma | 2651 Elm Ave., Ste. 100 | Long Beach, CA 90806 | |
| Gary | Shelton | | Long Beach Area Coalition For The Homeless | P.O. Box 92365 | Long Beach, CA 90809-2365 | |
| Rev. C. Kit | Wilke | | Long Beach Area Homeless Coalition | 3737 Atlantic Ave., Apt 1001 | Long Beach, CA 90807-6447 | revkit@verizon.net |
| Arthur J | Merrick | | Long Beach Container Terminal | 1171 Pier F Ave, Berth F10 | Long Beach, CA 90802 | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| | | Environmental Manager | Long Beach Generation, LLC | 2665 W Seaside Ave | Long Beach, CA 90813 | |
| Patricia | Benoit | | Long Beach Homeless Coalition | 4433 E. Barker Way | Long Beach, CA 90814-3018 | |
| | | | Long Beach Multi-Service Center | 1301 W. 12th St. | Long Beach, CA 90813-2720 | |
| Ryan | Zummaller | | Long Beach Post | 444 W Ocean Blvd, Ste 150 | Long Beach, CA 90802 | |
| | | | Long Beach Shoreline Marina | 450 E Shoreline Dr | Long Beach, CA 90802 | |
| Alan | Reising | | Long Beach Unified School District | 2425 Webster Avenue | Long Beach, CA 90810 | |
| Paul | Shadmani | | Los Angeles County Dept of Public Works | 900 S Fremont Ave 10th Floor | Alhambra, CA 91803-1331 | |
| Lindy | Lee | | Los Angeles County Metropolitan Transportation Authority | 1 Gateway Plaza, Mail Stop 99-25-1 | Los Angeles, CA 90012 | leelin@metro.net |
| | | Manager of Environmental Planning | Los Angeles Dept of Water & Power | 111 Hope St | Los Angeles, CA 90012 | |
| Evi | Boncato | | Los Angeles Dept. of Water & Power | 931 N Avalon Blvd | Wilmington, CA 90744 | evi.boncato@ladwp.com |
| Jennifer | Pinkerton | | Los Angeles Dept. of Water & Power | 111 N Hope St, Rm 1044 | Los Angeles, CA 90012 | |
| Cris B. | Liban | | Los Angeles Metropolitan Transportation Authority | One Gateway Plaza, Ms 99-17-2 | Los Angeles, CA 90012 | LibanE@metro.net |
| Marc | Stearns | | Manson Construction Co. | 340 Golden Shore, Ste 310 | Long Beach, CA 90802-4229 | |
| Kip | Louttit | | Marine Exchange | 3601 S Gaffey St, Bldg 803 | San Pedro, CA 90731 | 310-832-6411 |
| | | | Marine Express, Inc. | 1500 Pier C Avenue | Long Beach, CA 90802 | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| Raymond | Crispino | | Marine Spill Response Corp | 3300 East Spring Street | Long Beach, CA 90806 | |
| Louis | Tilley | | Marine Support International | Po Box 514 | Summerland, CA 93067 | louistilley@gmail.com |
| Ken | Pope | | Marine Terminals Corp Lb Shop | 2001 John S Gibson Blvd | San Pedro CA 90731 | |
| Vincent | Passanisi | | Marisa Foods | 1401 Santa Fe Ave | Long Beach, CA 90813 | |
| Michael | Carter | | Maritime Administration | Mar-410, W25-302 1200 New Jersey Ave | Washington, DC 20590 | |
| Dr Mark | Perez | | Memorial Maritime Clinic | 9017 Suva Street | Downey, CA 90240-3421 | |
| Rob | Waterman | | Metropolitan Stevedore Co. | 3806 Worsham Ave. | Long Beach, CA 90808 | |
| | | | Metropolitan Stevedore Co. | 1045 Pier G Avenue | Long Beach, CA 90802 | |
| Eric | Jen | | Mitsubishi Cement Corp | 1150 Pier F Ave | Long Beach, CA 90802 | |
| Michael | Jasberg | | Mitsubishi Cement Corporation | 151 Cassia Way | Henderson, NV 89104-6616 | mjasberg@mitsubishicement.com |
| Kyle | Gredvig | | Morton Salt | 1050 Pier F St | Long Beach, CA 90801 | kgredvig@mortonsalt.com, mpavezmortonsalt.com |
| Eddie | Zepeda | | MTA | One Gateway Plz | Los Angeles, CA 90012-2952 | |
| David | Pettit | | National Resources Defense Council (NRDC) | 1314 Second Street | Santa Monica, CA 90401 | dpettit@nrdc.org |
| Steve | Rogers | | New NGC Inc | 1850 Pier B St | Long Beach, CA 90802 | sjrogers@nationalgypsum.com |
| Don | Beaumont | | Nielsen Beaumont Marine | 2420 Shelter Island Dr | San Diego, CA 92106 | |
| Todd | Roloff | | NRC Environmental Services | 3777 Long Beach Blvd Ste 100 | Long Beach, CA 90807-3336 | |
| Paul | Morcos | | NRC Environmental Services | Pier D Street, Berth 47 | Long Beach, CA 90802 | pmorcos@nrcc.com |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| | | Environmental Manager | NRG Services Corp | 301 Vista Del Mar Blvd | El Segundo, CA 90245 | |
| Yutaka | Nagashima | | NYK Line | 300 Lighting Way | Secaucus, NJ 07094 | |
| | | HCC Holdings LLC | Oceanwide Ship Repair/APR Engineering | 1812 W 9th St | Long Beach, CA 90813-2614 | |
| Digran | Khalili | | Oxbow Carbon & Minerals, LLC | 330 Golden Shore Ste 210 | Long Beach, CA 90802 | digran.khalili@oxbow.com |
| Nauman | Charania | | Oxy | 111 West Ocean Blvd, Ste 800 | Long Beach, CA 90802 | |
| Jesse | Urquidi | | P2S Engineering (Future Ports) | 5000 Spring, 8th Floor | Long Beach, CA 90815 | |
| Otis | Cliatt II | | Pacific Harbor Line | 705 N Henry Ford Ave | Wilmington, CA 90744 | ocliatt@anacostia.com |
| Marc | La Maestra | | Pacific Maritime Administration | 555 Market St | San Francisco, CA 94105-2800 | |
| | | | Pacific Merchant Shipping Association | 70 Washington Street, Suite 305 | Oakland, CA 94607 | |
| Ray | Jackson | | Pacific Pipeline System LLC | 5900 Cherry Ave | Long Beach, CA 90805 | |
| | | LA/LB Division Manager | Pacific Tugboat Service | 1512 W Pier C Street | Long Beach, CA 90813 | |
| | | | Patriot Environmental Services | P.O. Box 1091 | Long Beach, CA 90801-1091 | |
| Steven | Ascenio | | PCMC | 250 W. Wardlow Rd | Long Beach, CA 90807 | |
| Robert | Puertas | | PCMC | 19 Willowbrook | Irvine, CA 92604-3616 | |
| Pat | Kennedy | | Petro Diamond | 1920 Lugger Way | Long Beach, CA 90813 | |
| Eric | Conard | | Petro Diamond Inc | 1100 Main Fl 2 | Irvine, CA 92614 | |
| Greg | Phillips | | Phillips Steel Co | 1368 W Anaheim St | Long Beach, CA 90813-2730 | daryl@phillipssteel.com |
| Ngiabi | Gicuhi | | Plains West Coast Terminals, LLC | 5900 Cherry Ave | Long Beach, CA 90805 | ngicuhi@paalp.com |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| Thomas | Jelenić | | PMSA | One World Trade Center, Ste 1700 | Long Beach, CA 90831 | tjelenic@pmsaship.com |
| | | | Polar Tankers Inc | 600 N. Dairy Ashford/Mo2026 | Houston, TX 77079 | |
| Steven | Debaun | | RCTC Legal Counsel Best Best & Krieger LLP | P.O. Box 1028 | Riverside, CA 92502-2208 | |
| Shannon | Walker | | Residence Inn | 600 Queensway Drive | Long Beach, CA 90802 | shannon.walker@marriott.com |
| John | Dougherty | | Ribost terminal | 1405 Pier C Street | Long Beach, CA 90813 | jdougherty@worldoil.com |
| John | Standiford | | Riverside County Transportation Commission | 4080 Lemon St, 3rd Floor | Riverside, CA 92502-2208 | jstandiford@rctc.org |
| | | | Robertson's Cement | 1602 W. Pier D St | Long Beach, CA 90802 | jackiem@rrmca.com |
| Moises | Figueroa | | SA Recycling | 482 Pier T Berth 118 | Long Beach, CA 90802 | mfigueroa@sarecycling.com |
| Mark | Tabbert | | SA Recycling | 901 New Dock St | Terminal Island, CA 90731 | |
| Richard | Averett | | San Bernardino County Transportation Authority | 1170 W. 3Rd St., 2Nd Floor | San Bernardino, CA 92410-1715 | |
| Christina S. | Casgar | | San Diego Association of Governments (SANDAG) | 401 B Street, Suite 800 | San Diego, CA 92101-4231 | CCA@Sandag.org, christina.casgar@sandag.org |
| Katheen | Woodfield | | San Pedro Peninsula Home Owners Coalition | 505 South Bandini Street | San Pedro, CA 90731 | |
| Clay | Sandidge | | Sandidge Consulting/Muni-Fed Energy | 192 Marina Drive | Long Beach, CA 90803 | csandidge@munifedenergy.com; clay@sandidgeconsulting.com |
| | | | Santa Fe Importers | 1401 Santa Fe Ave | Long Beach, CA 90813 | vince@santafeimporters.com |
| | | | Sause Bros. | 1607 W. Pier D St | Long Beach, CA 90802 | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| | | | Save The Queen | 1126 Queensway Dr | Long Beach, CA 90802 | |
| | | | SERRF | 118 Pier S Avenue | Long Beach, CA 90802 | |
| Don | Herman | | Shell | 20945 S Wilmington Ave | Carson, CA 90810 | |
| | | | Sherwin Williams | 1168 Harbor Ave | Long Beach, CA, 90813 | |
| Patty | Allen | | Shippers Transport | 1150 E. Sepulveda Blvd | Carson, CA 90745 | pallen@shipperstransport.com |
| John | Hinz | | Sierra Club of Long Beach | Po Box 91301 | Long Beach, CA 90809 | |
| | | | Spun Products Inc-MLZ INC | 1800 W 9th St | Long Beach, CA 90813 | |
| Rebecca | Maehara | | SRM Corporation | 555 Pico Ave | Long Beach, CA 90802 | queenswharf@gmail.com |
| Tony | Liberatore | | SSA Crescent Terminals Inc | 50 W Pier D St | Long Beach, CA 90802 | |
| Janaya | Nichols | | SSA LB Terminal | 700 Pier A Ave | Long Beach, CA 90813 | |
| Don | Kee | | SSA Marine | 1160 Pier F Ave | Long Beach, CA 90802 | |
| Ryan | Baird | | Pacific Container Terminal | 1521 Pier J Avenue | Long Beach, CA 90802 | |
| | | | SSA Matson Terminal | 1521 Pier C St | Long Beach, CA 90813 | |
| Paul | Gagnon | | SSA Terminals | 700 Pier A Plz | Long Beach, CA 90802 | paul.gagnon@ssamarine.com |
| | | | St. Mary Medical Center | 1050 Linden Ave | Long Beach, CA 90813 | |
| | | | Stapleton Technologies | 1350 W. 12th St | Long Beach, CA 90813 | phil@stapletontech.com |
| Wayne | Wilms | | Sundown Fox & Co/LB Boat Movers, Jones G&H Trust | 1769 W 9th St | Long Beach, CA 90813-2611 | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| Stan | Janocha | | Superior Electrical Advertising | 1700 W Anaheim St | Long Beach, CA 90813-1102 | stanjj@superiorsigns.com |
| Eric | Tate | | Teamsters Local Union No. 848 | 731 East Arrow Highway | Glendora, CA 91740 | |
| Donna | Dirocco | | Tesoro | 1300 Pier B St | Long Beach, CA 90813 | donna.m.dirocco@tsocorp.com |
| Scott | Gooden | | Tesoro | 820 Carrack Ave. | Long Beach, CA 90813 | |
| Yung | Chung | | Tesoro Calciner Barns | 1301 Pier G Ave | Long Beach, CA 90802 | yung.s.chung@tsocorp.com |
| Chris | Maudlin | | Tesoro Socal Pipeline Company, LLC | 6 Centerpointe Drive, Suite 500 | La Palma, CA 90623 | |
| Elisa | Nicholas | | The Children's Clinic | 455 E Columbia St | Long Beach, CA 90806 | |
| Kristi | Allen | | The Hotel Maya | 700 Queensway Dr | Long Beach, CA 90802 | |
| Robert | Rodine | | The Polaris Group | 14649 Tustin Street | Sherman Oaks, CA 91403 | polarisrlr@sbcglobal.net |
| Trent | Rosenlieb | | The Reef Restaurant | 880 S Harbor Scenic Dr | Long Beach, CA 90802 | |
| | | | The Termo Company | 3275 Cherry Ave | Long Beach, CA 90807 | |
| Frank | Komin | | Thums Long Beach Company | 111 W Ocean Blvd, Ste 800 | Long Beach, CA 90802 | |
| Cindi | Alvitre | | Ti'at Society | 3094 Mace Ave, Apt B | Costa Mesa, CA 92626 | calvitre@yahoo.com |
| Michael | Mirelez | | Torres Martinez Desert Cahuilla Indians | Po Box 1160 | Thermal, CA 92274 | mmirelez@tmdci.org |
| Gerry | Tintle | | Tosco Refining Company | 3900 Kilroy Airport Way, Ste 210 | Long Beach, CA 90806-6817 | |
| Phillip T. | Wright | | Total Terminals International | 301 Mediterranean Way | Long Beach, CA 90802 | phillipwr@totalterminals.com |
| Audie | Freeman | | Toyota Logistics Services | 785 Edison Ave | Long Beach, CA 90813 | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| | | Safety & Environmental Mgr | Toyota Motor Sales USA | 19001 S Western Ave | Torrance, CA 90509-2991 | |
| | | | Tran Harbor Inc. | 222 E. G St. | Wilmington, CA 90744 | |
| Dj Auto Body | | | Trans Harbor Inc. | 1130 Santa Fe Ave | Long Beach, CA 90813 | dae@djautobody.com |
| Chris | Balden | | Trans Harbor Investments, Inc | 2501 N. Rosemead Blvd | South El Monte, CA 91733-1531 | baldenca@gmail.com |
| | | | Trans Ocean Carrier Inc | 1650 Harbor Ave., Ste. B | Long Beach, CA 90813 | |
| | | | Transportation 4 America | 1152 15th St. Nw, Ste 450 | Washington, DC 20005 | |
| Jeff | Asay | | Union Pacific Railroad | 10031 Foothills Blvd, Rm 200 | Roseville, CA 95747 | |
| andrea M. | Hricko | | USC | 2001 Soto St. (SSB) 225R MC9237 | Los Angeles, CA 90033 | Ahricko@usc.edu |
| Mark | Phair | | Valero Wilmington Refinery | 2402 E Anaheim St | Wilmington, CA 90744 | mark.phair@valero.com |
| Mario | DeLaura | | Vnamar Inc | 1280 W. 12th Street | Long beach, CA 90813 | mdelaura@vinamarinc.com, sdelaura@vinamarinc.com |
| Michael | La Cavera | | Vopak | 3601 Dock St | San Pedro, CA 90731 | |
| Louis | Warschaw | | Warland Investments Co | 1299 Ocean Ave, Ste 300 | Santa Monica, CA 90401 | |
| | | | Waterman Family Trust | Po Box 596 | Wilmington, CA 90748 | |
| Steve | Dickson | | Wayne Electric Company /Horace Sherer Trust | 1560 W. Anaheim St | Long Beach, CA 90813-2644 | wayneelectric@yahoo.com |
| | | | Wayne Electric Company /Horace Sherer Trust | 421 Daroca Ave | Long Beach, CA 90803-2104 | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| Frank | Murphy | | Weighmaster Murphy | 1601 W. 12th St | Long Beach, CA 90812 | frank@weighmastersmurphy.com |
| Paul | Collins | | Westside Project Area Council | 1415 Cota Ave. | Long Beach, CA 90813 | pacdesign88@gmail.com |
| Wayne | Driggers | | Westway Trading Group | 2701 Taleyrand Ave | Jacksonville, FL 32206 | |
| Don | Peters | | Weyerhauser Company | 800 Pier T Ave | Long Beach, CA 90802 | |
| | | | Wilmington Chamber of Commerce | P.O. Box 90 | Wilmington, CA 90744 | info@wilmington-chamber.com |
| Valerie | Contreras | | Wilmington Neighborhood Council | 544 N. Avalon Blvd, Suite 103 | Wilmington, CA 90744 | wilmingtonnc@empowerlala.org |
| Nayomi | De Silva | | World Oil Corporation | 9302 Garfield Ave | South Gate, CA 90280 | |
| Legacy Partners | | | World Trade Center | One World Trade Center, Ste 198 | Long Beach, CA 90801 | |
| Linda | Frame | | Yusen Terminals Inc | 701 New Dock St | Terminal Island, CA 90731 | linda.frame@yti.com |
| Lawrence | Maehara | | Berth 55 Seafood | 555 Pico Ave | Long Beach, CA 90802 | queenswharf@gmail.com |
| Taylor | Thomas | | East Yard Communities For Environmental Justice | 2448 Santa Fe Ave. | Long Beach, CA 90810 | tbthomas@eycej.org |
| Jan Victor | Andasan | | East Yard Communities For Environmental Justice | 2448 Santa Fe Ave. | Long Beach, CA 90810 | jandasan@eycej.org |
| Devin | Hanson | | International Bird Rescue | 3601 S. Gaffey St., Box 3 | San Pedro, CA 90731 | devin.hanson@bird-rescue.org |
| Julie | Skogland | | International Bird Rescue | 3601 S. Gaffey St., Box 3 | San Pedro, CA 90731 | julie.skogland@bird-rescue.org |
| Thomas | Jelenić | | PMSA | One World Trade Center, Ste 1700 | Long Beach, CA 90831 | tjelenic@pmsaship.com |
| Nathan | Francis | | Rio Tinto - US Borax | 300 Falcon St. | Wilmington, CA 90744 | nathan.francis@riotinto.com |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| | | | Golden Shore RV Resort | 101 Golden Shore | Long Beach, CA 90802 | |
| | | | Annie Nam Southern California Council of Governments | 900 Wilshire Blvd., Ste. 1700 | Los Angeles, CA 90017 | |
| | | | 5000 Spring, LLC c/o Jamison Services | 4811 Airport Plaza Drive, Suite #300 | Long Beach, CA 90815 | |
| | | | Oryx Energy Company | Four North Park East, P.O. Box 2880 | Dallas, TX 75221 | |
| | | | Kinder Morgan Liquids Terminals LLC | 200 Dallas Street, Suite 100 | Houston, TX 77002 | |
| | | | CEMEX Construction Materials Pacific, LLC | 840 Gessner, Suite 1400 | Houston, TX 77024 | |
| | | | Air Products and Chemicals, Inc. | 12600 Northborough, Suite 196 | Houston, TX 77067 | |
| | | | Tesoro Refining & Marketing Company LLC | 19100 Ridgewood Parkway | San Antonio, TX 78259 | |
| | | | Garrett Freight Lines, Inc. | 12136 West Bayard Ave. | Lakewood, CO 80228 | |
| | | | MCC Terminal, Inc. | 151 Cassia Way | Henderson, NV 89014 | |
| | | | Eller Media, Inc. | 1550 West Washington Blvd | Los Angeles, CA 90007 | |
| | | | Patrick Media Group, Inc. | 1550 West Washington Blvd | Los Angeles, CA 90007 | |
| | | | California State Department of Public Works | 120 South Spring Street | Los Angeles, CA 90012 | |
| | | | City of Los Angeles | 200 North Spring Street, Room 395 | Los Angeles, CA 90012 | |
| | | | General Exploration Company of California | 417 South Hill Street | Los Angeles, CA 90013 | |
| | | | MacMillan Ring-Free Oil Co., Inc. | 911 Wilshire Blvd, Suite 1680 | Los Angeles, CA 90017 | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| | | | Western Union Telegraph | 745 South Flower Street | Los Angeles, CA 90017 | |
| | | | Bruck, William W. | 1200 Santa Fe Avenue | Los Angeles, CA 90021 | |
| | | | Signal Trucking Service Ltd. | 3770 East 26th Street | Vernon, CA 90023 | |
| | | | Atlantic Richfield Company | P.O. Box 2679 | Los Angeles, CA 90051 | |
| | | | Los Angeles County Internal Services Department | 1100 North Eastern Avenue | Los Angeles, CA 90063 | |
| | | | MacLeod Metals Company | 731 West 182nd Street | Gardena, CA 90248 | |
| | | | Industrial Steel Treating Company | 3370 Benedict Way | Huntington Park, CA 90255 | |
| | | | Quality Wood Products, Inc. | 6203 Maywood Avenue | Huntington Park, CA 90255 | |
| | | | Dayton Foundry Company | P.O. Box 2008 | South Gate, CA 90280 | |
| | | | Ruchti Bros. Inc. | 10600 Ruchti Road | South Gate, CA 90280 | |
| | | | County Sanitation District No. 3 of Los Angeles County | 1955 Workman Mill Road | Whittier, CA 90607 | |
| | | | Fremont Forest Group Corporation | P.O. Box 4129 | Whittier, CA 90607 | |
| | | | Gulf Oil Corporation | P.O. Box 2109 | Santa Fe Springs, CA 90670 | |
| | | | Torrance Basin Pipeline Company | 12851 East 166th Street | Cerritos, CA 90703 | |
| | | | Water Replenishment District of Southern California | 4040 Paramount Blvd. | Lakewood, CA 90712 | |
| | | | Consolidated Fabricators Corporation | 7815 East Compton Boulevard | Paramount, CA 90723 | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| | | | Pacific Finishing Company | 16200 Illinois | Paramount, CA 90723 | |
| | | | Paramount Perlite Company | 16236 South Illinois St. | Paramount, CA 90723 | |
| | | | Paramount Petroleum Corporation | 14700 Downey Avenue | Paramount, CA 90723 | |
| | | | John S. Meek Company, Inc. | 1931 North Gaffey Street, Suite C | San Pedro, CA 90732 | |
| | | | National Metal & Steel Corp. | P.O. Box 3406 | Terminal Island, CA 90731 | |
| | | | Murat Mischel, Susan & Mary Murat | 1748 El Rey Road | San Pedro, CA 90732 | |
| | | | Rollins, Robert W. Jr, Robert W. Sr & Donald, GP | 1313 Mt. Rainier | San Pedro, CA 90732 | |
| | | | Equilon Enterprises, LLC | 2101 E. Pacific Coast Highway | Wilmington, CA 90744 | |
| | | | Marcus Trucking Company | 1017 North Foote Avenue | Wilmington, CA 90744 | |
| | | | O'Donnell Oil, LLC | 246 N. Fries Avenue | Wilmington, CA 90744 | |
| | | | Stevedoring Services of America, Inc. | 1001 New Dock Street | Wilmington, CA 90744 | |
| | | | Ultramar Inc., dba Valero Wilmington Refinery | 2402 East Anaheim Street | Wilmington, CA 90744 | |
| | | | Ultramar, Inc. | 2402 East Anaheim Street | Wilmington, CA 90744 | |
| | | | Alameda Corridor Transportation Authority (ACTA) | One Civic Plaza, Suite 650 | Carson, CA 90745 | |
| | | | California Sulphur Company | P.O. Box 176 | Wilmington, CA 90748 | |
| | | | Oil Operators Incorporated | 2852 Gundry Ave | Signal Hill, CA 90755 | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| | | | CSA Equipment Company, LLC | P.O. Box 229 | Long Beach, CA 90801 | |
| | | | International City Theatre | P.O. Box 1690 | Long Beach, CA 90801 | |
| | | | Long Beach Community TV & Media | P.O. Box 1468 | Long Beach, CA 90801 | |
| | | | City of Long Beach | 333 W. Ocean Blvd | Long Beach, CA 90802 | |
| | | | Crescent Terminals, Inc. | 1160 Pier F Ave | Long Beach, CA 90802 | |
| | | | Crescent Warehouse Company, Ltd. | Berth D50, Pier D Street | Long Beach, CA 90802 | |
| | | | GENERAL TELEPHONE COMPANY OF CALIFORNIA | 200 W. Ocean Blvd. | Long Beach, CA 90802 | |
| | | | LBCT LLC | 1171 Pier F Ave | Long Beach, CA 90802 | |
| | | | Maehara, Samuel and Rebecca | 555 N. Pico Ave | Long Beach, CA 90802 | |
| | | | Mixton Transport Corp. | 1409 E. 4th Street, #G | Long Beach, CA 90802 | |
| | | | OOCL LLC | 1171 Pier F Ave | Long Beach, CA 90802 | |
| | | | Pacific Maritime Services, LLC/Pacific Container Terminal | 1521 Pier J Ave | Long Beach, CA 90802 | |
| | | | PierPass Inc. | 444 W. Ocean Blvd, Suite 700 | Long Beach, CA 90802 | |
| | | | Port of Long Beach | 415 W. Ocean Blvd | Long Beach, CA 90802 | |
| | | | Queensbay Hotel, LLC | 700 Queensway Drive | Long Beach, CA 90802 | |
| | | | S7 Sea Launch Limited | 2700 Nimitz Road | Long Beach, CA 90802 | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| | | | San Pedro Bay Pipeline Company | 111 W. Ocean Blvd, Suite 1240 | Long Beach, CA 90802 | |
| | | | Southeast Resource Recovery Facility | 120 Pier S Ave | Long Beach, CA 90802 | |
| | | | State Lands Commission | 245 West Broadway, Suite 425 | Long Beach, CA 90802 | |
| | | | United States of America - Department of the Navy | 3500 Nimitz Road | Long Beach, CA 90802 | |
| | | | Desiderata Homes, Ltd. | 4700 Long Beach Blvd. | Long Beach, CA 90805 | |
| | | | Lorenz, Ed and Glo | 6046 Orange Avenue, Apt 1 | Long Beach, CA 90805 | |
| | | | Cardinal Pipeline, L.P. | 2459 Redondo Avenue | Long Beach, CA 90806 | |
| | | | Long Beach Acquisition Corp/Charter Communications | 2931 Redondo Avenue | Long Beach, CA 90806 | |
| | | | Long Beach Gas & Oil | 2400 E. Spring Street | Long Beach, CA 90806 | |
| | | | Phillips 66 Pipeline LLC | 3900 Kilroy Airport Way, Suite 210 | Long Beach, CA 90806 | |
| | | | Xtra Energy Corporation | 717 Walton Street | Long Beach, CA 90807 | |
| | | | Chief Oil Company, Inc. | 4235 Country Club Drive | Long Beach, CA 90808 | |
| | | | Bowers, William A. | 3846 Gondar Ave | Long Beach, CA 90810 | |
| | | | Evanculla, Isidro | 2033 Arlington Street | Long Beach, CA 90810 | |
| | | | Martin Magdaleno | 1955 W. Cameron St. | Long Beach, CA 90810 | |
| | | | Ojedo, Melesio | 2011 West Lincoln St. | Long Beach, CA 90810 | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| | | | Songcayauon, Vincent | 2301 W. Arlington Street | Long Beach, CA 90810 | |
| | | | Villarael, Silverio | 2000 West Cameron Street | Long Beach, CA 90810 | |
| | | | ARCO Terminal Services Corporation | 1300 Pier B Street | Long Beach, CA 90813 | |
| | | | Pacific Maritime Services, L.L.C. | 700 Pier A Plaza | Long Beach, CA 90813 | |
| | | | Wilms, Wayne | 4290 E. Patero Way | Long Beach, CA 90815 | |
| | | | Legacy Partners II LB World Trade, LLC | One World Trade Center, Suite 198 | Long Beach, CA 90831 | |
| | | | Sun Oil Company | 23928 Lyons Avenue | Newhall, CA 91321 | |
| | | | United Ready Mixed Concrete Company, Inc. | 13131 Los Angeles Street | Irwindale, CA 91706 | |
| | | | Insight Cablevision of Los Angeles | 212 South Indian Hill Blvd. | Claremont, CA 91711 | |
| | | | Southern California Gas Company | 488 8th Ave, HQ06N1 | San Diego, CA 92101 | |
| | | | MCM Construction, Inc. | 19010 Slover Ave | Bloomington, CA 92316 | |
| | | | Modern Development Company | 3152 Redhill Ave, Suite 100 | Costa Mesa, CA 92626 | |
| | | | PsomasFMG Long Beach Port Solar I, LLC | 7777 Center Avenue, Suite 200 | Huntington Beach, CA 92647 | |
| | | | Group W Cable TV of South Gate | 2734 Susan | Santa Ana, CA 92704 | |
| | | | XO California, Inc. | 1924 East Deere Avenue | Santa Ana, CA 92705 | |
| | | | Western Exterminator Company | P.O. Box C11881 | Santa Ana, CA 92711 | |
| | | | Texaco Trading and Transportation, Inc. | P.O. Box 2087 | Bakersfield, CA 93303 | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| | | | Texaco, Inc. | 5005 Business Park North, Suite 200 | Bakersfield, CA 93309 | |
| | | | Standard Gas Company | 9525 Camino Media, E-2037 | Bakersfield, CA 93311 | |
| | | | Chemoil Corporation | 4 Embarcadero Center, Suite 1800 | San Francisco, CA 94111 | |
| | | | California State Division of Highways | P.O. Box 1499 | Sacramento, CA 95801 | |
| | | | California Geological Survey - State of California | 801 K Street, MS 13-35 | Sacramento, CA 95814 | |
| | | | Praxair, Inc. | P.O. Box 44 | Tonawanda, NY 14150-7891 | |
| | | | The Sherwin-Williams Company | 101 Prospect Avenue NW, 920 M, Store Real Estate Dept. | Cleveland, OH 44225-1075 | |
| | | | Los Angeles County Hall of Records | 500 West Temple Street, 11th Floor | Los Angeles, CA 90012-2770 | |
| | | | Los Angeles County Weights & Measures | 222 South Hill Street, 3rd Floor | Los Angeles, CA 90012-3506 | |
| | | | Alfred-Dixon Properties | 380 South Beverly Drive, Suite 411 | Beverly Hills, CA 90212-3904 | |
| | | | City of Downey | 11111 Brookshire Avenue | Downey, CA 90241-3898 | |
| | | | Pacific Bell Telephone Company | 100 West Alondra Boulevard, Room A207 | Gardena, CA 90248-2702 | |
| | | | Dynamic Machine, Inc. | 3470 Randolph Street | Huntington Park, CA 90255-3259 | |
| | | | WC Auto Body of South Gate, Inc. | 8648 Atlantic Avenue | South Gate, CA 90280-3502 | |
| | | | W. A. Woods Industries, Inc. | 10120 West Frontage Road | South Gate, CA 90280-5433 | |
| | | | ConocoPhillips Company | 9645 Santa Fe Springs Road | Santa Fe Springs, CA 90670-2900 | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| | | | Harbor Land Company, LLC | c/o Martin Container, Inc., 1402 East Lomita Blvd | Wilmington, CA 90744-1611 | |
| | | | Texaco Refining and Marketing, Inc. | 2101 East Pacific Coast Highway | Wilmington, CA 90744-2914 | |
| | | | Union Pacific Resources Company | 420 Henry Ford Avenue, P.O. Box 1317 | Wilmington, CA 90748-1317 | |
| | | | Crimson California Pipeline, L.P. | 2459 Redondo Avenue | Long Beach, CA 90755-4020 | |
| | | | Lomita Gasoline Company, Inc. | P.O. Box 851 | Long Beach, CA 90801-0851 | |
| | | | Pacific Towboat & Salvage Company | P.O. Box 1940 | Long Beach, CA 90801-1940 | |
| | | | U.S. Coast Guard | 501 West Ocean Boulevard, Suite 6200 | Long Beach, CA 90802-4222 | |
| | | | Tidelands Oil Production Company | 301 East Ocean Boulevard, Suite 300 | Long Beach, CA 90802-4830 | |
| | | | R.M.S. Foundation, Inc. | 1126 Queens Highway | Long Beach, CA 90802-6390 | |
| | | | The Dow Chemical Company | 6754 North Paramount Boulevard | Long Beach, CA 90805-1902 | |
| | | | American Transportation Services, Inc. | P.O. Box 9993 | Long Beach, CA 90810-0993 | |
| | | | Verizon California, Inc. | 6220 East Spring Street | Long Beach, CA 90815-1422 | |
| | | | Livingston-Graham, Inc. | 13550 Live Oak Lane | Baldwin Park, CA 91706-1318 | |
| | | | SBC California | 100 North Stoneman Avenue, Room 265 | Alhambra, CA 91801-3521 | |
| | | | Los Angeles County Flood Control District | P.O. Box 1460 | Alhambra, CA 91801-1460 | |
| | | | BNSF Railway Company | 740 East Carnegie Drive | San Bernardino, CA 92408-3571 | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| | | | Pleasantville 27, LLC | 1306 Sandcastle Drive | Corona Del Mar, CA 92625-1217 | |
| | | | Anthem Telecom, LLC | 436 Prospect Street | Newport Beach, CA 92663-1918 | |
| | | | Production Operators, Inc. | P.O. Box 40262 | Houston, TX 97240-0262 | |
| | | | HCC Holdings LLC | PO Box 9100 | Long Beach, CA 90810-0100 | |
| | | | | | | |
| | | | MLZ Inc. | 1800 W 9th St | Long Beach, CA 90813-2614 | |
| | | | | | | |
| | | | Berns Bros Inc. | 1250 W 17th St | Long Beach, CA 90813-1310 | |
| | | | Harrison Pacific LLC | 1326 W. 12th St | Long Beach, CA 90813-2721 | |
| | | | Legend Thirteen 26 LLC | 1140 Highland Ave, #112 | Manhattan Beach, CA 90266 | |
| | | | Allied Packing and Rubber Inc | 1335 W 11th St | Long Beach, CA 90813-2714 | |
| | | | | | | |
| | | | Bernal Holding Company | 29723 Knoll View Dr | Rancho Palos Verdes, CA 90275-6435 | |
| | | | 1556 W 11th Street LLC | 2600 Michelson Dr, #850 | Irvine, CA 92612-6504 | |
| | | | KASCO | 1458 El Monte Dr | Thousand Oaks, CA 91362-2124 | |
| | | | | | | |
| | | | TRANS Harbor Inc | 2501 Rosemead Blvd | South El Monte, CA 91733-1531 | |
| | | | BUEHLER ET AL TR/ BLACKWEILER ET AL TR | 420 W. 42nd St, Apt 38E | New York, NY 10036-6866 | |
| | | | Church of the Good Shepherd | 400 W Duarte Rd | Arcadia, CA 91007-6819 | |

| RECIPIENT | | TITLE | ORGANIZATION | STREET | CITY, STATE, ZIP | EMAIL |
|---|---|---|---|---|---|---|
| | | | 1220 9th Street LLC | 18303 Gridley Rd | Cerritos, CA 90703-5401 | |
| | | | Deep Pacific | 250 W Wardlow Rd | Long Beach, CA 90807-4429 | |

1

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

## APPENDIX K: EJSCREEN REPORTS

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

October 2019

US Army Corps of Engineers ®

Port of LONG BEACH
The Green Port

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# EJSCREEN Report (Version 2018)

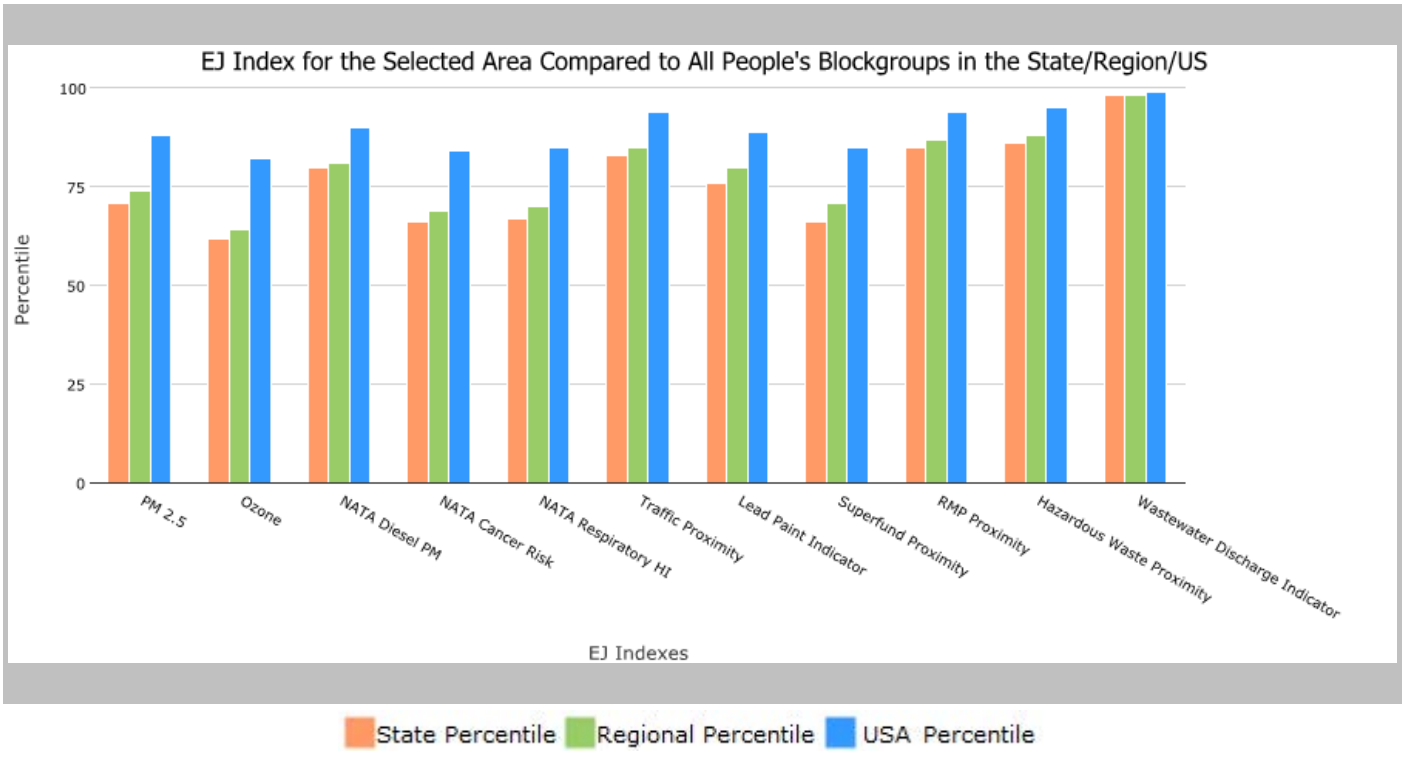
**City: Long Beach, CALIFORNIA, EPA Region 9**

**Approximate Population: 469,743**

**Input Area (sq. miles): 51.44**

**(The study area contains 6 blockgroup(s) with zero population.)**

| Selected Variables | State Percentile | EPA Region Percentile | USA Percentile |
|---|---|---|---|
| **EJ Indexes** | | | |
| EJ Index for PM2.5 | 71 | 74 | 88 |
| EJ Index for Ozone | 62 | 64 | 82 |
| EJ Index for NATA* Diesel PM | 80 | 81 | 90 |
| EJ Index for NATA* Air Toxics Cancer Risk | 66 | 69 | 84 |
| EJ Index for NATA* Respiratory Hazard Index | 67 | 70 | 85 |
| EJ Index for Traffic Proximity and Volume | 83 | 85 | 94 |
| EJ Index for Lead Paint Indicator | 76 | 80 | 89 |
| EJ Index for Superfund Proximity | 66 | 71 | 85 |
| EJ Index for RMP Proximity | 85 | 87 | 94 |
| EJ Index for Hazardous Waste Proximity | 86 | 88 | 95 |
| EJ Index for Wastewater Discharge Indicator | 98 | 98 | 99 |




This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

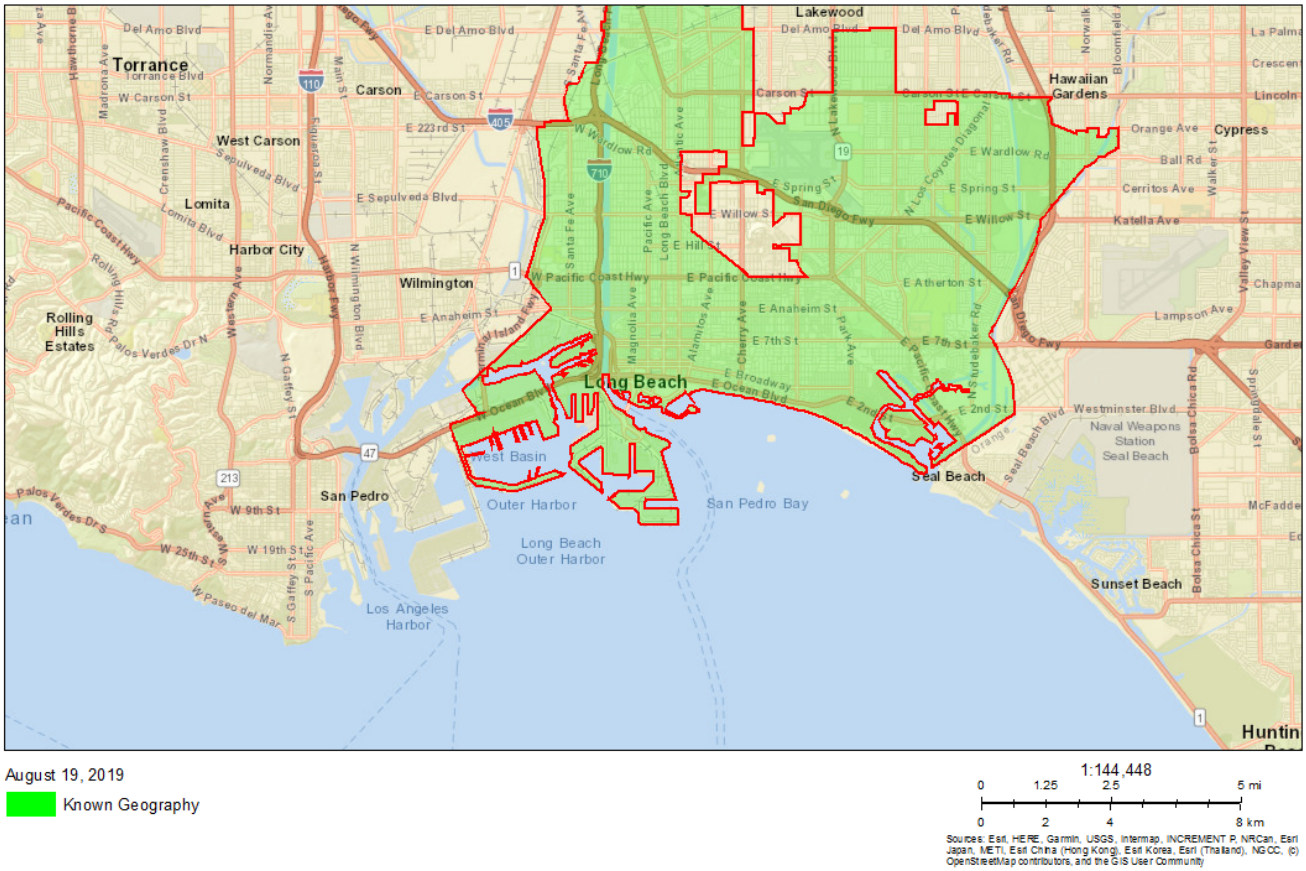
# EJSCREEN Report (Version 2018)

**City: Long Beach, CALIFORNIA, EPA Region 9**

**Approximate Population: 469,743**

**Input Area (sq. miles): 51.44**

**(The study area contains 6 blockgroup(s) with zero population.)**




| Sites reporting to EPA | |
|---|---|
| Superfund NPL | 0 |
| Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF) | 26 |

# EJSCREEN Report (Version 2018)

**City: Long Beach, CALIFORNIA, EPA Region 9**

**Approximate Population: 469,743**

**Input Area (sq. miles): 51.44**

**(The study area contains 6 blockgroup(s) with zero population.)**

| Selected Variables | Value | State Avg. | %ile in State | EPA Region Avg. | %ile in EPA Region | USA Avg. | %ile in USA |
|---|---|---|---|---|---|---|---|
| **Environmental Indicators** | | | | | | | |
| Particulate Matter (PM 2.5 in µg/m$^3$) | 13.4 | 10.7 | 82 | 10.1 | 86 | 9.53 | 97 |
| Ozone (ppb) | 40.3 | 47.4 | 26 | 48.3 | 20 | 42.5 | 30 |
| NATA* Diesel PM (µg/m$^3$) | 1.64 | 0.972 | 87 | 0.978 | 80-90th | 0.938 | 80-90th |
| NATA* Cancer Risk (lifetime risk per million) | 45 | 44 | 56 | 43 | 50-60th | 40 | 60-70th |
| NATA* Respiratory Hazard Index | 2.2 | 2.1 | 57 | 2 | 60-70th | 1.8 | 70-80th |
| Traffic Proximity and Volume (daily traffic count/distance to road) | 1900 | 1200 | 82 | 1100 | 83 | 600 | 93 |
| Lead Paint Indicator (% Pre-1960 Housing) | 0.56 | 0.29 | 78 | 0.24 | 82 | 0.29 | 80 |
| Superfund Proximity (site count/km distance) | 0.075 | 0.17 | 52 | 0.14 | 58 | 0.12 | 63 |
| RMP Proximity (facility count/km distance) | 2.1 | 1.1 | 84 | 0.97 | 87 | 0.72 | 91 |
| Hazardous Waste Proximity (facility count/km distance) | 6.1 | 3.3 | 82 | 2.8 | 85 | 4.3 | 92 |
| Wastewater Discharge Indicator (toxicity-weighted concentration/m distance) | 21 | 16 | 97 | 12 | 97 | 30 | 98 |
| **Demographic Indicators** | | | | | | | |
| Demographic Index | 57% | 48% | 63 | 47% | 65 | 36% | 79 |
| Minority Population | 72% | 62% | 57 | 59% | 61 | 38% | 80 |
| Low Income Population | 42% | 35% | 64 | 35% | 64 | 34% | 67 |
| Linguistically Isolated Population | 8% | 9% | 55 | 8% | 59 | 4% | 80 |
| Population With Less Than High School Education | 21% | 18% | 63 | 17% | 66 | 13% | 78 |
| Population Under 5 years of age | 7% | 6% | 59 | 6% | 60 | 6% | 63 |
| Population over 64 years of age | 10% | 13% | 46 | 13% | 45 | 14% | 35 |

* The National-Scale Air Toxics Assessment (NATA) is EPA's ongoing, comprehensive evaluation of air toxics in the United States. EPA developed the NATA to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that NATA provides broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the NATA analysis can be found at: https://www.epa.gov/national-air-toxics-assessment.

For additional information, see: www.epa.gov/environmentaljustice

# EJSCREEN Report (Version 2018)

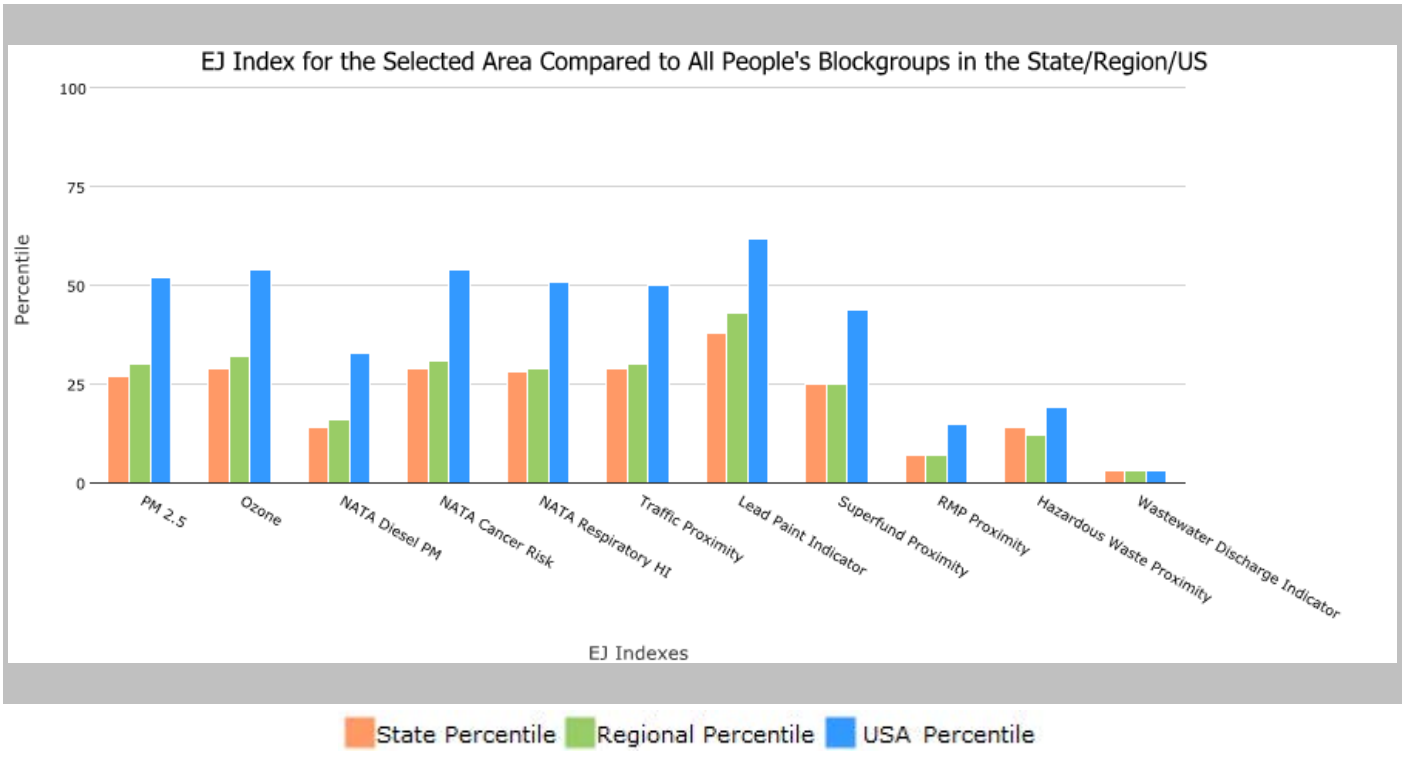
**1 mile Ring around the Area, CALIFORNIA, EPA Region 9**

**Approximate Population: 3**

**Input Area (sq. miles): 15.79**

**(The study area contains 3 blockgroup(s) with zero population.)**

| Selected Variables | State Percentile | EPA Region Percentile | USA Percentile |
|---|---|---|---|
| **EJ Indexes** | | | |
| EJ Index for PM2.5 | 27 | 30 | 52 |
| EJ Index for Ozone | 29 | 32 | 54 |
| EJ Index for NATA* Diesel PM | 14 | 16 | 33 |
| EJ Index for NATA* Air Toxics Cancer Risk | 29 | 31 | 54 |
| EJ Index for NATA* Respiratory Hazard Index | 28 | 29 | 51 |
| EJ Index for Traffic Proximity and Volume | 29 | 30 | 50 |
| EJ Index for Lead Paint Indicator | 38 | 43 | 62 |
| EJ Index for Superfund Proximity | 25 | 25 | 44 |
| EJ Index for RMP Proximity | 7 | 7 | 15 |
| EJ Index for Hazardous Waste Proximity | 14 | 12 | 19 |
| EJ Index for Wastewater Discharge Indicator | 3 | 3 | 3 |




This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

# EJSCREEN Report (Version 2018)

**1 mile Ring around the Area, CALIFORNIA, EPA Region 9**

**Approximate Population: 3**

**Input Area (sq. miles): 15.79**

**(The study area contains 3 blockgroup(s) with zero population.)**


| Sites reporting to EPA | |
|---|---|
| Superfund NPL | 0 |
| Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF) | 4 |

# EJSCREEN Report (Version 2018)

**1 mile Ring around the Area, CALIFORNIA, EPA Region 9**

**Approximate Population: 3**

**Input Area (sq. miles): 15.79**

**(The study area contains 3 blockgroup(s) with zero population.)**

| Selected Variables | Value | State Avg. | %ile in State | EPA Region Avg. | %ile in EPA Region | USA Avg. | %ile in USA |
|---|---|---|---|---|---|---|---|
| **Environmental Indicators** | | | | | | | |
| Particulate Matter (PM 2.5 in µg/m$^3$) | 12.2 | 10.7 | 67 | 10.1 | 73 | 9.53 | 93 |
| Ozone (ppb) | 38.3 | 47.4 | 19 | 48.3 | 15 | 42.5 | 21 |
| NATA* Diesel PM (µg/m$^3$) | 2.44 | 0.972 | 97 | 0.978 | 95-100th | 0.938 | 95-100th |
| NATA* Cancer Risk (lifetime risk per million) | 34 | 44 | 17 | 43 | <50th | 40 | <50th |
| NATA* Respiratory Hazard Index | 1.9 | 2.1 | 43 | 2 | <50th | 1.8 | 60-70th |
| Traffic Proximity and Volume (daily traffic count/distance to road) | 17 | 1200 | 13 | 1100 | 17 | 600 | 24 |
| Lead Paint Indicator (% Pre-1960 Housing) | 0 | 0.29 | 10 | 0.24 | 16 | 0.29 | 10 |
| Superfund Proximity (site count/km distance) | 0.074 | 0.17 | 51 | 0.14 | 58 | 0.12 | 63 |
| RMP Proximity (facility count/km distance) | 2.8 | 1.1 | 90 | 0.97 | 91 | 0.72 | 95 |
| Hazardous Waste Proximity (facility count/km distance) | 3.3 | 3.3 | 66 | 2.8 | 72 | 4.3 | 85 |
| Wastewater Discharge Indicator (toxicity-weighted concentration/m distance) | 0.99 | 16 | 90 | 12 | 90 | 30 | 95 |
| **Demographic Indicators** | | | | | | | |
| Demographic Index | 32% | 48% | 26 | 47% | 28 | 36% | 52 |
| Minority Population | 63% | 62% | 49 | 59% | 52 | 38% | 75 |
| Low Income Population | 0% | 35% | 0 | 35% | 0 | 34% | 0 |
| Linguistically Isolated Population | 0% | 9% | 16 | 8% | 19 | 4% | 44 |
| Population With Less Than High School Education | 12% | 18% | 47 | 17% | 49 | 13% | 59 |
| Population Under 5 years of age | 2% | 6% | 8 | 6% | 8 | 6% | 9 |
| Population over 64 years of age | 9% | 13% | 37 | 13% | 36 | 14% | 28 |

* The National-Scale Air Toxics Assessment (NATA) is EPA's ongoing, comprehensive evaluation of air toxics in the United States. EPA developed the NATA to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that NATA provides broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the NATA analysis can be found at: https://www.epa.gov/national-air-toxics-assessment.

For additional information, see: www.epa.gov/environmentaljustice

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

## APPENDIX L: APPLICATION SUMMARY REPORT

DEEP DRAFT NAVIGATION STUDY

Los Angeles County, California

October 2019

US Army Corps of Engineers ®

Port of LONG BEACH
The Green Port

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# APPLICATION SUMMARY REPORT

## 1.1 Introduction

The California Coastal Act of 1976 (CCA or Coastal Act) requires the Port of Long Beach (Port or POLB) to prepare and adopt master plans for land and water areas within its boundaries that are located within the coastal zone. The Port's most recent plan to be comprehensively updated and certified was the 1990 Port Master Plan (PMP). The Port adopted Guidelines for Implementation of the Port of Long Beach Certified Port Master Plan in July 1996 (Guidelines). Adopted as Ordinance HD-1701, the purpose of the Guidelines is to provide the Board of Harbor Commissioners (BHC or Board) with the necessary procedures, objectives, and criteria for the implementation of City Charter Section 1215 and the PMP in accordance with provisions of the CCA. Section 3 of the Guidelines, states that the Board shall not approve or grant an application for a permit unless a determination has been made by the Board that either the project conforms with the Certified Port Master Plan, or the project is exempt from the provisions of the Coastal Act and a permit is not required. POLB is currently updating its PMP, and expects certification of the update next year (the 2020 PMP update).

Section 6.5 of the Guidelines requires the preparation of a summary report of each application filed. The Application Summary Report (ASR) requires presentation of a description of the significant features of the proposed project, applicable policies of the Port Master Plan and Coastal Act, as well as summaries of environmental impact reports and other environmental and geotechnical evaluations. This ASR, in conjunction with the environmental impact report (EIR), is prepared in accordance with the Port PMP, as amended, and the CCA.

The proposed Deep Draft Navigation and Channel Deepening Project (proposed Project), which would be undertaken jointly by the U.S. Army Corps of Engineers and the POLB, would deepen the approach channel to -80 feet (ft) mean lower low water (MLLW), bend-easing sections of the main channel to a depth of -76 ft MLLW, construct an approach channel to Pier J to an authorized depth of -55 ft MLLW, and deepen the West Basin to -55 ft MLLW. The proposed Project comprises feasible dredging and disposal measures, in accordance with federal and state guidelines, including the POLB's environmental protection guidelines.

In addition to the activities listed above, the POLB would also deepen two additional locations within the harbor to an authorized depth of -55 MLLW: the Pier J slip, including berths J266–J270, and berth T140 on Pier T. Structural improvements would also be performed on the Pier J breakwaters at the entrance to the Pier J slip to accommodate deepening of the slip and approach channel to -55 ft MLLW. These activities would be undertaken solely by the POLB.

As discussed below, the proposed Project is in conformance with the stated policies of the PMP and the CCA. The ASR and proposed staff recommendations have been prepared to evaluate the proposed Project for consistency with both the certified 1990 PMP, as amended, as well as the 2020 PMP update. In the consistency analysis discussed below, the proposed Project is demonstrated to be in conformance with the stated policies of both PMPs and the CCA. In addition, this document will be circulated for public review and will become effective upon certification by the Board of Harbor Commissioners. Section 6.3 contains the special conditions that would be imposed upon the proposed Project or any of the build alternatives.

## 1.2 Consistency with the California Coastal Act

Relevant sections of the CCA are listed below, with a brief discussion of each.

### *1.2.1 Chapter 3 (Coastal Resources Planning and Management Policies)*

As discussed below, Section 30715 of Chapter 8 of the CCA may result in an interpretation by the California Coastal Commission (CCC) that the proposed Project represents an appealable development. The policies of Chapter 3 constitute the standards by which the adequacy of local coastal programs and the permissibility of proposed developments subject to the provisions are determined. These policies relate to:

- Public Access (Article 2: Sections 30210 – 30214)
- Recreation (Article 3: Sections 30220 – 30224)
- Marine Environment (Article 4: Sections 30230 – 30236)
- Land Resources (Article 5: Sections 30240 – 30244)
- Development (Article 6: Sections 30250 – 30255)
- Industrial Development (Article 7: Section 30260 – 30265.5)

The proposed Project would not restrict public access or recreational opportunities. No new development or activities would occur that would affect access or recreation within the harbor. Marine resources, such as biological and water quality would be temporarily impacted during dredging. However, there are no environmentally sensitive habitat areas that would be impacted, and nominal impacts have been determined to be less than significant in the EIR. Improvements to the Pier J breakwaters would occur to reinforce the structure as a result of deeper dredging, and not result in new or expansion of uses or alteration of the natural shoreline. Commercial fishing and boating would not be affected as a result of the proposed Project. No agricultural or timberland areas are located within the project area that would be affected. No scenic resources are located within the vicinity of the project area, and existing visual conditions would be maintained without significantly impacting the project area. The proposed Project would not increase risks to life, property, or structural integrity, or otherwise result in adverse impacts other than air quality, which have been analyzed in the EIR. Mitigation in the form of an electric clam shell dredge will be incorporated to reduce air emissions. The proposed project does not propose any new industrial development. Therefore, for the reasons discussed above, the proposed Project would be consistent with Chapter 3 of the CCA.

### *1.2.2 Chapter 8 (Ports)*

In accordance with the CCA, the coastal zone includes all areas within 3 miles seaward and approximately 1,000 yards inland, depending on the level of existing inland development. Chapter 8 of the CCA recognizes California ports, including the POLB, as primary economic and coastal resources that are essential elements of the national maritime industry (Section 30701[a]). Relevant Chapter 8 sections of the CCA are listed below, and their relationship to the proposed Project is discussed.

#### *1.2.2.1 Section 30705*

(a) *Water areas may be diked, filled, or dredged when consistent with a certified Port master plan only for the following:*

*1. Such construction, deepening, widening, lengthening, or maintenance of ship channel approaches, ship channels, turning basins, berthing areas, and facilities that are required for the safety and the accommodation of commerce and vessels to be served by port facilities.*

The Port currently experiences navigational challenges, including existing channel depths that do not meet the draft requirements of the current and future fleet of larger container and liquid bulk vessels. Tide restrictions, light loading, lightering, and other operational inefficiencies result in economic inefficiencies that translate into increased costs for the national economy. Container movements along the secondary channels serving Pier J and Pier T/West Basin, as well as liquid bulk vessel movements along the main channel, have been identified as constrained by current conditions. The proposed Project would increase transportation efficiencies for container and liquid bulk vessels operating in the POLB for both the current and future fleet and improve conditions for vessel operations and safety by dredging several areas of the harbor and the approach channel. This change would continue efforts to improve navigational efficiency and vessel safety throughout the POLB.

Dredging would be planned, scheduled, and carried out to minimize disruptions to fish and bird breeding and migration, marine habitats, and water circulation. Bottom sediments or sediment elutriate would be analyzed for toxicants prior to dredging; where water quality standards are met, dredged spoils may be deposited in open coastal water sites designated to minimize potential adverse impacts on marine organisms or in confined coastal waters designated as fill sites, in accordance with regulatory permits and the master plan, where the spoil can be isolated and contained or in fill basins on upland sites. Dredged material would not be transported from coastal waters into estuarine or freshwater areas for disposal. Excavated materials would be hauled by barge and disposed of at permitted ocean disposal facilities or nearby borrow pits.

#### *1.2.2.2 Section 30708*

*All port-related developments shall be located, designed, and constructed so as to:*

*(a) Minimize substantial adverse environmental impacts.*

The proposed Project would reduce wait times within the harbor and reduce loading and unloading delays for deeper-drafting liquid bulk vessels. The proposed Project would incorporate several minimization measures to avoid or reduce impacts on water quality and biological resources. The proposed Project would result in significant impacts on air quality from emissions associated with dredging activities. Although several mitigation measures have been identified and incorporated that would reduce impacts, including the use of an electric dredge, impacts would remain significant and unavoidable.

*(c) Give highest priority to the use of existing land space within harbors for Port purposes.*

The proposed Project would not involve the use of existing land space. The proposed Project would improve existing navigation channels within the Port complex and would not require zone changes or changes to existing land uses. The dredging and deepening of harbor waters would allow the terminals to continue to operate efficiently for Port purposes related to national and regional goods movement, thereby promoting maritime commerce. Container movements along the secondary channels serving Pier J and Pier T/West Basin and liquid bulk vessel movements along the main channel would be improved, thereby reducing transportation costs and vessel congestion and increasing the Port's competitiveness. Removing channel and berth restrictions so as to increase the vessels' maximum practicable loading capacity, would result in fewer vessel trips to transport the forecast cargo, and the proposed Project would contribute to the efficient functioning of the Port. While the proposed Project could accommodate larger ships, larger ships alone do not drive growth for the harbor. Many factors may influence the growth of a particular harbor, and harbor depth is just one of many involved in determining growth and market share for a particular port. The economic analysis for the proposed Project was conducted with the historical cargo share at the POLB remaining the same in both the future without-project and future with-

project conditions. Cargo may vary in the future as investments are made in port facilities and supporting infrastructure, and long-term leases are renewed or changed at individual terminals; however, the POLB's share of cargo is expected to remain relatively consistent with growth in the future being attributed to GDP growth for the U.S. West Coast and associated hinterland based on the information provided in the commodity forecast conducted for the IFR study (Mercator 2016). Based on that evaluation, the analysis assumes that the POLB will receive a relatively similar share of regional cargo volumes with or without navigation improvements. Thus, since the proposed Project would not accommodate an increase in throughput, the efficiencies gained by the proposed Project would result in fewer, but larger, vessels within the harbor.

#### *1.2.2.3 Section 30715*

Section 30715 identifies the California Coastal Commission's permit authority and the process for appealable approvals, as follows:

*(a) Until such time as a port master plan or any portion thereof has been certified, the commission shall permit developments within ports as provided for in Chapter 7 (commencing with Section 30600). After a port master plan or any portion thereof has been certified, the permit authority of the commission provided in Chapter 7 (commencing with Section 30600) shall no longer be exercised by the commission over any new development contained in the certified plan or any portion thereof and shall at that time be delegated to the appropriate port governing body, except that approvals of any of the following categories of development by the port governing body may be appealed to the commission:*

*(1) Developments for the storage, transmission, and processing of liquefied natural gas and crude oil in such quantities as would have a significant impact upon the oil and gas supply of the state or nation or both the state and nation. A development which has a significant impact shall be defined in the master plans.*

*(2) Waste water treatment facilities, except for those facilities which process waste water discharged incidental to normal port activities or by vessels.*

*(3) Roads or highways which are not principally for internal circulation within the port boundaries.*

*(4) Office and residential buildings not principally devoted to the administration of activities within the port; hotels, motels, and shopping facilities not principally devoted to the sale of commercial goods utilized for water-oriented purposes; commercial fishing facilities; and recreational small craft marina related facilities.*

*(5) Oil refineries.*

*(6) Petrochemical production plants.*

*(b) If maintenance dredging is part of, or is associated with, any category of development specified in paragraphs (1) to (6), inclusive, of subdivision (a), the commission shall not consider that maintenance dredging in its review and approval of those categories.*

The proposed Project involves dredging to improve the navigation by liquid bulk vessels, which transport crude oil. The CCC may interpret Section (a)(1) to apply to the proposed project, in which case the project may be characterized as an appealable project under the CCA.

#### *1.2.2.4 Section 30233*

Any offshore disposal of dredged materials that is to occur outside of the Port would be subject to the standard of review for dredged material disposal in Section 30233 of the CCA. The relevant sections are presented below.

> *(a) The diking, filling, or dredging of open coastal waters, wetlands, estuaries, and lakes shall be permitted in accordance with other applicable provisions of this division, where there is no feasible less environmentally damaging alternative, and where feasible mitigation measures have been provided to minimize adverse environmental effects, and shall be limited to the following:*
>
> *2. Maintaining existing, or restoring previously dredged, depths in existing navigational channels, turning basins, vessel berthing and mooring areas, and boat launching ramps.*
>
> *6. Restoration purposes.*
>
> *7. Nature study, aquaculture, or similar resource dependent activities.*
>
> *(b) Dredging and spoils disposal shall be planned and carried out to avoid significant disruption to marine and wildlife habitats and water circulation. Dredged spoils suitable for beach replenishment should be transported for these purposes to appropriate beaches or into suitable longshore current systems.*

The proposed Project comprises feasible dredging and placement/disposal measures, in accordance with federal and state guidelines, including POLB environmental protection guidelines. Dredged material would be disposed of at a nearshore placement site (Surfside Borrow Site), an ocean-dredged material disposal site (LA-2 and/or LA-3), or a combination of the two. The nearshore placement site (Surfside Borrow Area) can accommodate about 2.5 million cubic yards (mcy) of dredged material. LA-2 and LA-3 have annual disposal volumes 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 the proposed Project annually. It is assumed that dredging would be performed using a hopper dredge as well as a clamshell dredge. To minimize transit time, the disposal of material from the hopper dredge would maximize use of the nearshore site, while a clamshell dredge would be evaluated for disposal at an ocean-dredged material disposal site. All disposal options have been previously analyzed and permitted.

## 1.3 Consistency with the Port Master Plans

As discussed above, this ASR has been prepared to evaluate the proposed Project for consistency with both the certified 1990 PMP, as amended, as well as the 2020 PMP update. Both are described below.

### *1.3.1 1990 PMP*

Under the 1990 PMP, the proposed Project site is within Harbor Planning District 4 (Terminal Island Planning District), District 5 (Middle Harbor Planning District), District 6 (Southwest Harbor Planning District), District 7 (Navigation Planning District), District 8 (Southeast Harbor Planning District), and District 10 (Outer Harbor Planning District). The proposed Project is consistent with (a) permitted Port-related industrial and navigation uses associated with the harbor planning districts and (b) overall goals stipulated in the PMP and the long-range planning goals for the Terminal Island, Middle Harbor, and Southwest Harbor Planning Districts to increase primary Port use, as well as the navigation goal, and the Outer Harbor Planning District's goal to help navigation.

#### *1.3.1.1 1990 PMP Goals and Objectives*

The 1990 PMP identifies six long-range planning goals and objectives for developing Port policies involving future Port development and expansion. Among the goals for Port development in Chapter IV of the PMP, the proposed Project would support the relevant goals summarized below.

*Goal 2: Encourage maximum use of facilities.*

The proposed Project would allow more efficient use of navigational channels and existing terminals within the Port. However, the proposed Project would not result in increased use or throughput of the terminal facilities because of existing backland constraints. Objectives under Goal 2 would be met by the proposed Project.

*Goal 4: Provide for the safe cargo handling and movement of vessels within the Port.*

The objectives of Goal 4 are to deepen channels and basins to accommodate supertanker and post-panamax vessels, and separation of ocean-going vessels and recreational small craft. The need for the project is to address transportation inefficiencies at the POLB, which occur when channels and maneuvering areas do not fully accommodate the vessels using them. Existing channel depths, and in some areas, channel widths, do not meet the draft requirements of the current and future fleet of larger container and liquid bulk vessels that call on POLB. Tide restrictions, light loading, lightering, and other operational inefficiencies result in vessel congestion, increased wait times, and delays in loading and unloading. The increased channel depths would allow for shippers to replace smaller, less efficient vessels with larger, more efficient vessels that are not subject to these restrictions. Thus, the proposed Project would reduce vessel congestion, and the number of vessels calling at the Port, thereby improving safety and allowing for better separation between ocean-going vessels and recreational small craft. The proposed Project would be consistent with Goal 4 by improving the movement of vessels within the Port.

*Goal 5: Develop land for primary Port facilities and Port-related uses.*

Although the proposed Project would not involve land development, the dredging and deepening of harbor waters would allow the terminals to continue to operate efficiently for Port purposes related to national and regional goods movement, thereby promoting maritime commerce. Container movements along the secondary channels serving Pier J and Pier T/West Basin and liquid bulk vessel movements along the main channel would be improved, thereby reducing transportation costs and vessel congestion and increasing the Port's competitiveness. By recognizing the importance of removing channel and berth restrictions so as to increase the vessels' maximum practicable loading capacity, accommodating larger vessels, and resulting in fewer vessel trips to transport the forecast cargo, the proposed Project would contribute to the efficient functioning of the Port and would use the site in accordance with its highest priority. Objectives under Goal 5 would be met by the proposed Project.

#### *1.3.1.2 1990 PMP Elements*

In addition to the long-range planning goals addressed above, the 1990 PMP also identifies plan elements that focus on specific areas where a Port-wide review is pertinent compared to individual district plans. Plan elements identified in the PMP are listed below.

A. Public Access, Visual Quality, and Recreation/Tourism

B. Navigation

C. Environmental

D. Vehicular Transportation/Circulation

E. Intermodal Rail Facilities

F. Oil Production and Operations

For each of these plan elements, the PMP identifies planning goals, issues or areas of controversy, and recommendations for implementation, including a course of action for correcting, alleviating, and/or necessitating further study of the issue (POLB 1990). Of these, Elements B and C are applicable to the proposed Project, as discussed below.

*1.3.1.2.1 Element B: Navigation Element*

In addition to the general planning goals identified in the PMP, the Navigation Element details the need for developing and supporting a world fleet, including liquid bulk, dry bulk, and post-Panamax container vessels; maintaining navigational capabilities within the harbor district; and minimizing vessel congestion.

The proposed Project would support the following Navigation Element goals:

*Goal 1: Remain current to the changing needs of the maritime industry with respect to deep water access to commercial berths and anchorage areas by deepening channels to accommodate the existing and future tanker, dry bulk, and general cargo fleet.*

*Goal 3: Continue to facilitate access to anchorage areas within and adjacent to the harbor.*

*Goal 4: Minimize vessel congestion possibilities by properly coordinating and arranging ancillary Port uses (i.e., sport fishing; marine contracting, etc.) to complement primary Port activities.*

The proposed Project would help the Port attain these goals by allowing for a more efficient future fleet mix, reducing vessel congestion, increasing the reliability of the channel depth to encourage more efficient vessels, and removing channel restrictions to increase the vessels' maximum practicable loading capacity to transport forecast cargo. The proposed Project would help the Port attain these goals by improving the existing navigation channels within the POLB, which, in turn, would allow greater efficiency of current and future container and liquid bulk vessel operations. The proposed Project would be implemented in accordance with the Navigation Element and consistent with the PMP.

*1.3.1.2.2 Element C: Environmental Element*

The Environmental Element details the Port's environmental objective to protect, maintain, enhance, and restore the overall quality of both the human-made and the natural coastal environment. The Environmental Element encompasses the need for careful planning for Port development and implementation of environmental regulatory compliance. The issues of concern for this element are as follows: air quality, habitat preservation/marine mitigation, hazardous waste, and permit processing.

Of the five goals identified in the Environmental Element, the proposed Project would support the following:

*Goal 1: Minimize pollutant levels from existing and future sources.*

The proposed Project would minimize pollutant levels by mitigating air emissions from dredging activities. In addition, a reduction in vessel congestion through the channel would help minimize pollutant levels from existing and future resources. With implementation of the proposed Project's features and improvements, existing channel congestion would be reduced along with its associated pollutants.

*Goal 2: Minimize habitat loss within Port boundaries.*

Although the proposed Project could result in some impacts on benthic habitat in regards to turbidity and water quality, impacts would be localized and temporary. Water quality monitoring would be performed in accordance with regulatory permits during dredging activities. Therefore, the proposed Project would be implemented in accordance with the Environmental Element and consistent with the PMP.

#### *1.3.1.3 1990 PMP District Goals*

The proposed Project area is large and covers several planning districts within the Port. The proposed improvements at Pier T/West Basin would occur primarily in District 4, Terminal Island Planning District, which is designated for primary Port facilities, Port-related industries and facilities, ancillary Port facilities, federal uses, utilities, hazardous cargo facilities, navigation, and oil and gas production. The proposed main channel bend-easing improvements would occur within District 5, Middle Harbor Planning District, which is designated for primary Port facilities, Port-related, oil production, and ancillary Port facilities, and District 7, Navigation Planning District, which is designated for navigation uses. Deepening of the channel to Pier J would occur in District 8, Southeast Harbor Planning District. The proposed improvements at the Pier J approach would be located in District 10, Outer Harbor Planning District, which is designated for navigation and maneuvering.

The proposed Project's consistency with each of these planning districts from the 1990 PMP is described below.

##### *1.3.1.3.1 District 4 – Terminal Island Planning District*

*Goal 1: Acquire excess Navy property as it becomes available.*

*Goal 2: Redevelop excess Navy property for development of Port facilities.*

###### ***1.3.1.3.1.1 Permitted Uses***

Permitted uses for the Terminal Island Planning District include the following: primary Port facilities, Port-related industries and facilities, ancillary Port facilities, hazardous cargo facilities, navigation, and oil and gas production.

The proposed Project would improve the Port's ability to support Port-related uses and therefore would be consistent with the permitted uses within the Terminal Island Planning District.

##### *1.3.1.3.2 District 5 – Middle Harbor*

*Goal 1: Expand primary Port facilities.*

*Goal 2: Consolidate and abandon oil wells whenever possible.*

###### ***1.3.1.3.2.1 Permitted Uses***

This district's permitted uses are primary Port facilities, Port-related, oil production, and ancillary Port facilities. The proposed channel bend easing would benefit the primary and ancillary Port uses within District 5.

##### *1.3.1.3.3 District 7 – Navigation Area*

*Goal 1: Maintain and improve access for vessels entering and leaving the Port.*

#### *1.3.1.3.3.1 Permitted Uses*

The permitted use for the Navigation Planning District is navigation.

The proposed Project would provide deepening and bend-easing improvements to the main channel, which would be consistent with the permitted uses within the Navigation Planning District.

*1.3.1.3.4 District 8 – Southeast Harbor Planning District*

The PMP identifies one goal for this district:

*Goal 1: Modernize and maximize use of existing and future facilities.*

The proposed Project would be consistent with the goals of District 8 because the primary components of the proposed Project would dredge Port facilities to accommodate deep-draft berthing, support a more efficient future fleet mix, and reduce vessel congestion.

#### *1.3.1.3.4.1 Permitted Uses*

The permitted uses for the Southeast Harbor Planning District include the following: primary Port facilities, Port-related operations, oil production, and ancillary Port facilities.

The proposed Project would be consistent with the designated uses of this district because would support primary Port facilities and include improvements to Port-related operations by bend-easing the channel.

*1.3.1.3.5 District 10 – Outer Harbor*

The PMP identifies one goal for this district:

*Goal 1: Maintain and improve vessel access and manageability.*

The proposed Project would be consistent with Goal 1 of District 10 because it would modernize Port facilities to maximize uses and cargo support.

#### *1.3.1.3.5.1 Permitted Uses*

The permitted uses for the Southeast Harbor Planning District include the following: navigation and maneuvering.

The proposed Project would be consistent with the designated uses of District 10 because it would provide improvements to the Pier J approach channel, which would be consistent with navigation and maneuvering uses.

### *1.3.2 2020 PMP Update*

Under the PMP update (certification anticipated 2020), the proposed Project site is within Harbor Planning District 4 (West Basin) and District 5 (Southeast).

The proposed Project would be consistent with (a) permitted primary Port facilities use, maritime support facilities use, navigable corridor use, and maneuvering and berthing use associated with these harbor planning districts and (b) overall goals stipulated in the 2020 PMP update.

#### *1.3.2.1 2020 PMP Goals and Objectives*

The 2020 PMP update identifies four long-range planning goals and corresponding objectives for Port development that are designed to maintain flexibility, respond to Port tenant needs, and allow the Port

to respond effectively to requirements dictated by national and international economic trends. Among the proposed goals for Port development in the 2020 PMP update, the proposed Project would support the following:

*Goal 1: Accommodate Forecasted Demand for Diverse Cargoes*

The proposed Project would reduce vessel congestion, increase the opportunity for a more efficient fleet mix, and reduce loading and unloading delays for deeper drafting liquid bulk vessels, providing more efficient operations on existing terminals to accommodate existing and forecasted demand. Objectives under Goal 1 would be met by the proposed Project.

*Goal 2: Develop Modern Terminal Facilities with Efficient Operations*

The proposed Project would not directly develop terminal facilities but would be designed to support ongoing and future operations within the harbor and at terminal facilities for current and future container vessels and deeper drafting liquid bulk vessels. Objectives under Goal 2 would be met by the proposed Project.

*Goal 3: Integrate Green Port Policy and Land Use Planning*

The proposed Project would help the Port attain Goal 3 by increasing the reliability of the channel depth, which would encourage shippers to replace smaller, less efficient vessels with larger, more efficient vessels, which would reduce the number of smaller ships in the channel and result in fewer environmental impacts on the channel. Existing channel depths, and in some areas, channel widths, do not meet the draft requirements of the current and future fleet of larger container and liquid bulk vessels that call on POLB. Tide restrictions, light loading, lightering, and other operational inefficiencies result in vessel congestion, increased wait times, and delays in loading and unloading. The increased channel depths would allow for shippers to replace smaller, less efficient vessels with larger, more efficient vessels that are not subject to these restrictions. In addition, the proposed Project would minimize pollutant levels by mitigating air emissions from dredging activities through the use of electric dredging equipment. Therefore, the proposed Project would be implemented in accordance with Goal 3 and consistent with the PMP.

#### *1.3.2.2 2020 PMP Update District Elements*

In addition to the long-range planning goals addressed above, the 2020 PMP update also includes Plan elements, which provide the policy framework for future POLB development and Port-wide guidance on major operational/functional areas and policy areas. The PMP update includes eight plan elements:

1. Public Access and Recreation
2. Environment and Sustainability
3. Climate Change Adaptation
4. Transportation and Circulation
5. Navigation
6. Terminal Operations
7. Intermodal Rail
8. Oil Operations

Each of these plan elements consists of planning goals and issues and recommended actions. Of these elements, Element 2, Environment and Sustainability; Element 5, Navigation; and Element 6, Terminal Operations, are relevant to the proposed Project, as discussed below.

*1.3.2.2.1 Element 2: Environment and Sustainability Element*

The Environment and Sustainability Element embodies the Port's ongoing efforts to preserve and enhance the environment through innovative goods movement, natural resources stewardship, and sustainable Port operations and policy. The Environment and Sustainability Element is complementary to the Green Port Policy, which was adopted by the Board of Harbor Commissioners in January 2005.

Of the six goals identified for the Environment and Sustainability Element, the proposed Project would support the following planning goal:

*Goal 1: Reduce environmental and health impacts from Port operations.*

The proposed Project would help the Port attain this element goal by increasing the reliability of the channel depth, which would encourage shippers to replace smaller, less efficient vessels with larger, more efficient vessels, which would reduce the number of smaller ships in the channel and result in fewer environmental impacts on the channel. In addition, the proposed Project would minimize pollutant levels by mitigating air emissions from dredging activities through the use of electric dredging equipment.

*1.3.2.2.2 Element 5: Navigation Element*

The Navigation Element details the need for accommodation of diverse fleets, including liquid bulk, dry bulk, and post-Panamax container vessels within the harbor district. The Navigation Element also includes the need for proper sediment management and navigational safety within the harbor district.

The proposed Project would support the following planning goals under the Navigation Element:

*Goal 1: Provide deep-water access to commercial berths and anchorage areas to accommodate existing and future vessels.*

*Goal 2: Enhance navigation capabilities for vessel safety while transiting or maneuvering within the harbor.*

*Goal 3: Improve access to anchorage areas within and adjacent to the harbor's main channel.*

The proposed Project would help the Port attain these goals by allowing for a more efficient future fleet mix, reducing vessel congestion, increasing the reliability of channel depths to encourage more efficient vessels, and improving the existing navigation channels within the POLB, which, in turn, would allow greater efficiency of current and future container and liquid bulk vessel operations.

*1.3.2.2.3 Element 6: Terminal Operations Element*

The Terminal Operations Element is a new plan element that details the Port's need to accommodate forecast demand for containerized and non-containerized cargo as well as updates to terminal operational elements to accommodate changes in vessel sizes, increases in terminal capacities, the intermodal supply chain, and advances in technology. The proposed Project would support the following planning goals under the Terminal Operations Element:

*Goal 1: Enhance the capacities of container terminals to accommodate future demand.*

*Goal 2: Promote cargo diversity.*

*Goal 3: Streamline the movement of cargo within the Port complex.*

*Goal 4: Modernize container terminals to improve operational efficiency.*

*Goal 5: Transition to cleaner operations consistent with the Clean Air Action Plan.*

Although the proposed Project would not directly develop terminal facilities, it would help the Port attain these goals with the proposed Project's improvements at Pier T/West Basin, improving conditions and transportation efficiencies for container and liquid bulk vessels, and removing channel restrictions to increase vessels' maximum loading capacity for transporting the forecast cargo of the present and future.

The proposed Project would be implemented in accordance with all plan elements and consistent with the PMP, as summarized above.

#### *1.3.2.3 2020 PMP Update District Goals*

The proposed Project is within Districts 4 (West Basin), 5 (Southeast), and 6 (Anchorage and Open Water). The 2020 PMP update identifies goals and permitted uses for each planning district. The goals and permitted uses relevant to the proposed Project are described below.

##### *1.3.2.3.1 District 4 – West Basin*

*Goal 1: Accommodate container cargo forecast associated with international container market demands.*

*Goal 5: Provide safe navigation for bigger liquid bulk vessels to Pier T.*

The proposed Project would be consistent with Goals 1 and 5. The project would deepen channels, maneuvering areas, and berths to accommodate the current and future fleet of larger container and liquid bulk vessels that call on POLB. The project would also alleviate restrictions on vessel calls and maneuvers that are currently constrained by tidal fluctuations, light loading, lightering, and other operational inefficiencies result in vessel congestion, increased wait times, and delays in loading and unloading. Furthermore, the project includes bend-easing portions of the Main Channel (bend easing) to a depth of -76 ft MLLW to improve navigation of larger liquid build vessels calling at Pier T. These improvements would be consistent with Goals 1 and 5 in District 4.

###### ***1.3.2.3.1.1 Permitted Land and Water Uses***

The permitted uses for the West Basin Planning District include the following: primary Port facilities and Port-related facilities, hazardous cargo facilities, maritime support facilities, institutional facilities, oil and gas production, renewable energy resources, environmental protection, utilities, navigable corridor, maneuvering and berthing, and sediment management areas.

The proposed Project would improve maneuvering and berthing in the channels and support primary Port facilities. The proposed Project would therefore be consistent with permitted land and water uses for the West Basin Planning District.

##### *1.3.2.3.2 District 5 – Southeast*

*Goal 1: Accommodate container cargo forecast associated with international container market demands.*

*Goal 5: Provide safe navigation for larger ships in the Main Channel, turning basins, and berths and while maneuvering.*

The project would deepen channels, maneuvering areas, and berths to accommodate the current and future fleet of larger container and liquid bulk vessels that call on POLB. The project would also alleviate

restrictions on vessel calls and maneuvers that are currently constrained by tidal fluctuations, light loading, lightering, and other operational inefficiencies result in vessel congestion, increased wait times, and delays in loading and unloading. Furthermore, the project includes bend-easing portions of the Main Channel (bend easing) to a depth of -76 ft MLLW to improve navigation of larger liquid build vessels calling at Pier T. These improvements would be consistent with Goals 1 and 5 in District 5.

#### *1.3.2.3.2.1 Permitted Land and Water Uses*

The permitted uses for the Southeast Planning District include the following: primary Port facilities and Port-related facilities, maritime support facilities, oil and gas production, hazardous cargo facilities, institutional facilities, environmental protection, navigable corridor, maneuvering and berthing, and sediment management areas.

The proposed Project would improve the navigable corridor and maneuvering and berthing in the channels and support primary Port facilities. The proposed Project would therefore be consistent with permitted land and water uses for District 5.

## 1.4 Special Conditions

In some instances where the proposed Project presents no significant impact and no mitigation is required, there may be additional "Special Conditions" imposed on the Project by the Port that would further lessen a "no significant impact" finding to a level below a significance threshold or potentially eliminate an impact. These Special Conditions would be implemented as required in the Harbor Development Permit, proposed Project specifications, or other applicable documents governing site use and or facility operations. Special Conditions are consistent with the Green Port Policy, Clean Air Action Plan, and the Water Resources Action Plan.

The following describes the Special Conditions that would be incorporated as part of the proposed Project. The various means used to implement the Special Conditions, as well as their timing, are also provided.

### *1.4.1 Water Resource Protection*

**Special Condition:** The Permittee shall complete the provided stormwater BMP checklist for small construction projects (under 1 acre in total disturbed area) and implement those best management practices (BMPs) as identified in the checklist. A copy of the completed stormwater BMP checklist shall be submitted to the Director of Environmental Planning fourteen (14) days prior to the start of construction activities for approval. Upon approval of the stormwater BMP checklist, the Permittee shall be responsible for installing, constructing and implementing all control measure requirements described in the stormwater BMP checklist and other stormwater BMPs that may be appropriate during construction. The Permittee shall perform visual observations to verify that all control measures are implemented and performing properly. If control measures being implemented by the Permittee are inadequate to control water pollution effectively, the Port may require the Permittee to revise the operations and amend the stormwater BMP checklist. The Port's review and approval of the Permittee's stormwater BMP checklist shall not waive any contractual requirements and shall not relieve the Permittee from achieving and maintaining compliance with all Federal, State, and local laws, ordinances, statutes, rules and regulations. All records shall remain on site and readily accessible for review by the Port and any responsible agencies.

In the event that the proposed project scope changes and the landside disturbed area is greater than 1 acre, the Permittee shall work with the Port to obtain coverage under the Los Angeles Regional Water Quality Control Board's General Permit for Storm Water Discharges Associated with Construction and Land Disturbing Activities (CAS000002). A copy of the Notice of Intent (NOI) and Storm Water Pollution

Prevention Plan (SWPPP) shall be provided to the Director of Environmental Planning prior to the start of construction.

### *1.4.2 Transportation*

**Special Condition. Transportation Management Plan (TMP).** The Permittee shall coordinate with the POLB Traffic Engineering Bureau during the development of the Project to determine if a TMP is warranted, and if yes, what it needs to address. Permittee shall coordinate with adjacent construction projects at the time, if any, to ensure proper traffic circulation in the area is maintained. If a TMP is warranted during any phase of the project, the Permittee shall submit a Transportation Management Plan to POLB Traffic Engineering for review and approval.

### *1.4.3 Cultural Resources*

**Special Condition. Discovery of Archaeological Materials or Human Remains.** In the unlikely event that any archaeological material is discovered during construction, construction activities are to be halted, archeological experts are to be notified, and the USACE/Port will complete an evaluation of the significance of those resources and will determine the appropriate resolution of any potential adverse effects.

Permittee shall immediately notify the Director of Environmental Planning of any discoveries.

### *1.4.4 Air Quality*

**Special Condition. Community Grants Program (CGP).** In 2016, the Port adopted a Community Grants Program (CGP) following a public hearing process. The CGP contains mitigation measures for environmental impacts as policies and requirements within the program. As applied to projects within the Harbor District, projects must mitigate environmental impacts to the extent feasible, and when impacts remain, compliance with the CGP can be a condition of project approval such that the project must provide funding to future projects that apply to the CGP for such grant awards. The Port will participate and fund the CGP, as determined by the methodology described below. The timing of the payment will be made by the later of the following two dates: (a) the date that the Port issues a Notice to Proceed (NTP) or otherwise authorizes commencement of construction; or (b) the date that the Final EIS/EIR is conclusively determined to be valid, either by operation of PRC Section 21167.2 or by final judgment or final adjudication.

Contribution to the CGP was considered for pollutants that would exceed the SCAQMD peak day significance thresholds, following mitigation. Emissions greater than the threshold were multiplied by the cost per ton of emissions, per SCAQMD Rule 301, July 1, 2019. Table III. The CGP funding contribution for the proposed Project is expected to be $146,753. The plan is, in short, a firm commitment to future mitigation of significant impacts. The Port ensures compliance with the CGP.

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

## APPENDIX M: TRAFFIC

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

October 2019

US Army Corps of Engineers ®

Port of LONG BEACH
The Green Port

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FEHR PEERS

# Traffic Technical Memorandum

Date: September 25, 2019

To: Chad Beckstrom, ICF

From: Ribeka Toda and Netai Basu, Fehr & Peers

**Subject: Traffic Impact Analysis for Deep Draft Navigation Study and Deepening Project**

*LA19-3125*

Fehr & Peers conducted a traffic impact analysis for the proposed Deep Draft Navigation Feasibility Study and Deepening project. The study presents estimates of trip generation over the course of the entire project and available data on existing and future intersection operations along key access routes to the various sites where construction would occur. Based on the analysis, this memo summarizes conclusions regarding the significance of the temporary project-related traffic impacts.

## Project Description

The Port of Long Beach (POLB, the applicant) proposes to widen and deepen existing navigation channels to better accommodate container and liquid bulk vessels. The project is comprised of several components that would be conducted over a period of approximately five years from 2024 to 2029.

- Dredging would occur at five locations throughout the harbor as shown in Figure 1, including in the West Basin, the Pier J Turning Basin and approach; a new Standby Area adjacent to the Main Channel; along the Main Channel; and along the Approach Channel through Queen's Gate. Up to approximately 8.3 million cubic yards of material would be dredged and transported by barge to an approved offshore location.
- To power the dredging equipment, the POLB proposes to build an electric substation in the southeast area of Pier J.
- Underwater bulkheads would be constructed, and other structural modifications made to portions of the existing wharves on Pier J and Pier T to improve their strength near areas proposed for dredging.

The following phases or activities are required for the proposed project:

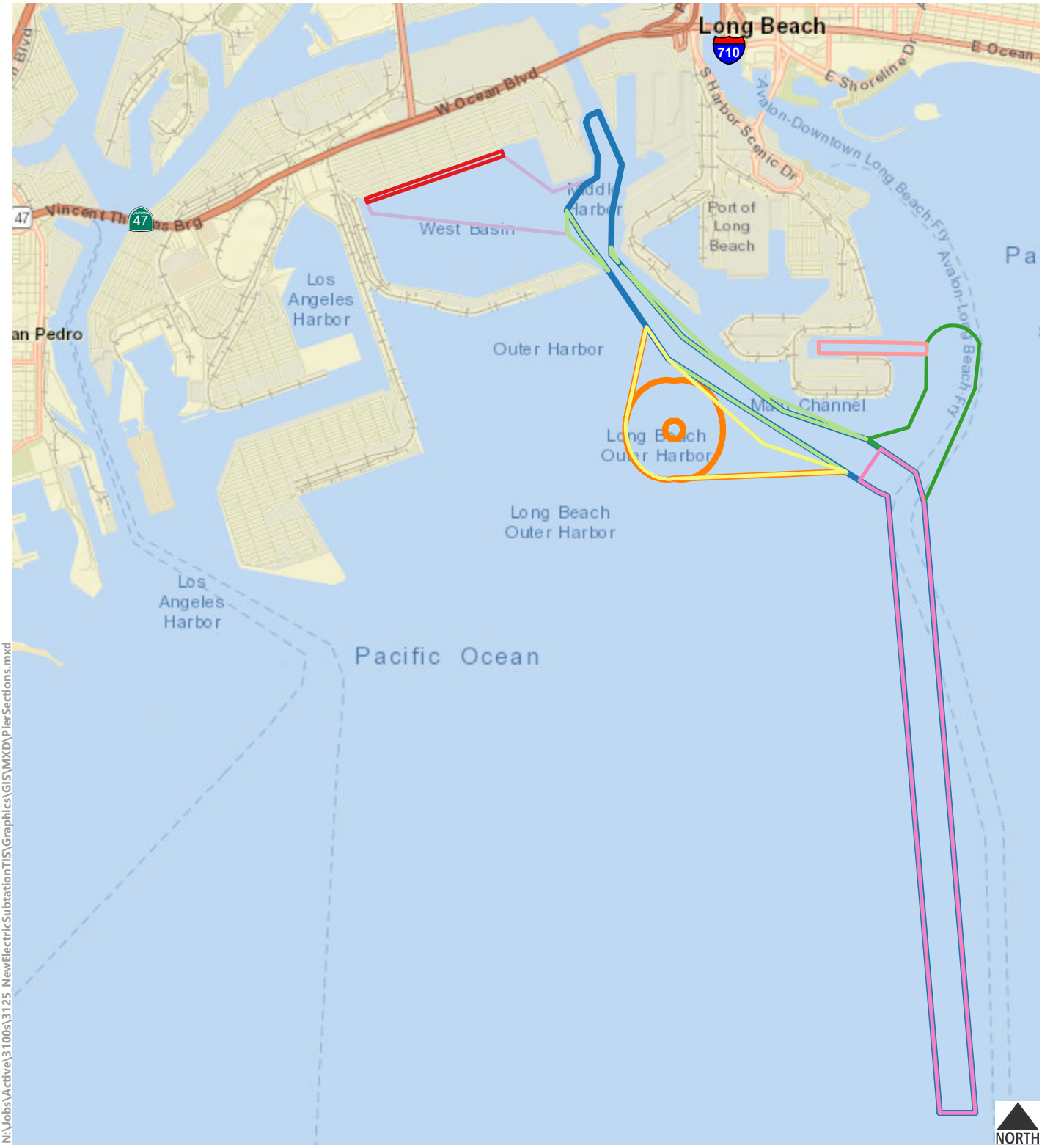
1. Landside Work: Construction of new electric substation (10/1/24 to 12/31/24)
2. Landside Work: Construction of finger dike at Pier J (1/1/24 to 3/2/24)
3. Landside Work: Upgrade of Pier J Wharf (1/1/24 to 6/24/24)
4. Landside Work: Upgrade of Pier T Wharf (1/1/24 to 11/16/24)
5. In-Water Work: Dredging of approach channel (1/1/25 to 2/4/26)
6. In-Water Work: Dredging of main channel for deepening and widening (1/1/26 to 6/28/26)
7. In-Water Work: Dredging of West Basin, part one (6/29/26 to 12/9/26)
8. In-Water Work: Dredging of West Basin, part two (1/1/27 to 3/28/27)
9. In-Water Work: Dredging of Pier T berths (3/29/27 to 4/5/27)
10. In-Water Work: Dredging of Pier J Basin (4/6/27 to 6/13/27)
11. In-Water Work: Dredging of Pier J approach, part one, (6/14/27 to 12/9/27)
12. In-Water Work: Dredging of Pier J approach, part two, (1/1/28 to 12/6/28)
13. In-Water Work: Dredging of Pier J approach, part three (1/1/29 to 2/20/29)

## Trip Generation Estimates

Information on the project schedule, number of workers, equipment, and number of truck trips required for different activities during construction of the project was obtained from ICF and Port staff. Maximum daily project trips were estimated for each activity or phase and then put into a table to identify the changes in daily trip-making over the course of the project. The following assumptions were considered in the estimation of total daily and peak hour project trips:

- Number of daily workers during different phases of the project were estimated by the applicant. To be conservative, the peak number of daily workers within each month is assumed for every day of that month.

- Work on the landside construction at Pier T and Pier J will be done in one 8-hour to 10-hour shift, which may include Saturdays. Access routes were identified for each location.




Approach Channel
Main Channel
Main Channel Widening
Pier J Approach Channel
Pier J Basin
Pier T Berths
Standby Area
Turning Basin
West Basin

Figure 1

Areas within the Port Under Study

- There are three potential launch sites for the workers on barges for the dredging activity: Pier S, Pier T, and a site near Pier D Street & Pico Avenue. Dredging activity will be a 24-hour operation, including weekends, with three 8-hour to 10-hour shifts. Access routes were identified for each option.

- Vehicular trip generation closely relates to the number of employee trips to and from the project site. Because the project site is not served by public transit, all employees were assumed to travel by private automobile. Consistent with Port practices and to provide a conservative analysis, it was assumed that no carpooling would occur. All workers were assumed to arrive at the project site during weekday morning peak hour and depart the project site during the afternoon peak hour. Trips by dredging workers at the beginning and end of their shifts were assumed to potentially occur during any of the three analyzed peak hours.

- One quarter of the workers on the land-side elements of the project were assumed to travel off-site during a lunch break.

- Trucks delivering material for the construction of the electric substation were assumed to make up to 4 round trips a day, with one trip occurring in the morning peak hour, one occurring in the midday peak hour, one trip occurring in the afternoon peak hour, and one trip during an off-peak period.

- A passenger car equivalent (PCE) factor of 2.0 is assumed for heavy duty trucks.

- Estimated daily trips are rounded to nearest even number.

Table 1 shows the estimated number of workers needed each month by activity/phase and the periods when simultaneous construction activities would occur. Truck trips are also included in the resulting total daily trips by activity/phase. The month representing peak traffic activity associated with the construction and demolition phase was selected for detailed traffic impact analysis. As shown in Table 1, the total daily trips range from a low of 54 to a high of 240. The highest number of daily trips is expected to occur in February 2024 (162 daily trips) and the first two months of year 2026 (240 daily trips).

The morning, midday, and afternoon peak hours, for traffic impact analysis purposes, are defined as occurring between 7:00 and 8:00 AM, 2:00 PM and 3:00 PM, and 4:00 and 5:00 PM, respectively. As shown in Table 1, the project would generate a maximum of approximately 240 daily trips during the first and second month of 2026, during which there is planned dredging over three shifts at the approach channel with the hopper dredger and the main channel widening with the clam shell dredge. Because it is not known when shift changes would occur, these estimates

assume that they could coincide with the peak hours of traffic within the Port. Of the 240 daily trips, 80 trips would occur in the AM peak hour, 80 trips would occur in the midday peak hour, and 80 trips would occur in the PM peak hour. The 80 trips during each peak hour includes 40 inbound trips and 40 outbound trips. The peak hour trips are estimated based on assumptions set forth above.

## Project Site Access

The substation construction and wharf improvements will be located on Pier J and Pier T. For dredging activity, workers will travel by water taxi from one of three potential launch sites: Pier T, and Pier S or a location near Pier D Street & Pico Avenue. Primary access routes connecting the regional freeway system with each landside work site and each launch site under consideration were identified and are shown in Figures 2A through 2E. The main access routes are via Ocean Boulevard, the Long Beach Freeway (I-710), the Harbor Freeway (I-110), and the Terminal Island Freeway (SR-47/SR-103). These access routes would be for both truck access and for workers commuting to the project site.

## Table 1: Schedule of Daily Workers and Trips

| Activity | Location | 2024 | | | | | | | | | | | | 2025 | | | | | | | | | | | | 2026 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 1. Electrical Substation Construction at Pier J | Pier J | | | | | | | | | | 15 | 15 | 15 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. Finger Dike Construction | Pier J | 25 | 25 | 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. Pier J Wharf Upgrade | Pier J | 15 | 25 | 25 | 25 | 25 | 25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. Pier T Wharf Upgrade | Pier T | 15 | 15 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. Approach Channel (hopper dredge 5,447,000 CY) | In water | | | | | | | | | | | | | 66 | 66 | 66 | 66 | 66 | 66 | 66 | 66 | 66 | 66 | 66 | 66 | 66 | 66 | | | | | | | | | | |
| 6. Main Channel Widening (clam shell dredge 1,065,000 CY) | In water | | | | | | | | | | | | | | | | | | | | | | | | | 54 | 54 | 54 | 54 | 54 | 54 | | | | | | |
| 7. West Basin (clam shell dredge 975,000 CY) | In water | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 54 | 54 | 54 | 54 | 54 | 54 |
| **Total Workers** | | **55** | **65** | **57** | **50** | **50** | **50** | **25** | **25** | **25** | **40** | **40** | **15** | **66** | **66** | **66** | **66** | **66** | **66** | **66** | **66** | **66** | **66** | **66** | **66** | **120** | **120** | **54** | **54** | **54** | **54** | **54** | **54** | **54** | **54** | **54** | **54** |
| **Total Trips** | | **138** | **162** | **142** | **126** | **126** | **126** | **62** | **62** | **62** | **116** | **116** | **54** | **132** | **132** | **132** | **132** | **132** | **132** | **132** | **132** | **132** | **132** | **132** | **132** | **240*** | **240*** | **108** | **108** | **108** | **108** | **108** | **108** | **108** | **108** | **108** | **108** |

| Activity | Location | 2027 | | | | | | | | | | | | 2028 | | | | | | | | | | | | 2029 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |
| 8. West Basin (Clam shell dredge 513,000 CY) | In water | 54 | 54 | 54 | | | | | | | | | | | | | | | | | | | | | | | |
| 9. Pier T Berths (clam shell dredge Berths T132 to T140, 44,000 CY) | In water | | | | 54 | | | | | | | | | | | | | | | | | | | | | | |
| 10. Pier J Basin (clam shell dredge 408,000 CY) | In water | | | | | 54 | 54 | | | | | | | | | | | | | | | | | | | | |
| 11. Pier J Approach (clam shell dredge 1,066,00 CY) | In water | | | | | | | 54 | 54 | 54 | 54 | 54 | 54 | | | | | | | | | | | | | | |
| 12. Pier J Approach (clam shell dredge 2,040,000 CY) | In water | | | | | | | | | | | | | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | | |
| 13. Pier J Approach (clam shell dredge 297,000 CY) | In water | | | | | | | | | | | | | | | | | | | | | | | | | 54 | 54 |
| **Total Workers** | | **54** | **54** | **54** | **54** | **54** | **54** | **54** | **54** | **54** | **54** | **54** | **54** | **54** | **54** | **54** | **54** | **54** | **54** | **54** | **54** | **54** | **54** | **54** | **54** | **54** | **54** |
| **Total Trips** | | **108** | **108** | **108** | **108** | **108** | **108** | **108** | **108** | **108** | **108** | **108** | **108** | **108** | **108** | **108** | **108** | **108** | **108** | **108** | **108** | **108** | **108** | **108** | **108** | **108** | **108** |

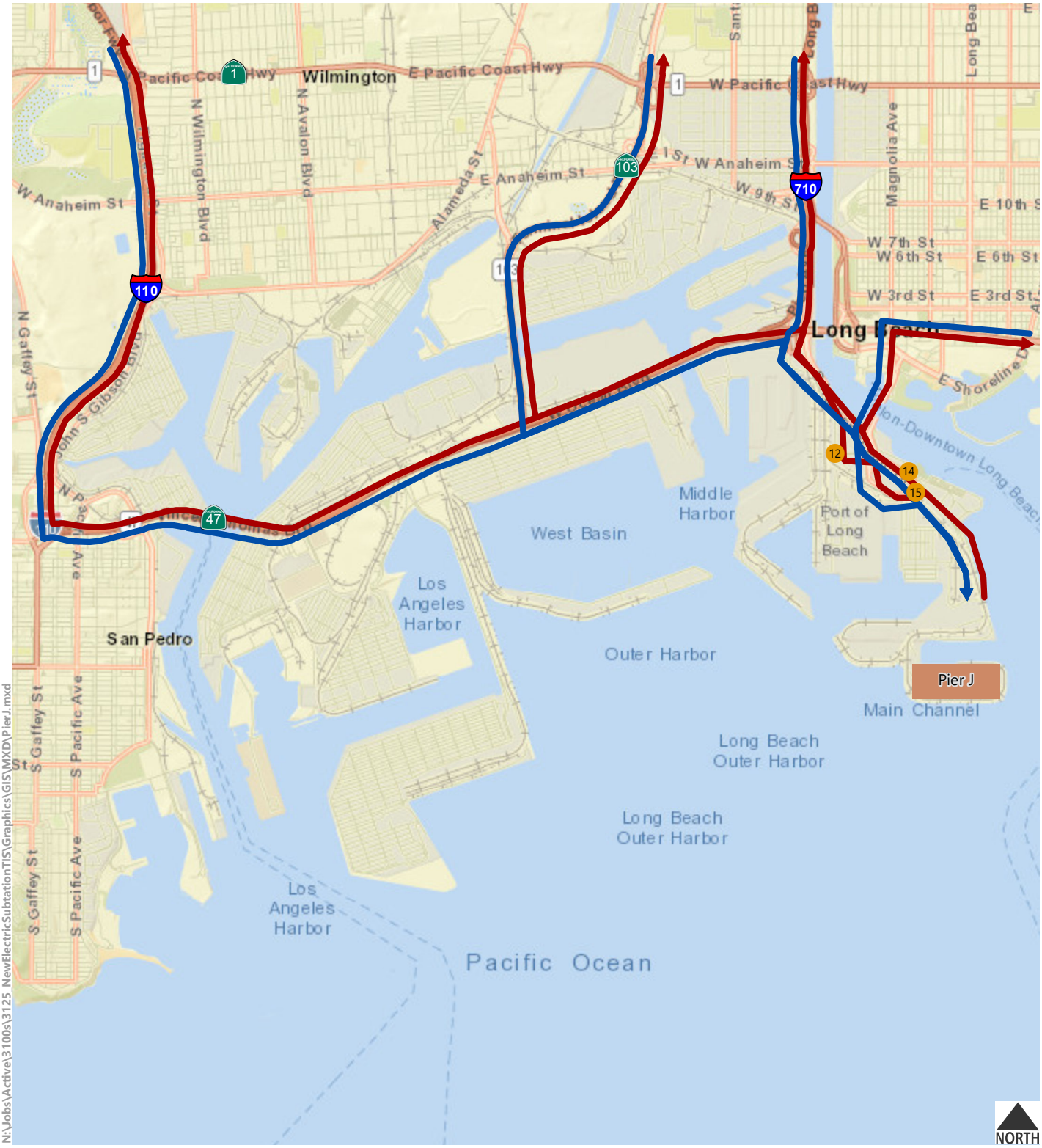
Notes:

The total trips for the electrical substation construction phase includes the trips associated with one truck making 4 round trips a day, with a passenger car equivalent (PCE) of 2.

The dredging work is consecutive and the activities do not overlap, other than in early 2026. The schedule calendar has been simplified to show this.

For example, the dredging of the Pier T Berths is projected to end on April 5th and is projected to to start at the Pier J Basin on April 6th. The calendar has been simplified to show that only one activity - Pier T Berths - occurs in April 2027, to avoid double-counting activities that are consecutive, and not overlapping.

*The maximum number of daily trips, 240, was used for the analysis.

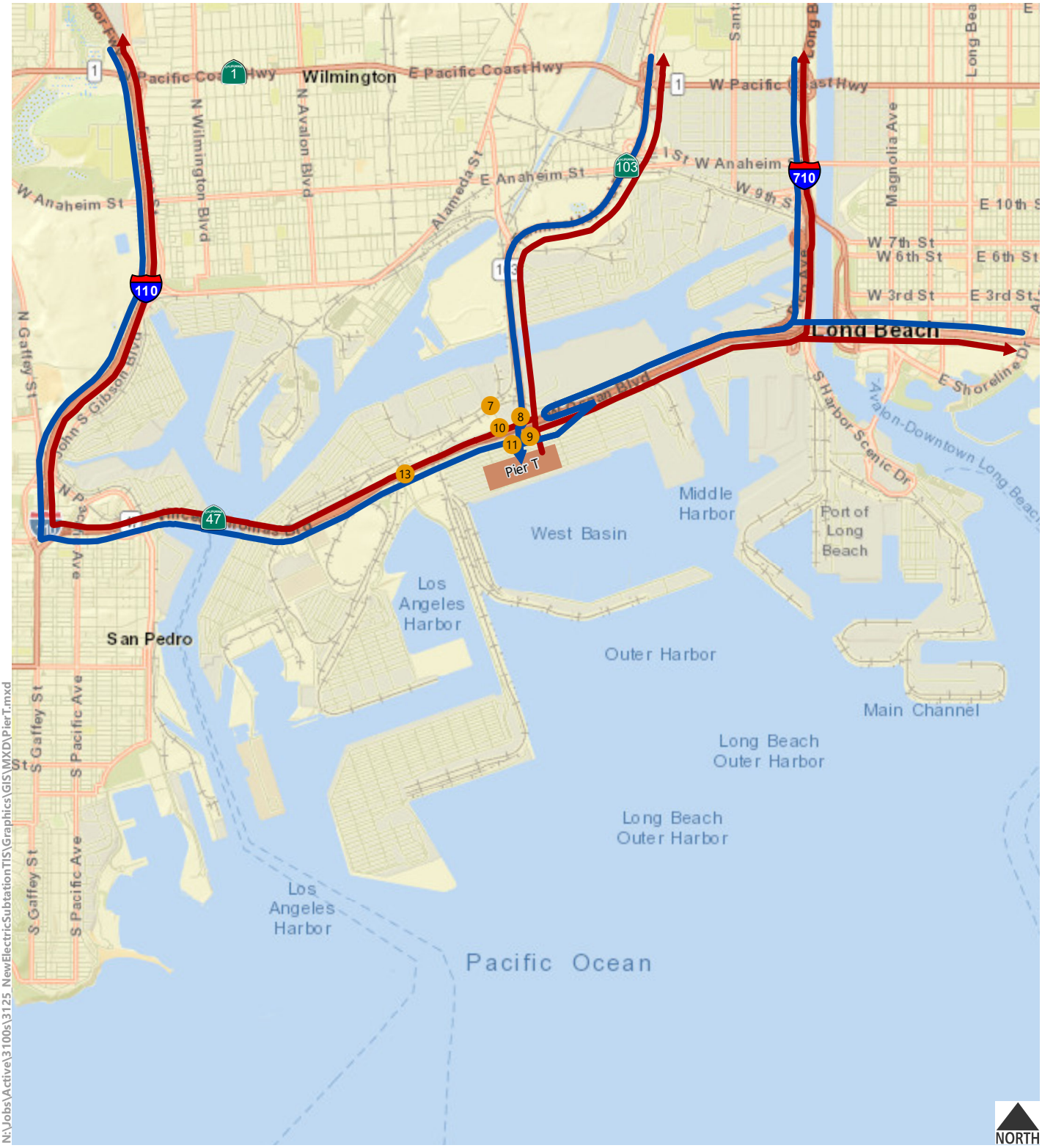



Access Routes
- Inbound
- Outbound
- Study Intersections

| Peak Hour Trips | AM | MD | PM | Total |
|---|---|---|---|---|
| Inbound | 50 | 13 | 0 | 63 |
| Outbound | 0 | 13 | 50 | 63 |

Figure 2A

Access Routes to Pier J Landside Work Site

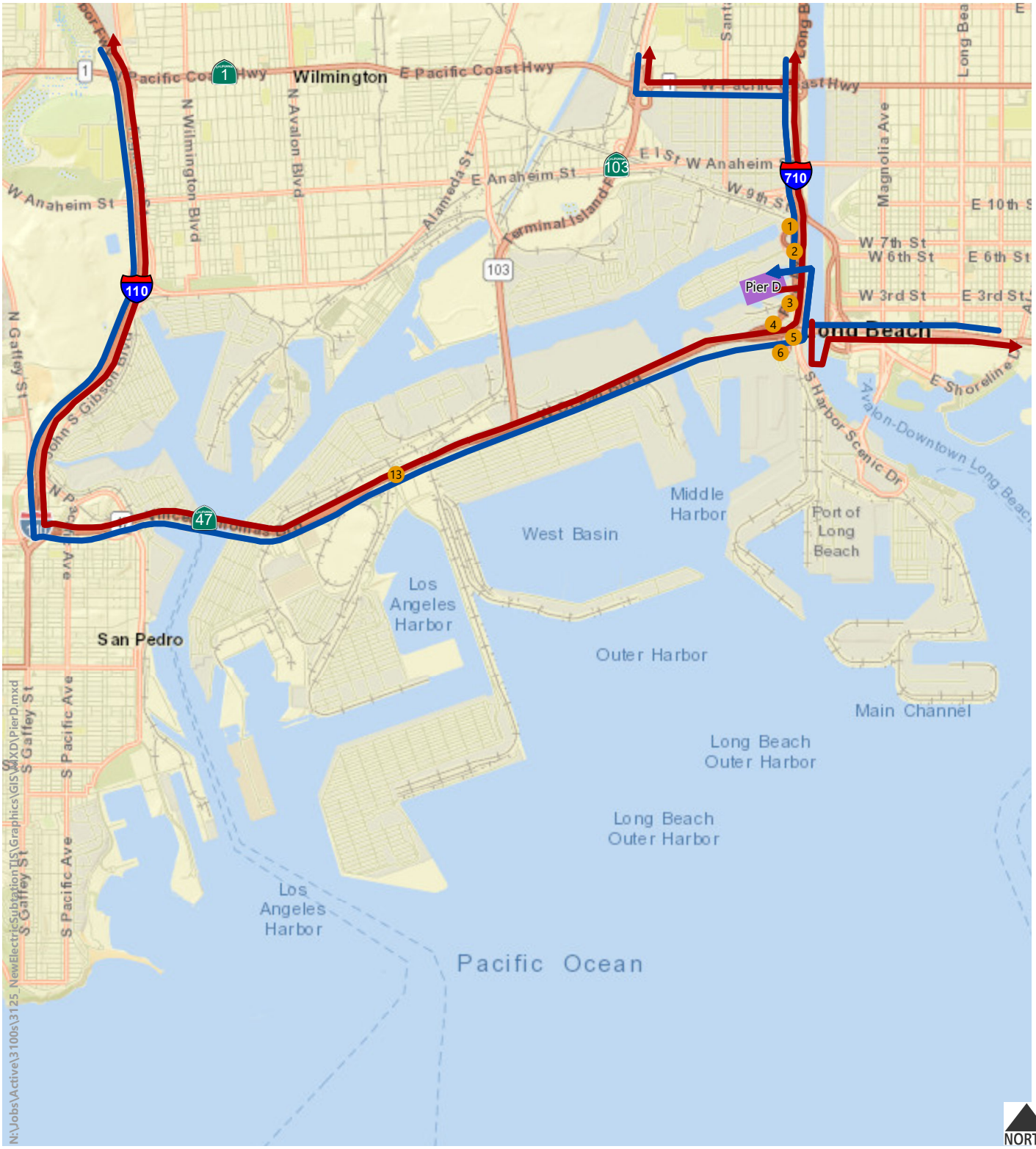



Access Routes
- Inbound
- Outbound
- Study Intersections

| Peak Hour Trips | AM | MD | PM | Total |
|---|---|---|---|---|
| Inbound | 25 | 6 | 0 | 31 |
| Outbound | 0 | 6 | 25 | 31 |

Figure 2B

Access Routes to Pier T Landside Work Site



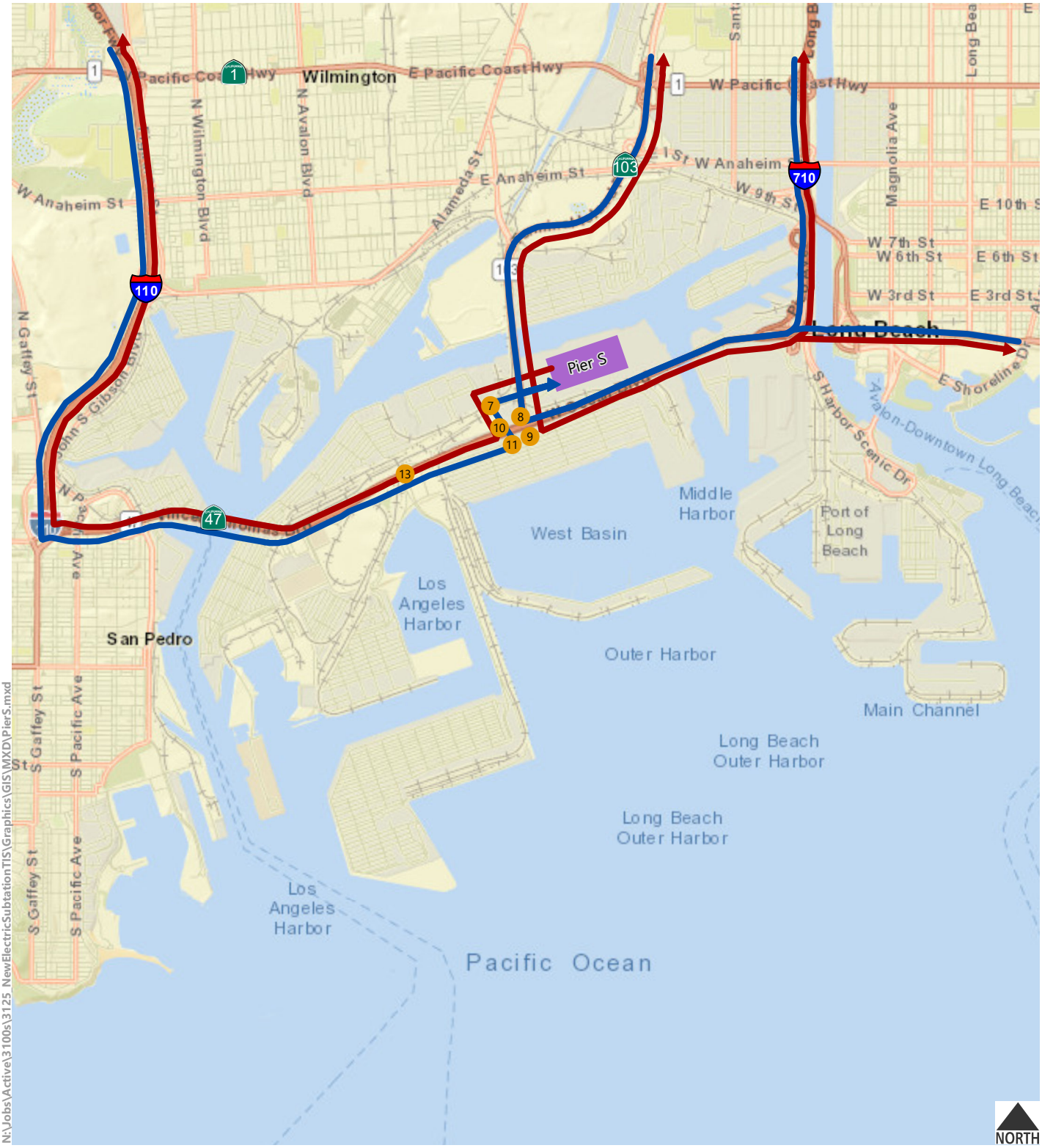

Access Routes

- Inbound
- Outbound
- Study Intersections

| Peak Hour Trips | AM | MD | PM | Total |
|---|---|---|---|---|
| Inbound | 40 | 40 | 40 | 120 |
| Outbound | 40 | 40 | 40 | 120 |

Figure 2C

## Access Routes to Potential Launch Site for In-Water Work on Pier D

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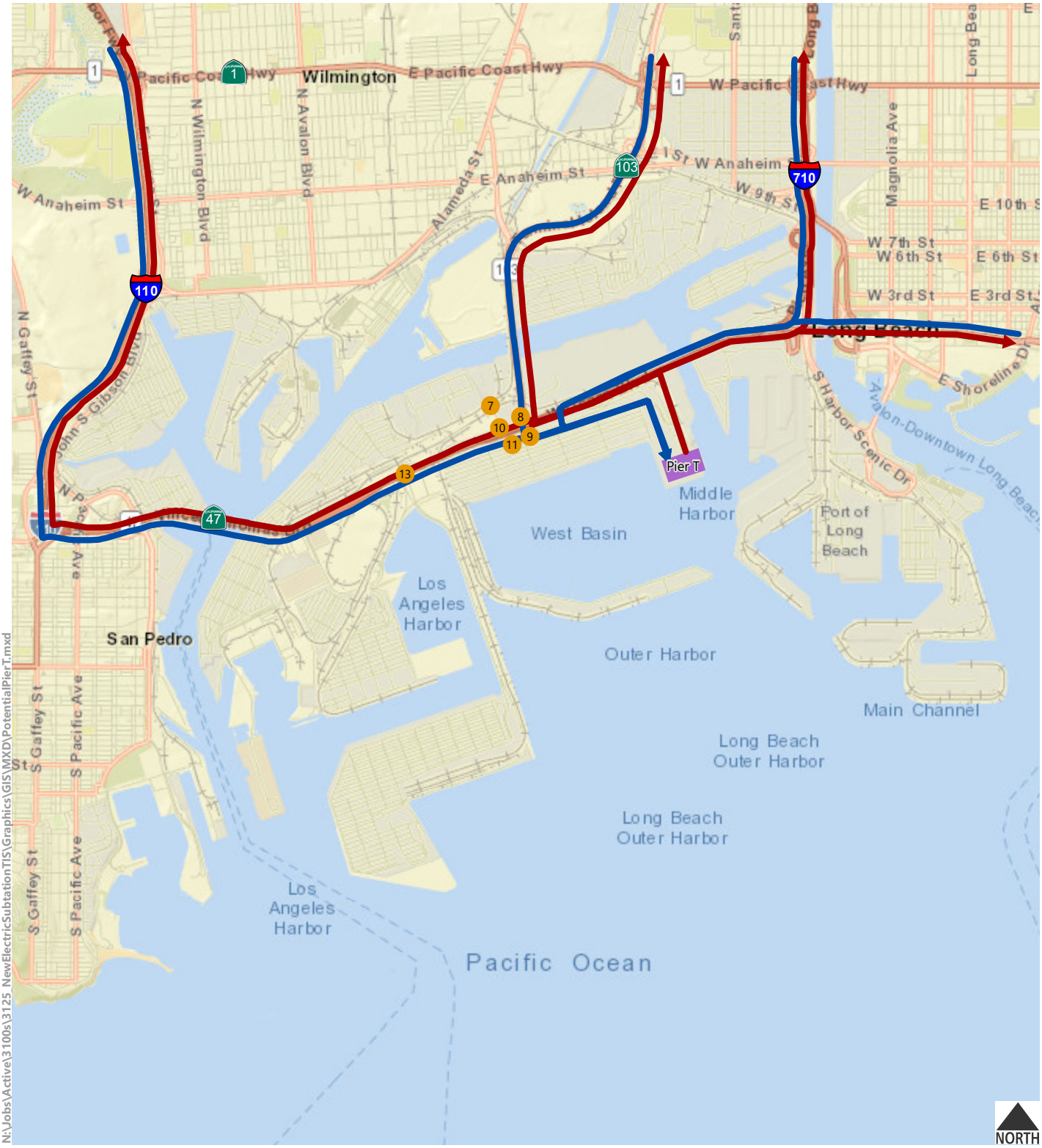
Access Routes
- Inbound
- Outbound
- Study Intersections

| Peak Hour Trips | AM | MD | PM | Total |
|---|---|---|---|---|
| Inbound | 40 | 40 | 40 | 120 |
| Outbound | 40 | 40 | 40 | 120 |

Figure 2D

Access Routes to Potential Launch Site for In-Water Work on Pier S




Access Routes

Inbound

Outbound

Study Intersections

| Peak Hour Trips | AM | MD | PM | Total |
|---|---|---|---|---|
| Inbound | 40 | 40 | 40 | 120 |
| Outbound | 40 | 40 | 40 | 120 |

Figure 2E

## Access Routes to Potential Launch Site for In-Water Work on Pier T

## Existing Traffic Conditions

Available information on current and future (2040) traffic operations at 15 intersections in the vicinity of the proposed land-side work sites and potential launch sites was taken from a recent study published by the Port (Port Master Plan Update Draft Program Environmental Impact Report [PMP EIR], August 2019). The intersections are shown on Figure 3. The analysis presents information on Existing Baseline conditions rather than simply Existing (2018) conditions, to account for the completion of the Gerald Desmond Bridge Replacement and Middle Harbor Terminal Redevelopment projects. The traffic counts were collected in 2018 when there were detour routes in place for the construction of these two major projects. The Existing Baseline conditions reflect the post-construction conditions in which the vehicles that were using the detour routes during construction would use the new Gerald Desmond Bridge. The PMP EIR projected 105,110 daily trips under the proposed master plan, of which 62,305 were trucks and 42,805 were autos associated with the Port of Long Beach. These locations are shown in Figures 2A through 2E and listed Table 2. As shown, good levels of service (LOS D or better) are shown under existing baseline and future conditions for the three analyzed weekday peak hours. Construction of the proposed project would occur between 2024 and 2029, ending approximately midway between the two horizon years for which LOS data is available.

## Impact Analysis

### *Significant Impact Thresholds*

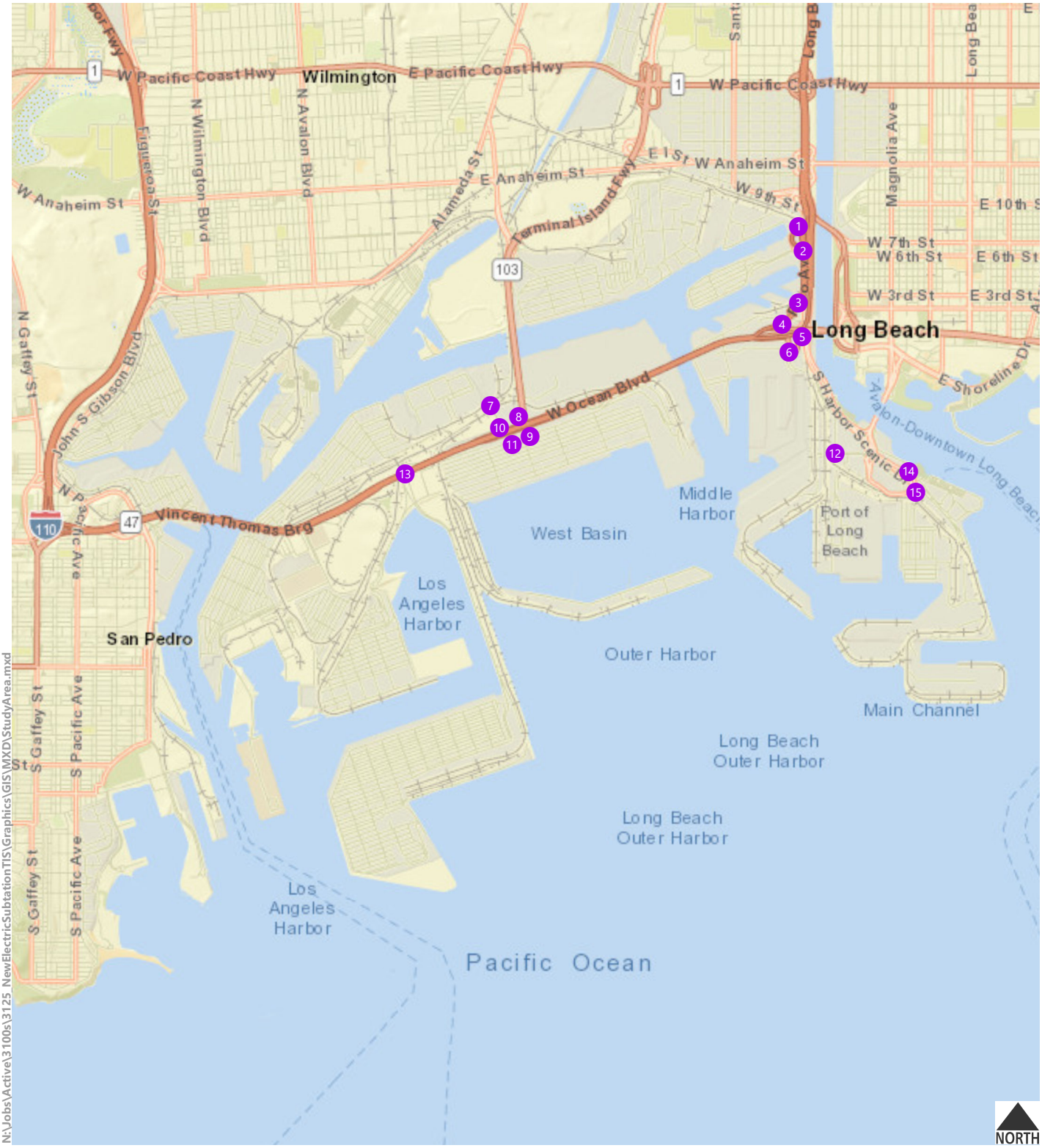
The City of Long Beach considers LOS D as the upper limit of satisfactory operations for intersections. A significant impact is identified where project traffic causes the intersection to deteriorate from LOS D to LOS E or F and increases the V/C ratio by 0.02 or more, or if the project traffic causes an increase in V/C ratio of 0.02 or greater when the intersection is operating at LOS E or F in the baseline condition.

As shown in Table 2, acceptable levels of service (LOS D or better) are shown under existing baseline and future conditions for the three analyzed weekday peak hours. Construction of the proposed project would occur between 2024 and 2029, ending approximately midway between the two horizon years for which LOS data is available. Because workers would travel between their homes and the different project work sites over various access routes, the project trips would be broadly distributed. During the peak of construction activity, estimated to occur over a period of two months, up to 80 trips would occur in any one-hour period (40 inbound and 40 outbound). Given the moderate peak hour trip generation, the various access sites, and the different sites that the workers would be travelling to and from, the trips would be distributed

broadly across the study area, it can be concluded that the additional project traffic would result in less than significant impacts according to the City's criteria.

While other project alternatives are studied under NEPA, the construction impact analysis for each alternative was not analyzed because this analysis is conducted for the peak day and the peak day is the same for all alternatives.

Upon completion of construction, there would be no traffic-related operational impacts as a result of this project. The purpose of this project is to increase safety and efficiency for in-water facilities and would not increase throughput capacity of the terminals. There would a nominal increase in vehicle trips per year for routine maintenance of the electrical substation, which would not be anticipated to impact traffic conditions.




● **Study Intersections**

Figure 3

Study Intersections

## Table 2: Intersection Level of Service Summary

| | Intersection | Peak Hour | Existing Baseline V/C | Existing Baseline LOS | Future (2040) V/C | Future (2040) LOS |
|---|---|---|---|---|---|---|
| 1 | PICO AVE & | AM | 0.327 | A | 0.479 | A |
| | PIER B ST | MID | 0.390 | A | 0.546 | A |
| | | PM | 0.417 | A | 0.493 | A |
| 2 | PICO AVE & | AM | 0.178 | A | 0.544 | A |
| | PIER C ST | MID | 0.295 | A | 0.576 | A |
| | | PM | 0.287 | A | 0.6 | A |
| 3 | PICO AVE & | AM | 0.235 | A | 0.443 | A |
| | PIER D ST | MID | 0.363 | A | 0.519 | A |
| | | PM | 0.241 | A | 0.486 | A |
| 4 | PICO AVE & | AM | 0.272 | A | 0.44 | A |
| | WESTBOUND OCEAN BLVD ON-RAMP | MID | 0.492 | A | 0.697 | B |
| | | PM | 0.308 | A | 0.443 | A |
| 5 | PICO AVE & | AM | 0.172 | A | 0.525 | A |
| | WESTBOUND OCEAN BLVD OFF-RAMP | MID | 0.206 | A | 0.594 | A |
| | | PM | 0.207 | A | 0.494 | A |
| 6 | PICO AVE & | AM | 0.378 | A | 0.616 | B |
| | PIER E ST/EASTBOUND OCEAN BLVD RAMP | MID | 0.340 | A | 0.672 | B |
| | | PM | 0.314 | A | 0.55 | A |
| 7 | PIER S AVE & | AM | 0.339 | A | 0.622 | B |
| | NEW DOCK ST | MID | 0.328 | A | 0.664 | B |
| | | PM | 0.328 | A | 0.569 | A |
| 8 | TERMINAL ISLAND FWY & | AM | 0.420 | A | 0.709 | C |
| | SR-47 WESTBOUND | MID | 0.469 | A | 0.757 | C |
| | | PM | 0.469 | A | 0.703 | C |
| 9 | TERMINAL ISLAND FWY & | AM | 0.362 | A | 0.714 | C |
| | SR-47 EASTBOUND | MID | 0.387 | A | 0.805 | D |
| | | PM | 0.434 | A | 0.757 | C |
| 10 | PIER S AVE & | AM | 0.346 | A | 0.819 | D |
| | SR-47 WESTBOUND | MID | 0.336 | A | 0.691 | B |
| | | PM | 0.361 | A | 0.578 | A |
| 11 | PIER S AVE & | AM | 0.340 | A | 0.505 | A |
| | SR-47 EASTBOUND | MID | 0.369 | A | 0.622 | B |
| | | PM | 0.300 | A | 0.484 | A |
| 12 | PICO AVE/PIER G AVE & | AM | 0.519 | A | 0.881 | D |
| | HARBOR PLAZA | MID | 0.592 | A | 0.819 | D |
| | | PM | 0.592 | A | 0.812 | D |
| 13 | NAVY WAY & | AM | 0.436 | A | | |
| | SEASIDE AVE | MID | 0.340 | A | Not an intersection in the future* | |
| | | PM | 0.554 | A | | |
| 14 | HARBOR PLAZA & | AM | 0.275 | A | 0.609 | B |
| | QUEENSWAY DR | MID | 0.387 | A | 0.863 | D |
| | | PM | 0.390 | A | 0.701 | C |
| 15 | HARBOR PLAZA & | AM | 0.449 | A | 0.723 | C |
| | HARBOR SCENIC DR | MID | 0.442 | A | 0.897 | D |
| | | PM | 0.434 | A | 0.585 | A |

* The intersection of Navy Way & Seaside Avenue, in Los Angeles, is planned for full grade separation in the future.

## VMT Analysis

The following discussion is only relevant to CEQA. Since this is also a NEPA document the VMT discussion has no bearing on NEPA.

On September 27,2013, Governor Brown signed SB 743, which mandated a change in the way that transportation impacts of projects are evaluated under CEQA. The legislation requires the OPR to amend the CEQA guidelines to use VMT as a criterion for determining significant transportation impacts rather than LOS. Instead of promoting mitigation that involves increasing capacity (i.e., the width of a roadway or size of an intersection), which may increase auto use and emissions, and discourage alternative forms of transportation, the new VMT criterion would support reduction of GHG emissions, creation of multimodal networks, and promotion of a mix of land uses. Section 15064.3 in the current (2018) CEQA Guidelines states: "For the purposes of this section, 'vehicle miles traveled' refers to the amount and distance of automobile travel attributable to the project."

OPR published a preliminary evaluation of possible metrics to replace LOS in transportation analyses in December 2013 and, following substantial public input, released the final guidelines in December 2018. While the new analysis rules are now in effect, local agencies have until July 1, 2020, to develop and adopt new analytical procedures and threshold criteria.

The estimation of project-related daily vehicles miles of travel (VMT) is based on the trip generation estimates presented earlier over the course of the project. Average VMT per day and average VMT per year for automobile commute trips, excluding truck trips, were estimated based on information from POLB.

POLB estimates that the commute trip lengths to the construction site could be up to 50 miles. This analysis assumes that one-way commute trips to and from the construction site would average 25 miles.

Based on the estimate 240 daily one-way trips, the highest project-related daily VMT is estimated to be approximately 6,000 miles. The 240 daily one-way trips estimated for the first two months of 2026 do not include truck trips nor midday lunch trips since the activities are in-water dredging work that do not involve trucks and workers are on the barge for the whole shift.

To estimate the VMT per year, the total number of round trips per year was multiplied by the assumed average round-trip length of 50 miles. Table 3 shows the VMT estimates for each year of construction. Of the five full years of construction, Year 2 (2025) has the highest annual average

VMT with an estimated 1,204,500 miles. During this year, there is planned dredging every day for the approach channel.

The City of Long Beach has not yet adopted thresholds for VMT impacts. As such, this VMT analysis is for informational purposes only and no conclusions regarding project-generated VMT impact can be made at this point.

## Conclusions

Based on the quantitative and qualitative analysis presented in this memorandum, it is concluded that the temporary traffic impacts related to the construction of the proposed Deep Draft Navigation project would result in less than significant traffic impacts on the surrounding street network.

## Table 3: VMT Analysis

| Year 1 (2024) | | | | Year 2 (2025) | | | Year 3 (2026) | | | Year 4 (2027) | | | Year 5 (2028) | | | Year 6 (2029) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Activity | Days | Daily Round Trips | VMT | Days | Daily Round Trips | VMT | Days | Daily Round Trips | VMT | Days | Daily Round Trips | VMT | Days | Daily Round Trips | VMT | Days | Daily Round Trips | VMT |
| ***1. Electric Substation*** | | | | ***5. Approach Channel*** | | | ***5. Approach Channel*** | | | ***8. West Basin, Part 2*** | | | ***12. Pier J Approach, Part 2*** | | | ***13. Pier J Approach, Part 3*** | | |
| Subtask 1 | 5 | 4 | 1,000 | 365 | 66 | 1,204,500 | 34 | 66 | 112,200 | 86 | 54 | 232,200 | 340 | 54 | 918,000 | 50 | 54 | 135,000 |
| Subtask 2 | 15 | 4 | 3,000 | | | | | | | | | | | | | | | |
| Subtask 3 | 5 | 2 | 500 | | | | | | | | | | | | | | | |
| Subtask 4 | 20 | 15 | 15,000 | | | | | | | | | | | | | | | |
| Subtask 5 | 26 | 8 | 10,400 | | | | | | | | | | | | | | | |
| Subtask 6 | 2 | 8 | 800 | | | | | | | | | | | | | | | |
| Subtotal | | | 30,700 | | | | | | | | | | | | | | | |
| ***2. Pier J Finger Dike*** | | | | | | | ***6. Main Channel*** | | | ***9. Pier T Berths*** | | | | | | | | |
| Subtask 1 | 3 | 8 | 1,200 | | | | 178 | 54 | 480,600 | 7 | 54 | 18,900 | | | | | | |
| Subtask 2 | 2 | 11 | 1,100 | | | | | | | | | | | | | | | |
| Subtask 3 | 45 | 21 | 47,250 | | | | | | | | | | | | | | | |
| Subtask 4 | 40 | 4 | 8,000 | | | | | | | | | | | | | | | |
| Subtask 5 | 2 | 7 | 700 | | | | | | | | | | | | | | | |
| Subtotal | | | 58,250 | | | | | | | | | | | | | | | |
| ***3. Pier J Wharf Improvements*** | | | | | | | ***7. West Basin, Part 1*** | | | ***10. Pier J Basin*** | | | | | | | | |
| Subtask 1 | 5 | 8 | 2,000 | | | | 163 | 54 | 440,100 | 68 | 54 | 183,600 | | | | | | |
| Subtask 2 | 10 | 8 | 4,000 | | | | | | | | | | | | | | | |
| Subtask 3 | 20 | 15 | 15,000 | | | | | | | | | | | | | | | |
| Subtask 4 | 135 | 21 | 141,750 | | | | | | | | | | | | | | | |
| Subtask 5 | 130 | 4 | 26,000 | | | | | | | | | | | | | | | |
| Subtask 6 | 5 | 3 | 750 | | | | | | | | | | | | | | | |
| Subtotal | | | 189,500 | | | | | | | | | | | | | | | |
| ***4. Pier T Wharf Improvements*** | | | | | | | | | | ***11. Pier J Approach, Part 1*** | | | | | | | | |
| Subtask 1 | 5 | 8 | 2,000 | | | | | | | 178 | 54 | 480,600 | | | | | | |
| Subtask 2 | 20 | 8 | 8,000 | | | | | | | | | | | | | | | |
| Subtask 3 | 35 | 15 | 26,250 | | | | | | | | | | | | | | | |
| Subtask 4 | 250 | 21 | 262,500 | | | | | | | | | | | | | | | |
| Subtask 5 | 245 | 4 | 49,000 | | | | | | | | | | | | | | | |
| Subtask 6 | 10 | 3 | 1,500 | | | | | | | | | | | | | | | |
| Subtotal | | | 349,250 | | | | | | | | | | | | | | | |
| **Total Annual VMT** | | | **627,700** | | | **1,204,500** | | | **1,032,900** | | | **434,700** | | | **918,000** | | | **135,000** |

Year 1 Activities and Subtasks:

1. Electric substation activities: 1) Demolish asphalt, 2) Cut trench for ducts and foundation for substation, 3) Removal of demlished material to disposal site, 4) Construct manholes, ducts, foundations, 5) New asphalt and paving, 6) Install transformer and heavy electrical equipment
2. Pier J Finger Pier Activities: 1) Mobilize/demobilize, 2) Clearing of seabed of any obstruction prior to pile driving, 3) Driving of bulkhead wall, 4) Installation of anti-scour rock in front of new bulkhead wall, 5) Survey of installed bulkhead wall
3. Pier J Wharf Improvements Activities: 1) Mobilize/demobilize, 2) Sheet pile delivery, 3) Clearing of seabed of any obstruction prior to pile driving, 4) Driving of bulkhead wall, 5) Installation of anti-scour rock in front of new bulkhead wall, 6) Survey of installed bulkhead wall
4. Pier T Wharf Improvements Activities: 1) Mobilize/demobilize, 2) Sheet pile delivery, 3) Clearing of seabed of any obstruction prior to pile driving, 4) Driving of bulkhead wall, 5) Installation of anti-scour rock in front of new bulkhead wall, 6) Survey of installed bulkhead wall