Appendix B2

Air Dispersion Modeling

Contents

List of Tables

List of Figures

1.0 Introduction

This appendix describes the methods and results of air dispersion modeling that predict the ground-level concentrations of criteria pollutants from continued operation of the China Shipping Container Terminal at Berths 97-109. The analysis modeled the following concentrations:

- 1-hour and annual nitrogen dioxide (NO_2);
- 1-hour and 24-hour sulfur dioxide (SO_2);
- 1-hour and 8-hour carbon monoxide (CO);
- 24-hour and annual particulate matter less than ten microns (PM_{10}); and
- 24-hour particulate matter less than 2.5 microns ($PM_{2.5}$).

The following two project scenarios were analyzed:

- **Revised Project:** this project scenario is the proposed Project for which this Draft Supplemental EIR (SEIR) has been prepared. As described in Section 2 of the Draft SEIR, the 2008 EIS/EIR for the China Shipping Container Terminal included a number of mitigation measures, some of which have yet to be fully implemented for various reasons. The Revised Project consists of continued operation of the terminal under the new or modified mitigation measures described in Section 2.5.1 of the Draft SEIR.

- **FEIR Mitigated Project:** this project scenario represents continued operation of the terminal assuming implementation of the 2008 EIS/EIR mitigation measures. Analysis of the FEIR Mitigated Project is provided for informational purposes to compare to the Revised Project.

Air quality impacts of the two project scenarios described above were analyzed relative to the following two baseline scenarios:

- **Unmitigated Baseline:** this baseline scenario represents 2014 actual activity and actual mitigation implementation.

- **Mitigated Baseline:** this baseline scenario represents 2014 as it would have been with implementation of all mitigations imposed by the 2008 EIS/EIR.

Details of these project and baseline scenarios are provided in Chapter 2.

Due to improvements in procedures and assumptions used to calculate emissions and in atmospheric dispersion modeling procedures used to estimate resulting pollutant concentrations, it is not possible to directly compare air quality impacts presented in the 2008 Final EIS/EIR with impacts calculated for this Draft SEIR, nor is it possible to reproduce the outdated methods, models, and procedures used to analyze air quality impacts in the 2008 EIS/EIR. Therefore, this appendix presents an evaluation of air quality impacts using current, state-of-the-art emission estimation and air quality modeling procedures. This is described more fully in Appendix B1.

The air dispersion modeling methodology was performed using the U.S. Environmental Protection Agency's (USEPA) AERMOD Modeling system, version 16216r, based on the Guideline on Air Quality Models (40 Code of Federal Regulation [CFR], Part 51, Appendix W, November 2005). NO_2, CO, SO_2, PM_{10}, and $PM_{2.5}$, were modeled for the project and baseline scenarios. The predicted ground-level concentrations for the project scenarios were compared to the relevant South Coast Air Quality Management District (SCAQMD) air quality significance thresholds to determine ambient air quality impacts.

2.0 Estimation of Emissions Used in the Air Dispersion Modeling

2.1 Emission Source Identification

The following operational emission sources were modeled in AERMOD:

- Container ships transiting between the SCAQMD overwater boundary and the terminal (about 40 nautical miles), anchoring while waiting for an available berth, and hoteling while at berth. Ship emission sources include propulsion engines, auxiliary engines, and boilers.
- Tugboats used to assist ships while arriving and departing the Port. Tugboat emission sources include propulsion and auxiliary engines.
- Locomotives performing switching activities at the on-dock rail yard; and line-haul locomotives moving and idling at the on-dock rail yard, and hauling trains to and from the yard. Locomotive emission sources include engine exhaust.
- Cargo handling equipment working both on-terminal and handling China Shipping-related containers at the on-dock rail yard. Cargo handling equipment emission sources include engine exhaust.
- Trucks idling at the in-gate, out-gate, and on-terminal; driving on-terminal; and driving off-terminal along the primary truck routes. Truck emission sources include engine exhaust, tire wear, brake wear, and road dust.
- Worker vehicles driving both on- and off-terminal. Worker vehicle emission sources include engine exhaust, tire wear, brake wear, and road dust.

2.2 Derivation of Peak 1-Hour, 8-Hour, and Annual Emissions

Section 3.1.4.1 of the SEIR and Appendix B1 describe the methodology for estimating annual, peak day, peak 8-hour, and peak 1-hour emissions associated with terminal operations. In general, peak day emissions were calculated for each source category (container ships, tugboats, locomotives, cargo handling equipment, trucks, and worker vehicles) based on expected maximum daily activity levels within the annual period being modeled. Peak 1-hour and 8-hour emissions for cargo handling equipment, trucks, and worker vehicles were then calculated internally by AERMOD based on the assumption that the peak daily source emissions follow the time-of-day profiles listed in Table B2-2. Peak 1-hour and 8-hour emissions for container ships, tugboats, and locomotives were calculated outside of AERMOD as described in Appendix B1 and modeled directly in AERMOD.

3.0 Dispersion Modeling Approach

3.1 Dispersion Model Selection and Inputs

Air dispersion modeling was performed using the USEPA AERMOD dispersion model, version 16216r (USEPA, 2017), based on the *Guideline on Air Quality Models* (USEPA, 2017b). The AERMOD model is a steady-state, multiple source, Gaussian dispersion model designed for applications which include areas of ground elevations that exceed emission source stack heights. Selection of the AERMOD model is well suited for this analysis because it is (1) accepted by the modeling community and regulatory agencies due to of its ability to provide reasonable results for large industrial projects with multiple emission sources, (2) annual sets of hourly meteorological data are available in AERMOD format, and (3) the model can handle various sources types, including point, area, line, and volume. Finally, AERMOD has been approved by the USEPA and SCAQMD for analysis of mobile sources.

3.1.1 Emission Source Modeling Representation

The following identifies how operational emission sources were represented in AERMOD:

- Container ships in transit were simulated as a series of separated volume sources extending from Berths 100 and 102 to the South Coast Air Basin (SCAB) overwater boundary. Volume source spacing was 100 meters within the harbor, 500 meters in the precautionary zone, 1,000 meters between the precautionary zone and 20 nautical miles from Point Fermin, and 2,000 meters between 20 nautical miles and the SCAB overwater boundary. Transit emissions were apportioned 75 percent to the north trans-Pacific route, and 25 percent to the west route, based on arrival and departure statistics for the terminal (Ramboll Environ, 2016).
- Container ships at berth were modeled as point sources located adjacent to Berths 100 and 102.
- Container ships at anchorage were modeled as an area source within the harbor. Eight percent of ship transits were assumed to include an anchorage stop, based on arrival and departure statistics for the terminal.
- Tugboats were modeled as a series of separated volume sources extending from Berths 100 and 102 to the Port breakwater. The volume source spacing was 100 meters.
- Locomotives were modeled as a series of contiguous line sources along the arriving and departing routes as well as within the on-dock rail yard. Locomotives were modeled as far north as Sepulveda Blvd, about 4.5 miles northeast of the terminal. A sensitivity AERMOD run showed that this range

was sufficient to adequately capture maximum pollutant concentrations near the terminal.

- Cargo handling equipment was modeled as area sources positioned over most of the terminal and the on-dock rail yard.
- Trucks driving and idling on-site were modeled as area sources positioned over the in-gate, out-gate, and terminal.
- Trucks and worker vehicles driving off-site were modeled a series of contiguous line sources along the primary travel routes. They were modeled as far north as Sepulveda Blvd, about 4.5 miles northeast of the terminal. A sensitivity AERMOD run showed that this range was sufficient to adequately capture maximum pollutant concentrations near the terminal.
- Worker vehicles on-site were modeled as area sources positioned over the entrance roads and on-terminal parking lots.

Table B2-1 presents source parameters used in the dispersion modeling of operational emissions. The source parameters are consistent with those developed and used in prior LAHD NEPA/CEQA documents for container terminals, including the 2008 EIS/EIR for the China Shipping Container Terminal (LAHD 2008; LAHD 2011; LAHD 2014). The locations of the emission sources as modeled are shown in Figures B2-1 through B2-3.

Table B2-1. AERMOD Source Parameters

Source Description	AERMOD Source Type	Release Height (m) [a]	Initial Vertical Dimension (m) [b]	Stack Exit Velocity (m/s)	Stack Exit Temp. (K)	Stack Inside Diameter (m)
Ships – Fairway and Precautionary Area Transit	Volume	49.1	11.4	--	--	--
Ships – Harbor Transit	Volume	59.1	13.7	--	--	--
Ships – Turning and Docking Near-Berth	Volume	78.6	18.3	--	--	--
Ships - At Berth - Auxiliary Engines	Point	44.5	--	7.5	583	0.539
Ships - At Berth – Boilers	Point	39.9	--	18.24	559	0.494
Ships - At Anchorage	Area	44.5	10.3	--	--	--
Tugboats	Volume	15.2	3.5	--	--	--
Locomotives - Offsite – Day [c]	Line	5.6	2.6	--	--	--
Locomotives - Offsite – Night	Line	14.6	6.79	--	--	--
Locomotives - Onsite – Day	Line	6.64	3.08	--	--	--
Locomotives - Onsite – Night	Line	13.56	6.31	--	--	--
Cargo Handling Equipment (except RTGs)	Area	4.57	1.06	--	--	--
Rubber Tired Gantry (RTG) Cranes	Area	12.5	2.9	--	--	--
Trucks	Area, Line [d]	4.57	1.06	--	--	--
Worker Vehicles	Area, Line [d]	0.61	0.14	--	--	--

Notes:

a. The release height for point sources in this table represents the actual release height of the exhaust above ground (or water, in this case). AERMOD then accounts for additional plume rise due to the upward momentum and buoyancy of the stack exhaust gas, based on the exit velocity, exit temperature, and stack diameter. By contrast, AERMOD does not calculate any additional plume rise for volume, area, and line sources. Therefore, the release heights presented in this table for volume, area, and line sources have been adjusted higher than the actual exhaust release heights in many cases to account for a nominal amount of plume rise due to upward momentum and buoyancy of the stack exhaust gas.

b. The initial vertical dimension of the plume (σ_z) was determined by dividing the initial vertical thickness by 4.3 for elevated releases and by 2.15 for ground-based releases.

c. Locomotive plume heights were derived from the *Roseville Rail Yard Study* (CARB, 2004). The plume heights vary by day versus night due to differences in atmospheric stability conditions.

d. Trucks and worker vehicles were modeled with area sources on-site and line sources off-site.

e. Source parameters are consistent with prior LAHD CEQA documents for container terminals (LAHD 2008; LAHD 2011; LAHD 2014).

Figure B2-1. AERMOD Source Representation – Ship (OGV) Transits

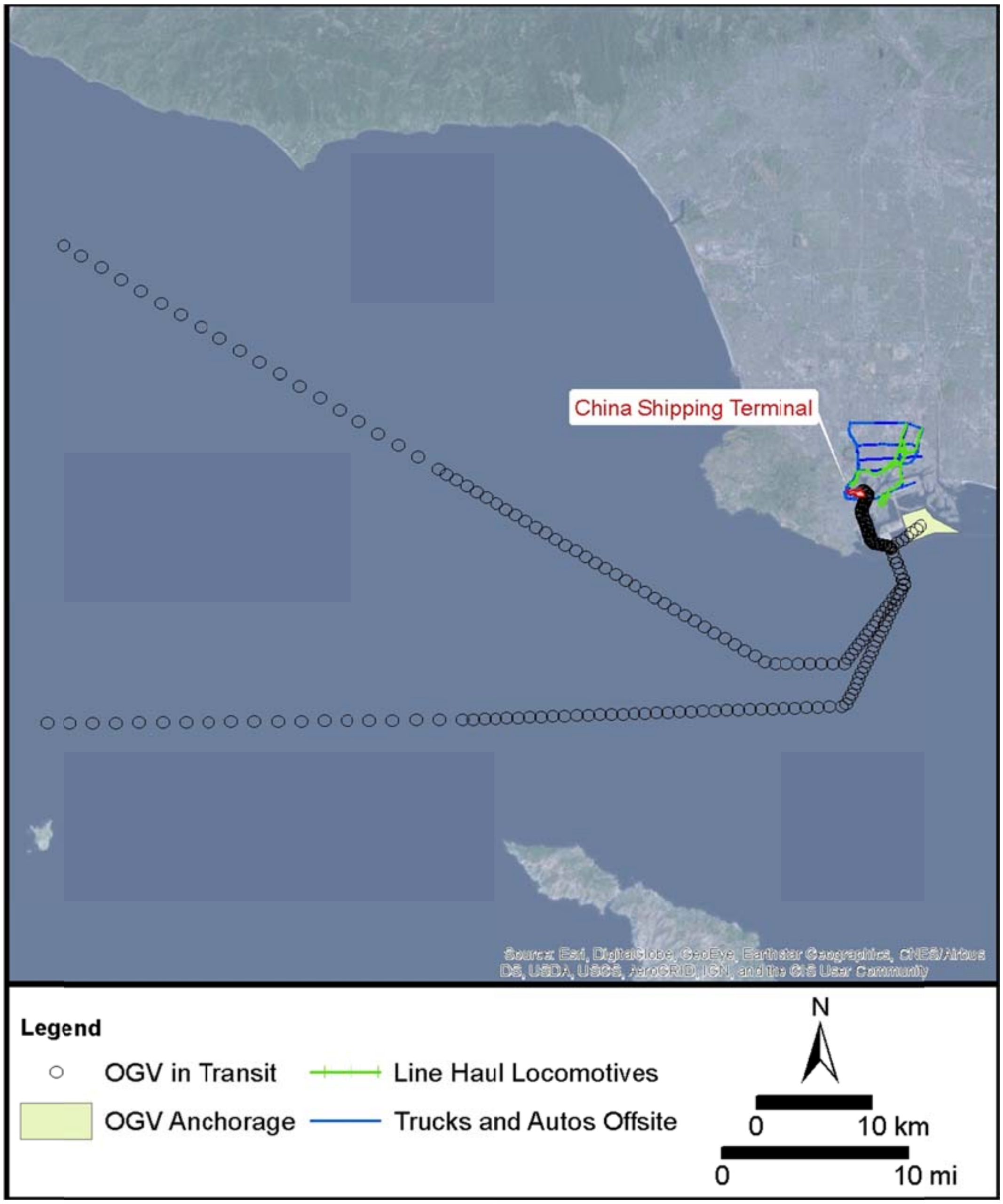


Figure B2-2. AERMOD Source Representation – OGV Maneuvering and Anchorage, Off-site Line Haul Locomotives, and Off-site Trucks and Worker Vehicles

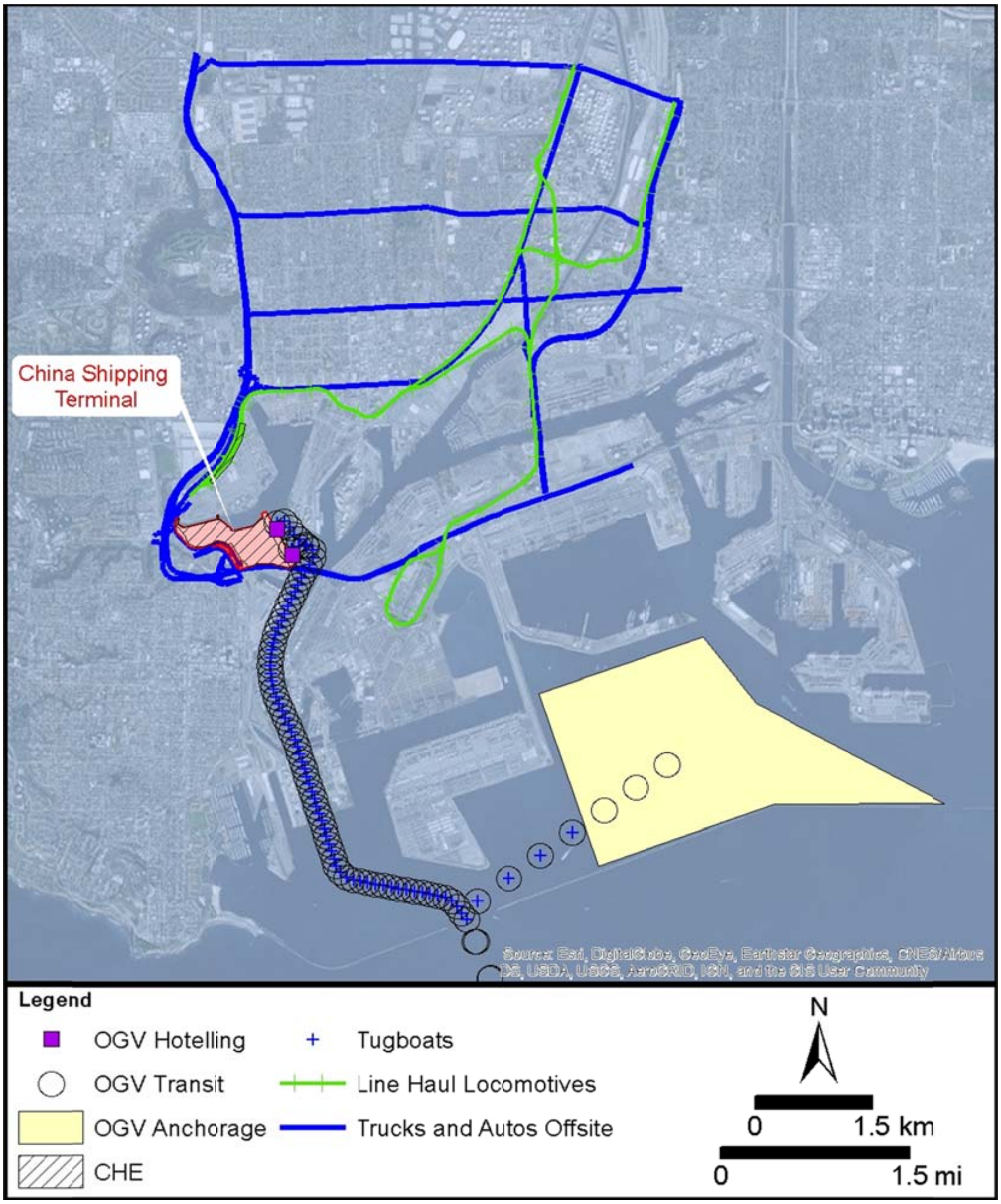
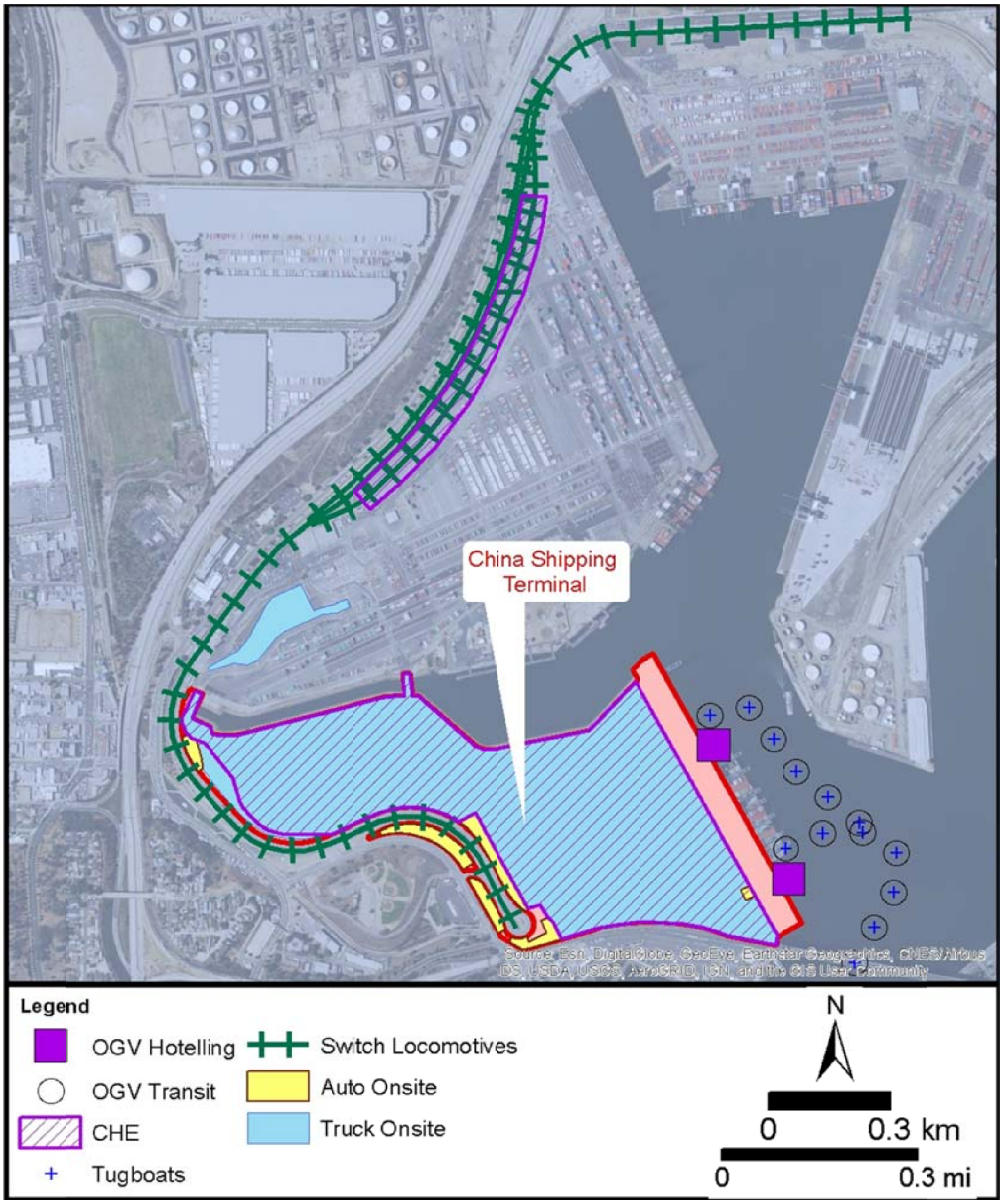


Figure B2-3. AERMOD Source Representation – OGV Hoteling, Cargo Handling Equipment (CHE), On-site Trucks and Worker Vehicles, and Switch Locomotives



3.1.2 Meteorological Data

The complex interaction of the ocean, land, and Palos Verdes hills near the Port may result in significant variations in wind patterns over relatively short distances (LAHD 2010). POLA and POLB currently operate monitoring stations that collect meteorological data from several locations within and near port boundaries. For this dispersion analysis, the meteorological data collected at the Wilmington Community Station, located at Saints Peter and Paul School (SPPS), was used for dispersion modeling. SPPS is located about 1.6 mile north-northeast of the China Shipping terminal, and is considered the most representative meteorological station for the terminal in accordance with the "Sphere of Influence" analysis conducted by POLA and POLB in 2010 (LAHD 2010).

The meteorological data used in AERMOD was collected between September 2006 and August 2007, the first complete 12-month period recorded at all six of the site-specific monitoring stations operated by the Ports of Los Angeles and Long Beach. The use of one year of meteorological data is consistent with USEPA guidelines, which state that "at least one year of site-specific" data are required" (USEPA, 2017b). For project-to-project consistency, this meteorological period has been used in numerous POLA and POLB EIRs since 2007.

The meteorological data were processed in 2013 using the USEPA's approved AERMET (version 12345) meteorological data preprocessor. To promote project-to-project consistency, the Ports reprocess the data with updated versions of AERMET only when necessary, such as when a new version of AERMET is different enough to substantially affect the AERMOD results for the Port projects. A review of changes made to AERMET between version 12345 and the current version (version 16216) was performed to confirm that none of the changes made would be expected to have a significant impact on AERMET output which would impact the current AERMOD application. Therefore, the existing 2013 preprocessed meteorological data was used for this analysis. Moreover, as part of the data processing effort, the data were compared to the more recent meteorological data collected during years 2009 to 2012. It was determined that the 2006-2007 data period is representative in comparison to the 2009 to 2012 data period. The evaluation showed that the average wind speed and wind patterns of the original data period are very similar to that of the 2009 to 2012 data period across the stations at both POLA and POLB. Therefore, it was concluded that the original data period is representative (ENVIRON 2013).

3.1.3 Model Options

Regulatory default technical options were selected in AERMOD for all pollutants except NO_2 in accordance with USEPA modeling guidance (USEPA, 2017b). Consistent with California Air Pollution Control Officers Association (CAPCOA), SCAQMD, and EPA guidance (CAPCOA, 2011; SCAQMD, 2012b; USEPA, 2010; USEPA, 2011a; USEPA, 2014), the conversion of nitrogen oxide (NO_X) to NO_2 in ambient air was simulated in AERMOD using the Ozone Limiting Method (OLM). The following in-stack NO_2/NO_X ratios were assumed: 0.1 for container ship propulsion engines and boilers (derived from USEPA, 2000); 0.11 for diesel heavy-duty trucks (CAPCOA, 2011); 0.25 for worker vehicles (CAPCOA, 2011); and 0.20 for all other diesel internal combustion engines, including ship auxiliary engines, tugboats, locomotives, and cargo handling equipment

(CAPCOA, 2011). For the OLM, AERMOD used hourly ambient ozone concentration data from the SCAQMD's North Long Beach monitoring station.

As recommended by the SCAQMD (2009), all sources were modeled with urban dispersion coefficients. An urban population of 9,862,049, representative of Los Angeles County, was used in AERMOD. Receptor and source base elevations were determined from USGS National Elevation Dataset (NED) files using AERMAP, version 11103 (USEPA 2011b). All coordinates were referenced to UTM NAD83, Zone 11.

3.1.4 Temporal Distribution Assumptions

For dispersion modeling purposes, operational emissions were assumed to occur during the times specified in Table B2-2. Emissions were assumed to be uniformly distributed during the specific time periods described in the table. The temporal distribution assumptions are identical for the baseline and project scenarios.

Table B2-2. Temporal Distribution of Emissions in AERMOD

Source Description	Temporal Distribution	
Container Ships	24 hours per day	
Tugboats	24 hours per day	
Locomotives	24 hours per day	
Cargo Handling Equipment [a]	10.0 percent 12 a.m. – 6 a.m. 25.0 percent 6 a.m. – 12 p.m. 32.5 percent 12 p.m. – 6 p.m. 32.5 percent 6 p.m. – 12 a.m.	
Trucks [b]	4.46 percent 12 a.m. – 1 a.m. 3.50 percent 1 a.m. – 2 a.m. 1.33 percent 2 a.m. – 3 a.m. 0.38 percent 3 a.m. – 4 a.m. 0.38 percent 4 a.m. – 5 a.m. 0.42 percent 5 a.m. – 6 a.m. 0.46 percent 6 a.m. – 7 a.m. 1.13 percent 7 a.m. – 8 a.m. 5.38 percent 8 a.m. – 9 a.m. 6.08 percent 9 a.m. – 10 a.m. 6.00 percent 10 a.m. – 11 a.m. 6.38 percent 11 a.m. – 12 p.m.	5.21 percent 12 p.m. – 1 p.m. 7.04 percent 1 p.m. – 2 p.m. 6.67 percent 2 p.m. – 3 p.m. 6.21 percent 3 p.m. – 4 p.m. 4.54 percent 4 p.m. – 5 p.m. 2.63 percent 5 p.m. – 6 p.m. 5.96 percent 6 p.m. – 7 p.m. 6.25 percent 7 p.m. – 8 p.m. 5.63 percent 8 p.m. – 9 p.m. 5.25 percent 9 p.m. – 10 p.m. 3.54 percent 10 p.m. – 11 p.m. 5.21 percent 11 p.m. – 12 a.m.
Worker Vehicles	Same distribution as trucks	

Notes:
[a] The temporal distribution for cargo handling equipment was derived from the truck distribution since a correlation exists between cargo handling and drayage truck visits. The truck factors were grouped into four 6-hour blocks to give less hour-by-hour variability than trucks because of a more steady-state workforce operating the cargo handling equipment.
[b] The temporal distribution for trucks was provided by the traffic study.

3.1.5 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 impacts, and identify maximum impact locations. Initial AERMOD runs were conducted with a 22 by 22 kilometer (km) coarse grid, with receptors placed 1,000 meters (m) apart, centered over the Project site. Embedded within this receptor grid were additional receptors, placed 500 m apart, covering an area 9 km x 12 km. Also embedded were additional receptors, placed 250 m apart, covering an area 7.5 km x 10.5 km in which maximum concentrations were anticipated to occur.

Once the locations of the maximum concentrations were identified on the aforementioned coarse grid, additional AERMOD runs were conducted with a fine grid of receptors, placed 50 m apart, centered over locations of the maximum coarse grid concentrations and along the project site boundary. Receptors over water and in modeled roadway traffic lanes were not considered in determining the maximum receptor locations because any human exposure there would be brief and transient.

Figures B2-4 and B2-5 show the receptor grids used in AERMOD for criteria pollutants.

Figure B2-4. AERMOD Coarse Grid Receptors (Far Field)

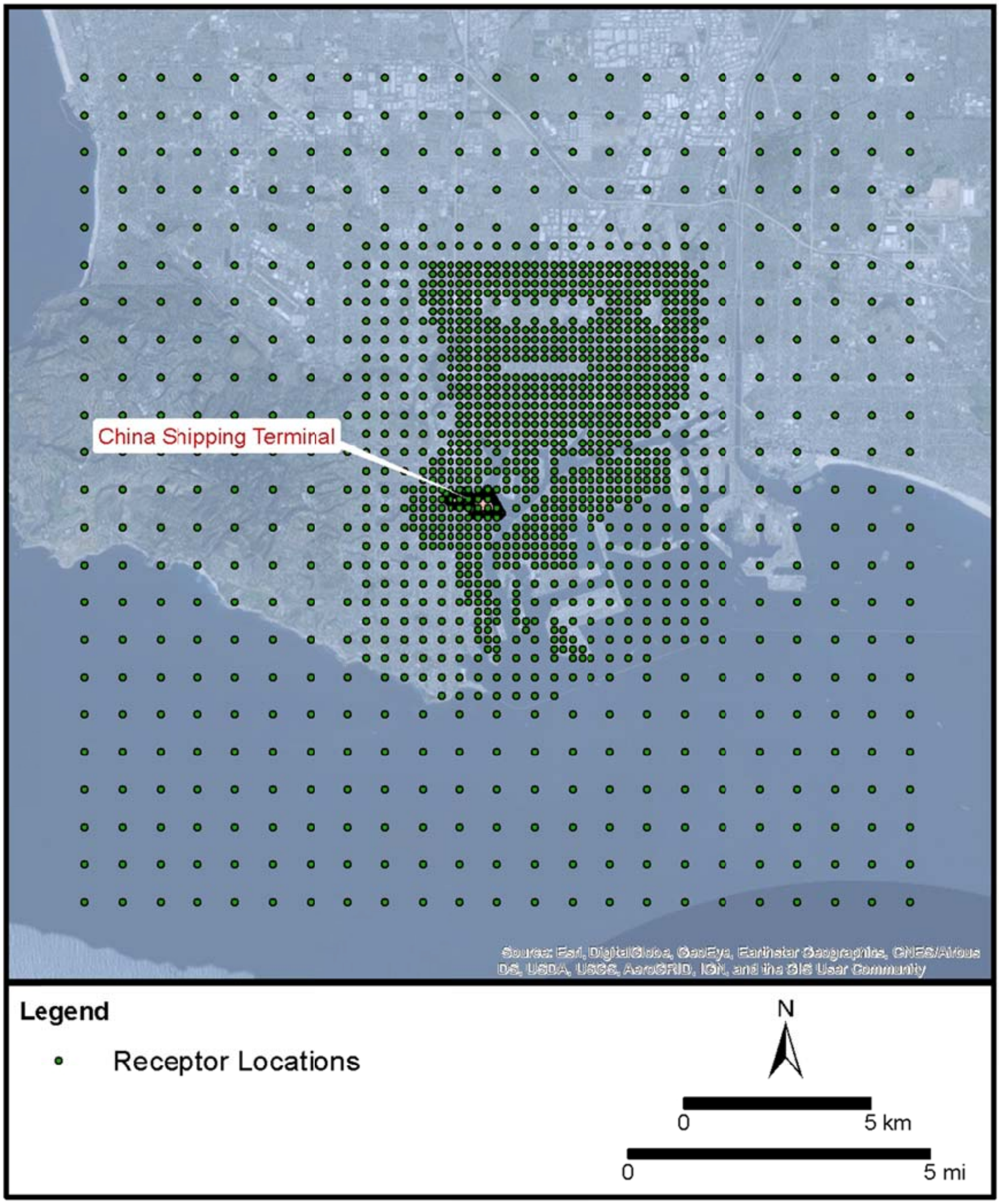
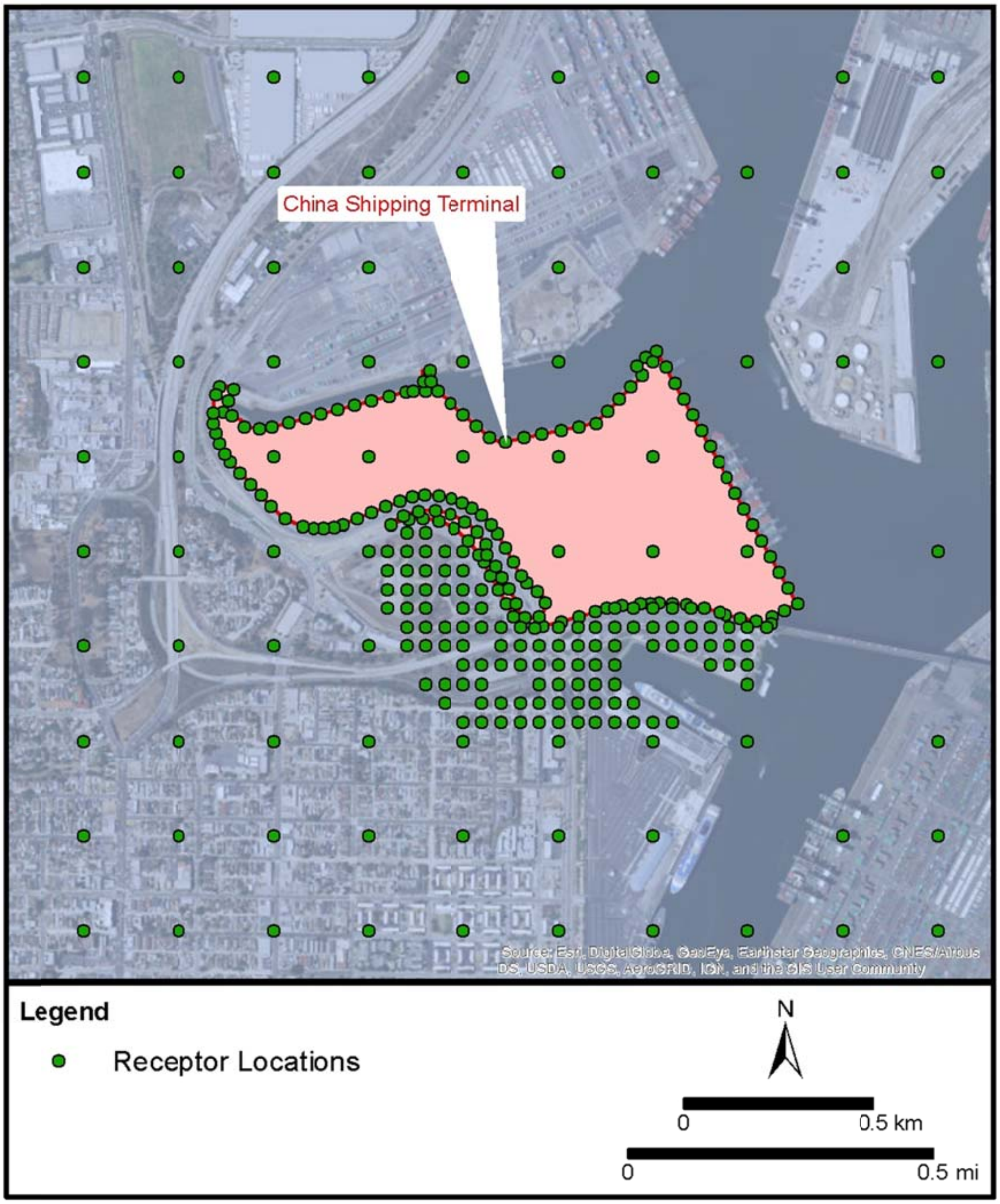


Figure B2-5. AERMOD Fine and Coarse Grid Receptors (Near Field)



3.2 Methodology for Determination of Impacts

NO_2, PM_{10} and $PM_{2.5}$ concentrations associated with the Revised Project and FEIR Mitigated Project were modeled for each analysis year (2023, 2030, 2036, and 2045). Because prior Port projects have shown that SO_2 and CO are unlikely to exceed the significance thresholds, a conservative screening approach was used for SO_2 and CO where all AERMOD sources were modeled with their maximum emissions even if they would occur in different analysis years. Thus, a single future year scenario was modeled for CO and SO_2 whereas four future year scenarios were modeled for NO_2, $PM_{2.5}$ and PM_{10}. The pollutant concentrations modeled by AERMOD were compared to the significance thresholds in Table B2-3 to assess impacts.

3.2.1 Methodology for NO_2, SO_2, and CO

The significance concentration thresholds for NO_2, SO_2, and CO are absolute thresholds based on the ambient air quality standards. Therefore, the change in modeled Project concentrations relative to existing conditions is determined at each receptor, and the value at the receptor with the highest change in concentration is added to the ambient background concentration to yield a total concentration. The background concentration represents the maximum ambient concentration in the vicinity of the project site excluding the incremental contribution from the Revised Project or FEIR Mitigated Project. Ambient background concentrations were obtained from the Wilmington Community Station using the most recent 3-year period of recorded data publicly available, May 2013 through April 2016. Table B2-4 shows the derivation of the background concentrations.

Because the Wilmington Community Station is part of POLA's site-specific monitoring network, it was assumed that the station captures the existing air quality effects of the CS Terminal. Therefore, the change in Revised Project or FEIR Mitigated Project concentrations relative to existing conditions was determined by subtracting modeled Unmitigated Baseline concentrations from the modeled scenario concentrations (the Unmitigated Baseline represents existing conditions in 2014). Subtracting modeled Mitigated Baseline concentrations would be inappropriate since the Mitigated Baseline conditions are not reflected in the observed background concentrations. Significance is determined by comparing the total concentrations (i.e, change in scenario concentrations plus background) to the thresholds. The Port's approach for determining total concentrations – that is, adding the site-specific background concentration to modeled scenario concentration minus modeled existing concentration – was endorsed by the SCAQMD (SCAQMD 2012a and SCAMQD 2012b).

To be consistent with the federal 1-hour NO_2 standard, the modeled federal 1-hour NO_2 concentrations represent the 98th percentile (8th highest) of the annual distribution of daily maximum 1-hour concentrations. Although compliance with the federal 1-hour NO_2 standard is based on a three-year average of the 98th percentile 1-hour concentrations, the EPA states that the use of one or more years of available site specific meteorological data serves as an unbiased estimate of the 3-year average for purposes of modeling demonstrations of compliance with the NAAQS (EPA, 2010). All other modeled pollutant concentrations, including the state 1-hour NO_2 concentration, represent the highest concentrations over the entire year of meteorological data.

3.2.2 Methodology for PM_{10} and $PM_{2.5}$

The significance concentration thresholds for PM_{10} and $PM_{2.5}$ are incremental thresholds. Concentration increments relative to baseline are compared directly to the thresholds without adding background concentrations. Therefore, Revised Project and FEIR Mitigated Project impacts were determined by subtracting modeled Unmitigated and Mitigated Baseline concentrations from modeled Revised Project and FEIR Mitigated Project concentrations (project minus baseline) at each receptor. Significance is determined by comparing the modeled receptor with the greatest increment to the thresholds. Revised Project and FEIR Mitigated Project concentration increments relative to the Unmitigated Baseline and Mitigated Baseline were determined and compared to the significance thresholds separately.

Table B2-3: SCAQMD Significance Thresholds for Operations

Air Pollutant	Operation Ambient Concentration Threshold
Nitrogen Dioxide (NO_2)[a]	
1-hour average (federal)[b]	0.100 ppm (188 µg/m^3)
1-hour average (state)	0.18 ppm (338 µg/m^3)
Annual average (federal)[c]	0.0534 ppm (100 µg/m^3)
Annual average (state)	0.030 ppm (57 µg/m^3)
Sulfur Dioxide (SO_2)[a]	
1-hour average (federal)[d]	0.075 ppm (197 µg/m^3)
1-hour average (state)	0.250 ppm (655 µg/m^3)
24-hour average	0.040 ppm (105 µg/m^3)
Carbon Monoxide (CO)[a]	
1-hour average	20 ppm (23,000 µg/m^3)
8-hour average	9.0 ppm (10,000 µg/m^3)
Particulates (PM_{10} or $PM_{2.5}$)[e]	
24-hour average (PM_{10} and $PM_{2.5}$)	2.5 µg/m^3
Annual average (PM_{10} only)	1.0 µg/m^3

Notes:

[a] The NO_2, SO_2, and CO thresholds are absolute thresholds; the maximum predicted Project impact is added to the background concentration and compared to the threshold.

[b] This analysis included the use of both the current SCAQMD NO_2 threshold (0.18 ppm), which is the state standard, and the newer 1-hour federal ambient air quality standard (0.100 ppm). To attain the federal standard, the 3-year average of the 98th percentile of the annual distribution of daily maximum 1-hour averages at a receptor must not exceed 0.100 ppm.

[c] For the purpose of determining significance, the more stringent annual state NO_2 standard of 57 µg/m^3 is used in instead of the higher annual federal standard.

[d] To attain the SO_2 federal 1-hour standard, the 3-year average of the 99th percentile of the annual distribution of daily maximum 1-hour averages at a receptor must not exceed 0.075 ppm. This analysis conservatively used the highest modeled 1-hour SO_2 concentration.

[e] The PM_{10} and $PM_{2.5}$ thresholds are incremental thresholds; the maximum Project impact relative to baseline is compared to these thresholds without adding a background concentration.

Sources:

SCAQMD 2015; USEPA 2017c.

Table B2-4. Background Concentrations Measured at the Wilmington Community Station

Pollutant	Averaging Period	Monitored Concentration (ppm) [a,f]			Background Concentration [c]	
		2013	2014	2015	(ppm)	($\mu g/m^3$) [d]
NO_2	1-Hour State	0.092	0.085	0.086	0.092	176
	1-Hour Federal [b]	--	--	--	0.068	130
	Annual	0.018	0.017	0.017	0.018	34
CO	1-Hour	4.0	3.8	3.9	4.0	4,661
	8-Hour	2.9	2.5	2.4	2.9	3,379
SO_2	1-Hour State	0.050	0.027	0.040	0.050	133
	1-Hour Federal [e]	--	--	--	0.017	45
	24-Hour	0.006	0.005	0.005	0.006	16

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 (2013-2015) of the 98th percentile of the annual distribution of daily maximum 1-hour average concentrations.

c. The background concentrations for the 1-hour federal NO_2 and SO_2 concentrations 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 ($\mu g/m^3$) is calculated as follows: $\mu g/m^3$ = ppm x MW / 0.02404. 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 (2013-2015) of the 99th percentile of the annual distribution of daily maximum 1-hour average concentrations.

f. The years reported in this table represent the following 12-month periods: Year 2013 represents May 2013 - April 2014, Year 2014 represents May 2014 - April 2015, and Year 2015 represents May 2015 - April 2016.

Source: POLA 2014; 2015; 2016.

3.3 Predicted Air Quality Impacts

3.3.1 Revised Project

Table B2-5 presents the maximum off-site NO_2 concentration impacts and Table B2-6 presents maximum off-site SO_2 and CO concentration impacts of the Revised Project. NO_2 impacts are presented for each analysis year. Because prior Port projects have shown that SO_2 and CO are unlikely to exceed the significance thresholds, a conservative screening approach was used for SO_2 and CO where all AERMOD sources were modeled with their maximum emissions even if they would occur in different analysis years. Results show that impacts of the Revised Project would be below the SCAQMD significance thresholds for all averaging times for NO_2, SO_2, CO.

Table B2-5. Maximum Off-Site Ambient NO_2 Concentrations Associated with the Revised Project

Pollutant	Averaging Period	Analysis Year	Background Concentration ($\mu g/m^3$)	Maximum Modeled Project Concentration Increment ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	Significance Threshold ($\mu g/m^3$)	Threshold Exceeded?
NO_2	Federal 1-hour	2023	130	< 0	130	188	No
		2030	130	< 0	130	188	No
		2036	130	< 0	130	188	No
		2045	130	< 0	130	188	No
	State 1-hour	2023	176	< 0	176	338	No
		2030	176	< 0	176	338	No
		2036	176	< 0	176	338	No
		2045	176	< 0	176	338	No
	Annual	2023	34	< 0	34	57	No
		2030	34	0.06	34	57	No
		2036	34	< 0	34	57	No
		2045	34	< 0	34	57	No

[a] Exceedances of the thresholds are indicated in bold.

[b] The federal 1-hour NO_2 modeled concentration represents the 98th percentile of the daily maximum 1-hour average concentrations. The state 1-hour NO_2 modeled concentration represents the maximum concentration.

[c] The background concentrations were obtained from the Wilmington Community Monitoring Station (Saints Peter and Paul School).

[d] The Modeled Project Concentration Increment represents the modeled concentration of the Project minus the modeled concentration of existing terminal operations (i.e., Unmitigated Baseline).

[e] The Total Concentration equals the Background Concentration plus the Maximum Modeled Project Concentration Increment.

[f] A Maximum Modeled Project Concentration Increment less than zero means that the Project concentration would be less than the Baseline concentration at every modeled receptor.

Table B2-6. Maximum Off-Site Ambient SO_2 and CO Concentrations Associated with the Revised Project

Pollutant	Averaging Period	Background Concentration ($\mu g/m^3$)	Maximum Modeled Project Concentration Increment ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	Significance Threshold ($\mu g/m^3$)	Threshold Exceeded?
SO_2	Federal 1-hour	45	1.2	46	197	No
	State 1-hour	133	1.2	134	655	No
	24-hour	16	0.1	16	105	No
CO	1-hour	4,661	6,735	11,396	23,000	No
	8-hour	3,379	4,739	8,118	10,000	No

[a] Exceedances of the thresholds are indicated in bold.

[b] The background concentrations were obtained from the Wilmington Community Monitoring Station (Saints Peter and Paul School).

[c] The Modeled Project Concentration Increment represents the modeled concentration of the Project minus the modeled concentration of existing terminal operations (i.e., Unmitigated Baseline).

[d] The Total Concentration equals the Background Concentration plus the Maximum Modeled Project Concentration Increment.

[e] A Maximum Modeled Project Concentration Increment less than zero means that the Project concentration would be less than the Baseline concentration at every modeled receptor.

Table B2-7 presents maximum off-site incremental concentrations for PM_{10} and $PM_{2.5}$. Incremental concentrations of PM_{10} and $PM_{2.5}$ represent differences between concentrations due to emissions from the Revised Project and concentrations due to emissions under the 2014 Mitigated Baseline. Incremental PM_{10} and $PM_{2.5}$ concentrations relative to the Unmitigated Baseline are shown in Table B2-8 for information purposes only. Results show that impacts of the Revised Project would be below the SCAQMD significance thresholds 24-hour PM_{10} and $PM_{2.5}$. Annual average PM_{10} impacts would exceed the SCAQMD threshold in 2030, 2036, and 2045 relative to either baseline.

Table B2-7. Maximum Off-Site Ambient PM_{10} and $PM_{2.5}$ Concentration Increments Associated with the Revised Project minus Mitigated Baseline

Pollutant	Averaging Period	Analysis Year	Maximum Modeled Project Concentration Increment (µg/m³)[b,c]	Significance Threshold (µg/m³)[d]	Threshold Exceeded?[a]
PM_{10}	24-hour	2023	1.9	2.5	No
		2030	2.4	2.5	No
		2036	2.2	2.5	No
		2045	2.3	2.5	No
	Annual	2023	0.7	1.0	No
		2030	**1.9**	1.0	**Yes**
		2036	**1.9**	1.0	**Yes**
		2045	**1.2**	1.0	**Yes**
$PM_{2.5}$	24-hour	2023	0.04	2.5	No
		2030	0.2	2.5	No
		2036	0.08	2.5	No
		2045	0.07	2.5	No

[a] Exceedances of the thresholds are indicated in bold.

[b] The Modeled Project Concentration Increment represents the modeled concentration of the Project minus the modeled concentration of the Baseline.

[c] A Maximum Modeled Project Concentration Increment less than zero means that the Project concentration would be less than the Baseline concentration at every modeled receptor.

[d] Because the thresholds for PM_{10} and $PM_{2.5}$ are incremental thresholds, background concentrations are not added to the Maximum Modeled Project Concentration Increment.

Table B2-8. Maximum Off-Site Ambient PM_{10} and $PM_{2.5}$ Concentration Increments Associated with the Revised Project minus Unmitigated Baseline

Pollutant	Averaging Period	Analysis Year	Maximum Modeled Project Concentration Increment ($\mu g/m^3$)[b,c]	Significance Threshold ($\mu g/m^3$)[d]	Threshold Exceeded?[a]
PM_{10}	24-hour	2023	1.2	2.5	No
		2030	1.8	2.5	No
		2036	1.6	2.5	No
		2045	1.6	2.5	No
	Annual	2023	0.6	1.0	No
		2030	**1.8**	1.0	**Yes**
		2036	**1.8**	1.0	**Yes**
		2045	**1.1**	1.0	**Yes**
$PM_{2.5}$	24-hour	2023	0.01	2.5	No
		2030	0.005	2.5	No
		2036	< 0	2.5	No
		2045	< 0	2.5	No

[a] Exceedances of the thresholds are indicated in bold.

[b] The Modeled Project Concentration Increment represents the modeled concentration of the Project minus the modeled concentration of the Baseline.

[c] A Maximum Modeled Project Concentration Increment less than zero means that the Project concentration would be less than the Baseline concentration at every modeled receptor.

[d] Because the thresholds for PM_{10} and $PM_{2.5}$ are incremental thresholds, background concentrations are not added to the Maximum Modeled Project Concentration Increment.

Figure B2-6 shows the locations of the maximum modeled concentrations of NO_2, SO_2, and CO for the Revised Project maximum modeled concentration increments as listed in Tables B2-5 and B2-6. Figure B2-7 shows the locations of the maximum modeled concentrations of PM_{10} and $PM_{2.5}$ for the Revised Project relative to the Mitigated Baseline as listed in Table B2-7. Figure B2-8 shows the locations of the maximum modeled concentrations of PM_{10} and $PM_{2.5}$ for the Revised Project relative to the Unmitigated Baseline as listed in Table B2-8. In all three figures, only the receptor locations with modeled concentration increments greater than zero are shown because negative increments would approach a maximum value of zero infinitely far away from the project site.

Figure B2-6. Locations of Maximum Modeled Concentrations of NO_2, SO_2, and CO for the Revised Project.

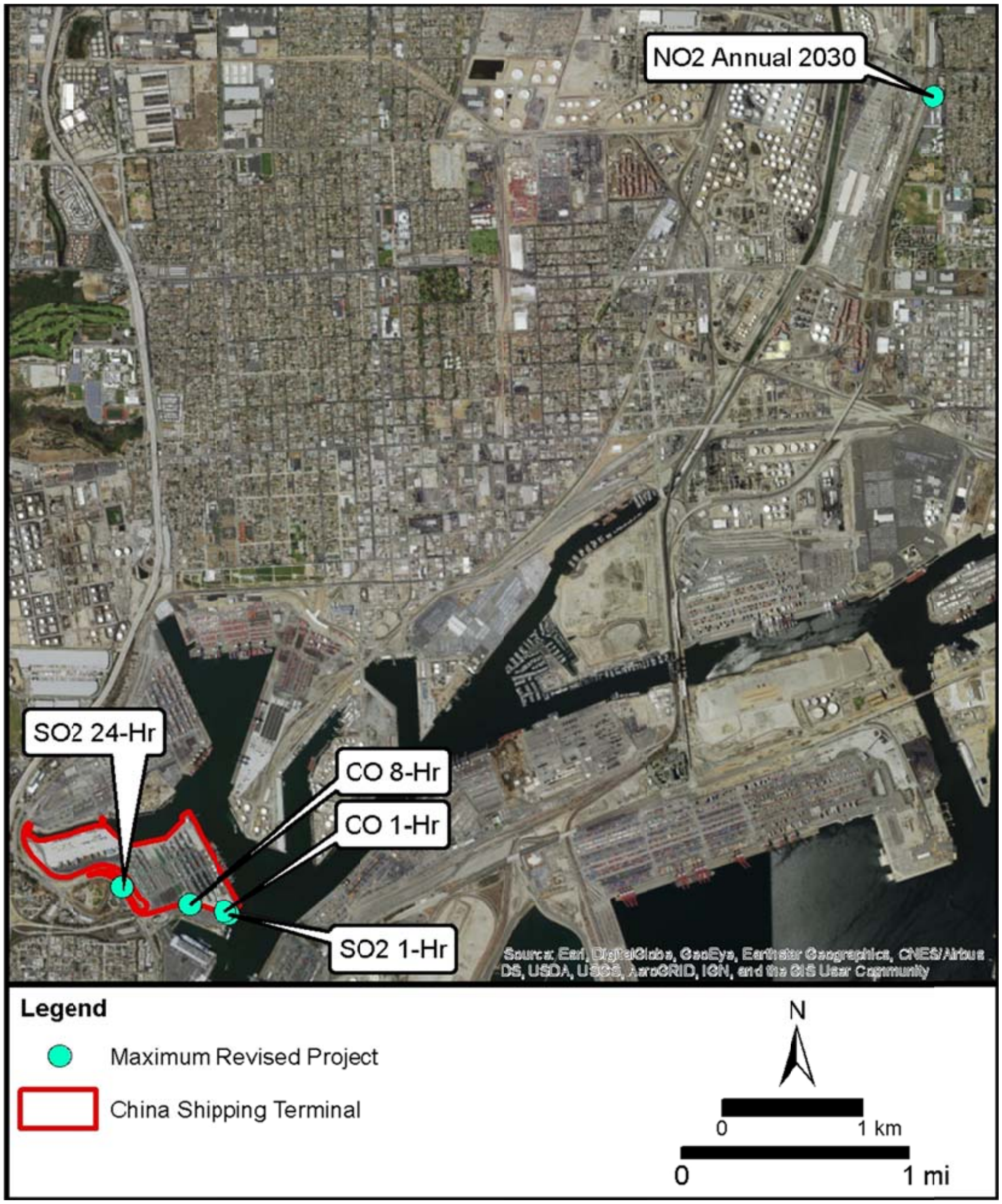


Figure B2-7. Locations of Maximum Modeled Concentrations of PM_{10} and $PM_{2.5}$ for the Revised Project minus Mitigated Baseline

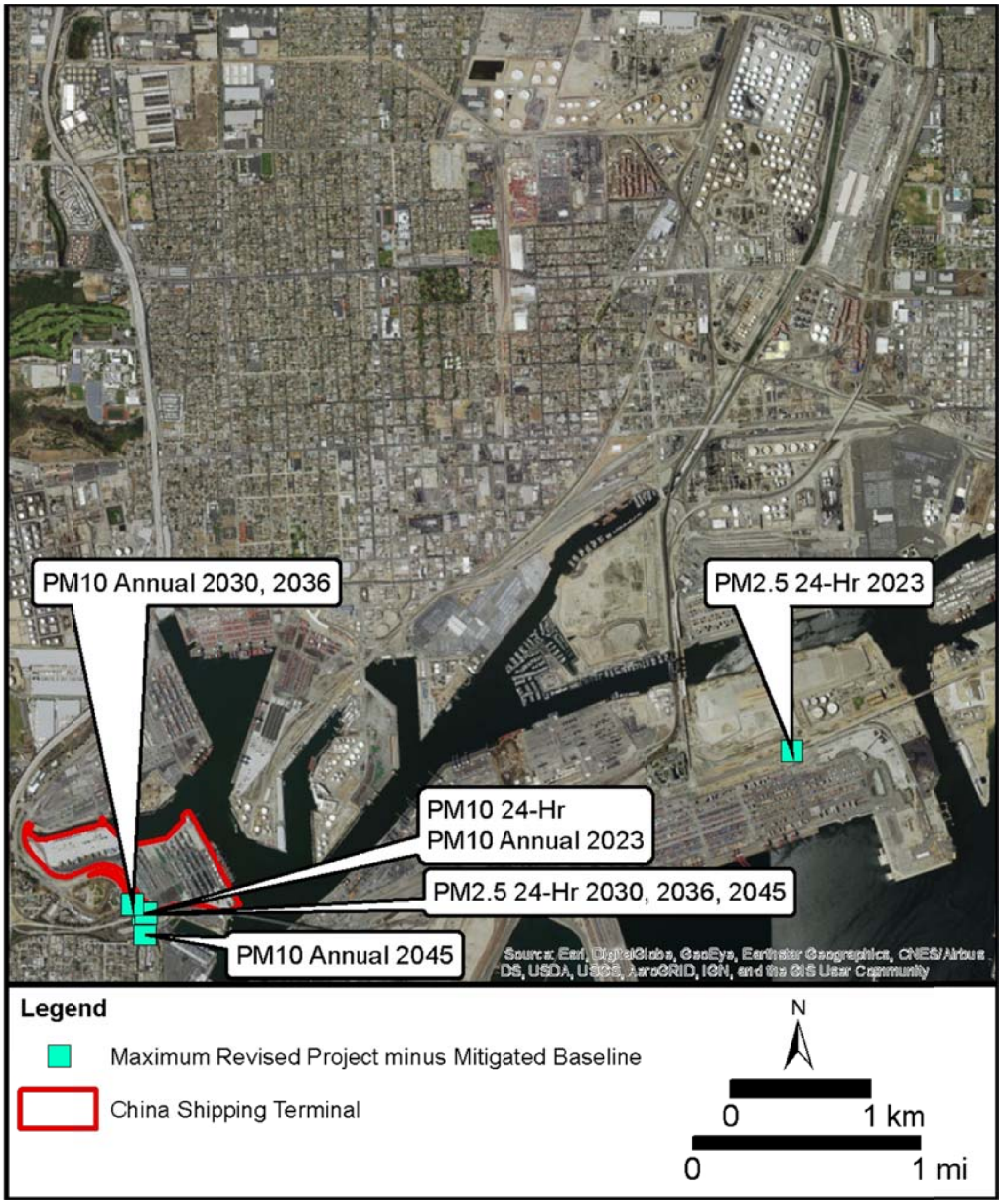
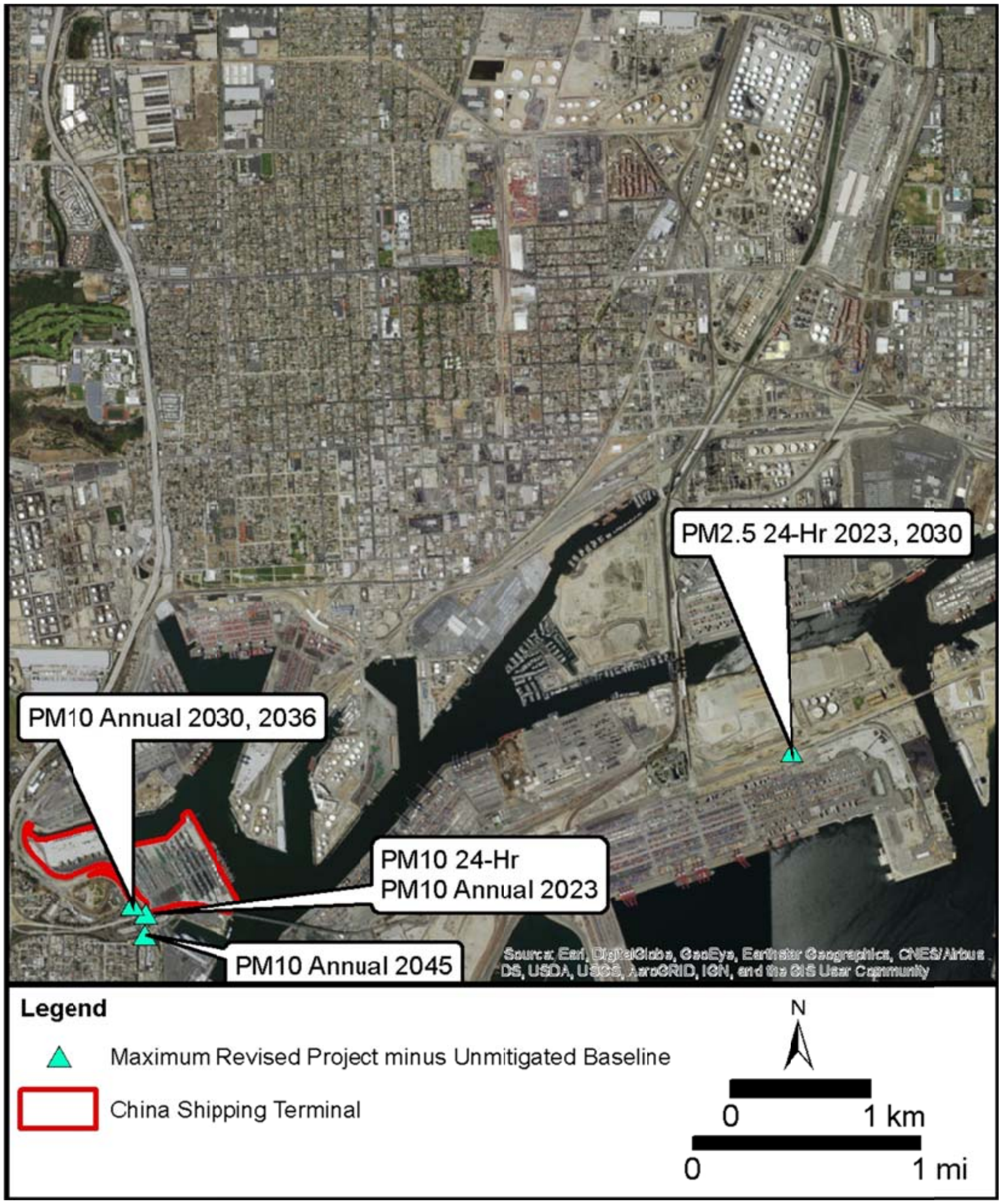


Figure B2-8. Locations of Maximum Modeled Concentrations of PM_{10} and $PM_{2.5}$ for the Revised Project minus Unmitigated Baseline



Figures B2-9, B2-10, and B2-11 show the areas where the annual PM_{10} impacts of the Revised Project relative to the Mitigated Baseline would exceed the SCAQMD threshold in 2030, 2036, and 2045, respectively. In each figure, the area of exceedance is located near the southwest terminal boundary. The area of exceedance does not extend over a residential area in any analysis year.

Figure B2-9. Area of Threshold Exceedance for the Revised Project Minus Mitigated Baseline; 2030 Annual PM_{10} Concentrations

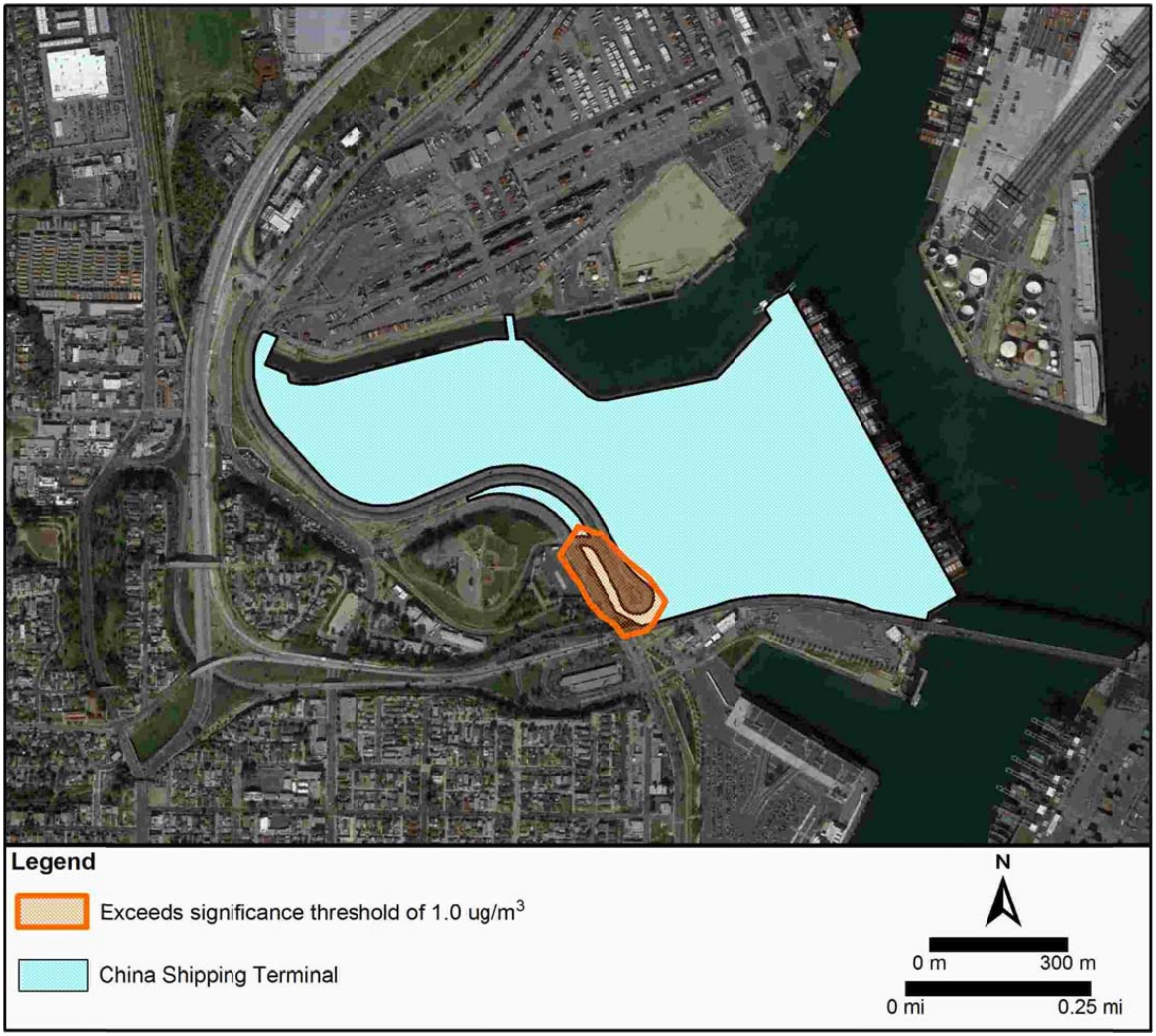


Figure B2-10. Area of Threshold Exceedance for the Revised Project Minus Mitigated Baseline; 2036 Annual PM_{10} Concentrations

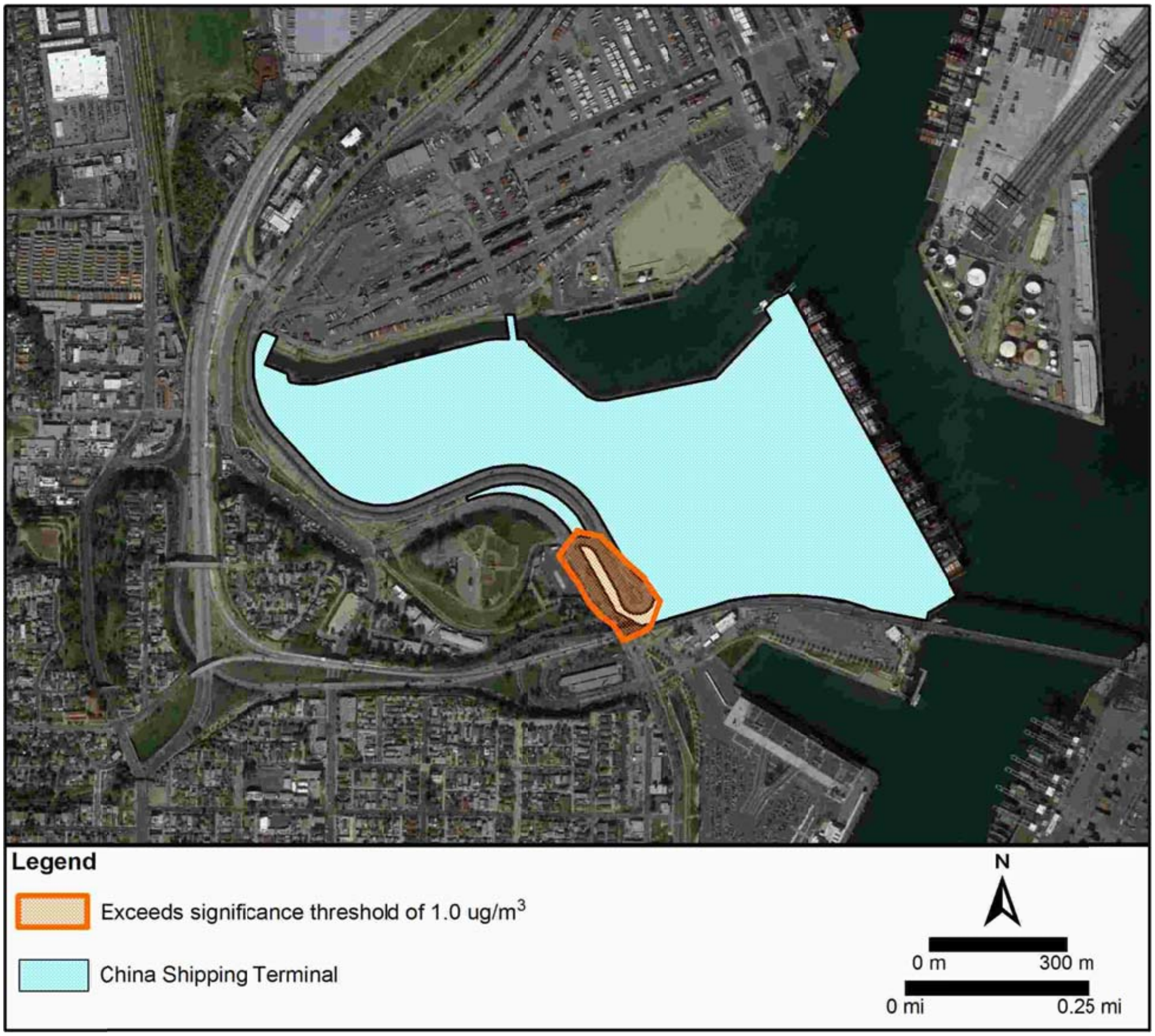


Figure B2-11. Area of Threshold Exceedance for the Revised Project Minus Mitigated Baseline; 2045 Annual PM_{10} Concentrations

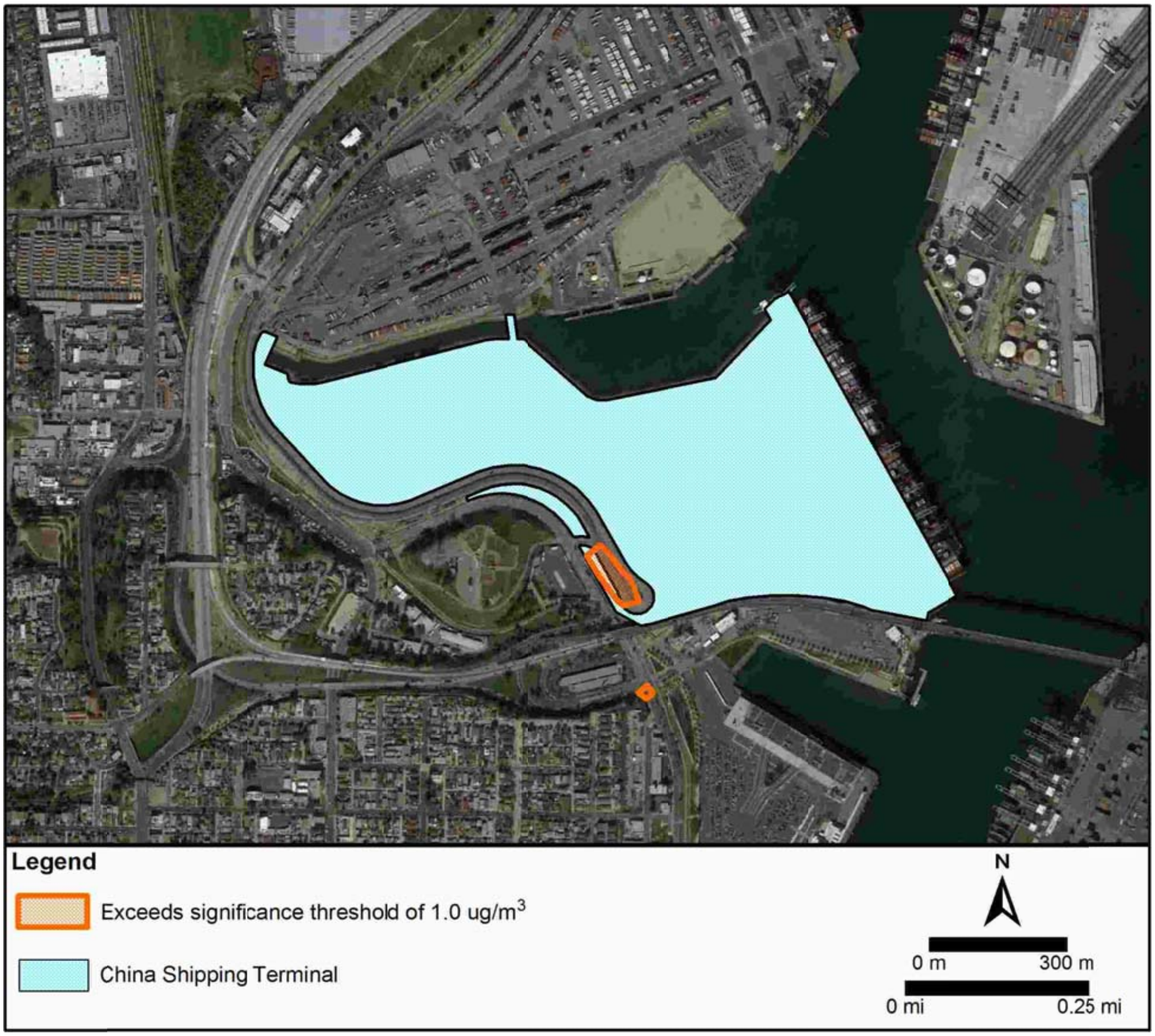


Table B2-9 presents the contributions by source type to the maximum annual average PM_{10} impact in 2030, the analysis year with the greatest predicted impact. Trucks would contribute nearly 69 percent of the modeled Project concentration at the maximum receptor, followed by worker vehicles, at approximately 27 percent. The relatively large contribution of trucks and worker vehicles to the maximum annual average PM_{10} impact (approximately 95 percent of the impact) is explained by the receptor's very close proximity to Harbor Boulevard and the Knoll entry road, near the southwest terminal boundary.

Table B2-9. Source Contributions to 2030 Annual PM_{10} Concentrations at the Maximum Increment Receptor for the Revised Project

Source Category	Contribution
Ships in Transit	0.11%
Ships at Berth	0.07%
Ships at Anchorage	0.00%
Tugboats	0.02%
Trucks at Gates and On-Terminal	24.46%
Trucks Driving Off-Terminal	44.23%
Switch Locomotives	0.06%
Line Haul Locomotives	0.06%
Cargo Handling Equipment	4.45%
Worker Vehicles	26.52%

3.3.2 FEIR Mitigated Project

Impacts associated with the FEIR Mitigated Project are presented for informational purposes to enable a comparison to the Revised Project. Table B2-10 presents the maximum off-site NO_2 concentration impacts and Table B2-11 presents maximum off-site SO_2 and CO concentration impacts of the FEIR Mitigated Project. NO_2 impacts are presented for each analysis year. Because prior Port projects have shown that SO_2 and CO are unlikely to exceed the significance thresholds, a conservative screening approach was used for SO_2 and CO whereby all AERMOD sources were modeled with their maximum emissions even if they would occur in different analysis years. Results show that impacts of the FEIR Mitigated Project would be below the SCAQMD significance thresholds for all averaging times for NO_2, SO_2, and CO.

Table B2-10. Maximum Off-Site Ambient NO_2 Concentrations Associated with the FEIR Mitigated Project

Pollutant[b]	Averaging Period	Analysis Year	Background Concentration[c] (µg/m³)	Maximum Modeled Project Concentration Increment (µg/m³)[d,f]	Total Concentration[e] (µg/m³)	Significance Threshold (µg/m³)	Threshold Exceeded?[a]
NO_2	Federal 1-hour	2023	130	< 0	130	188	No
		2030	130	< 0	130	188	No
		2036	130	< 0	130	188	No
		2045	130	< 0	130	188	No
	State 1-hour	2023	176	< 0	176	338	No
		2030	176	< 0	176	338	No
		2036	176	< 0	176	338	No
		2045	176	< 0	176	338	No
	Annual	2023	34	< 0	34	57	No
		2030	34	0.07	34	57	No
		2036	34	< 0	34	57	No
		2045	34	< 0	34	57	No

[a] Exceedances of the thresholds are indicated in bold.

[b] The federal 1-hour NO_2 modeled concentration represents the 98th percentile of the daily maximum 1-hour average concentrations. The state 1-hour NO_2 modeled concentration represents the maximum concentration.

[c] The background concentrations were obtained from the Wilmington Community Monitoring Station (Saints Peter and Paul School).

[d] The Modeled Project Concentration Increment represents the modeled concentration of the Project minus the modeled concentration of existing terminal operations (i.e., Unmitigated Baseline).

[e] The Total Concentration equals the Background Concentration plus the Maximum Modeled Project Concentration Increment.

[f] A Maximum Modeled Project Concentration Increment less than zero means that the Project concentration would be less than the Baseline concentration at every modeled receptor.

Table B2-11. Maximum Off-Site Ambient SO_2 and CO Concentrations Associated with the FEIR Mitigated Project

Pollutant	Averaging Period	Background Concentration[b] (µg/m³)	Maximum Modeled Project Concentration Increment (µg/m³)[c,e]	Total Concentration[d] (µg/m³)	Significance Threshold (µg/m³)	Threshold Exceeded?[a]
SO_2	Federal 1-hour	45	1.2	46	197	No
	State 1-hour	133	1.2	134	655	No
	24-hour	16	0.09	16	105	No
CO	1-hour	4,661	< 0	4,661	23,000	No
	8-hour	3,379	< 0	3,379	10,000	No

[a] Exceedances of the thresholds are indicated in bold.

[b] The background concentrations were obtained from the Wilmington Community Monitoring Station (Saints Peter and Paul School).

[c] The Modeled Project Concentration Increment represents the modeled concentration of the Project minus the modeled concentration of existing terminal operations (i.e., Unmitigated Baseline).

[d] The Total Concentration equals the Background Concentration plus the Maximum Modeled Project Concentration Increment.

[e] A Maximum Modeled Project Concentration Increment less than zero means that the Project concentration would be less than the Baseline concentration at every modeled receptor.

Table B2-12 presents maximum off-site incremental concentrations for PM_{10} and $PM_{2.5}$. Incremental concentrations of PM_{10} and $PM_{2.5}$ represent differences between concentrations due to emissions from the FEIR Mitigated Project and concentrations due to emissions under the 2014 Mitigated Baseline. Incremental PM_{10} and $PM_{2.5}$

concentrations relative to the Unmitigated Baseline are shown in Table B2-13. Results show that impacts of the FEIR Mitigated Project would be below the SCAQMD significance thresholds 24-hour PM_{10} and $PM_{2.5}$. Annual average PM_{10} impacts would exceed the SCAQMD threshold in 2045 relative to either baseline.

Table B2-12. Maximum Off-Site Ambient PM_{10} and $PM_{2.5}$ Concentration Increments Associated with the FEIR Mitigated Project minus Mitigated Baseline

Pollutant	Averaging Period	Analysis Year	Maximum Modeled Project Concentration Increment[b,c,d] (μg/m³)	Significance Threshold (μg/m³)	Threshold Exceeded?[a]
PM_{10}	24-hour	2023	2.0	2.5	No
		2030	2.3	2.5	No
		2036	2.3	2.5	No
		2045	2.3	2.5	No
	Annual	2023	0.7	1.0	No
		2030	0.8	1.0	No
		2036	0.8	1.0	No
		2045	**1.5**	1.0	**Yes**
$PM_{2.5}$	24-hour	2023	0.07	2.5	No
		2030	0.07	2.5	No
		2036	0.1	2.5	No
		2045	0.1	2.5	No

[a] Exceedances of the thresholds are indicated in bold.

[b] The Modeled Project Concentration Increment represents the modeled concentration of the Project minus the modeled concentration of the Baseline.

[c] A Maximum Modeled Project Concentration Increment less than zero means that the Project concentration would be less than the Baseline concentration at every modeled receptor.

[d] Because the thresholds for PM_{10} and $PM_{2.5}$ are incremental thresholds, background concentrations are not added to the Maximum Modeled Project Concentration Increment.

Table B2-13. Maximum Off-Site Ambient PM_{10} and $PM_{2.5}$ Concentration Increments Associated with the FEIR Mitigated Project minus Unmitigated Baseline

Pollutant	Averaging Period	Analysis Year	Maximum Modeled Project Concentration Increment[b,c,d] ($\mu g/m^3$)	Significance Threshold ($\mu g/m^3$)	Threshold Exceeded?[a]
PM_{10}	24-hour	2023	1.4	2.5	No
		2030	1.7	2.5	No
		2036	1.6	2.5	No
		2045	1.7	2.5	No
	Annual	2023	0.6	1.0	No
		2030	0.7	1.0	No
		2036	0.7	1.0	No
		2045	**1.4**	1.0	**Yes**
$PM_{2.5}$	24-hour	2023	0.01	2.5	No
		2030	0.0008	2.5	No
		2036	< 0	2.5	No
		2045	< 0	2.5	No

[a] Exceedances of the thresholds are indicated in bold.

[b] The Modeled Project Concentration Increment represents the modeled concentration of the Project minus the modeled concentration of the Baseline.

[c] A Maximum Modeled Project Concentration Increment less than zero means that the Project concentration would be less than the Baseline concentration at every modeled receptor.

[d] Because the thresholds for PM_{10} and $PM_{2.5}$ are incremental thresholds, background concentrations are not added to the Maximum Modeled Project Concentration Increment.

Figure B2-12 shows the locations of the maximum modeled concentrations of NO_2, SO_2, and CO for the FEIR Mitigated Project. The receptor locations correspond to the results in Tables B2-10 and B2-11. Figure B2-13 shows the locations of the maximum modeled concentrations of PM_{10} and $PM_{2.5}$ for the FEIR Mitigated Project relative to the Mitigated Baseline. The receptor locations correspond to the results in Table B2-12. Figure B2-14 shows the locations of the maximum modeled concentrations of PM_{10} and $PM_{2.5}$ for the FEIR Mitigated Project relative to the Unmitigated Baseline. The receptor locations correspond to the results in Table B2-13. In all three figures, only the receptor locations with modeled concentration increments greater than zero are shown in the figure because negative increments would approach a maximum value of zero infinitely far away from the project site.

Figure B2-12. Locations of Maximum Modeled Concentrations of NO_2 and SO_2 for the FEIR Mitigated Project

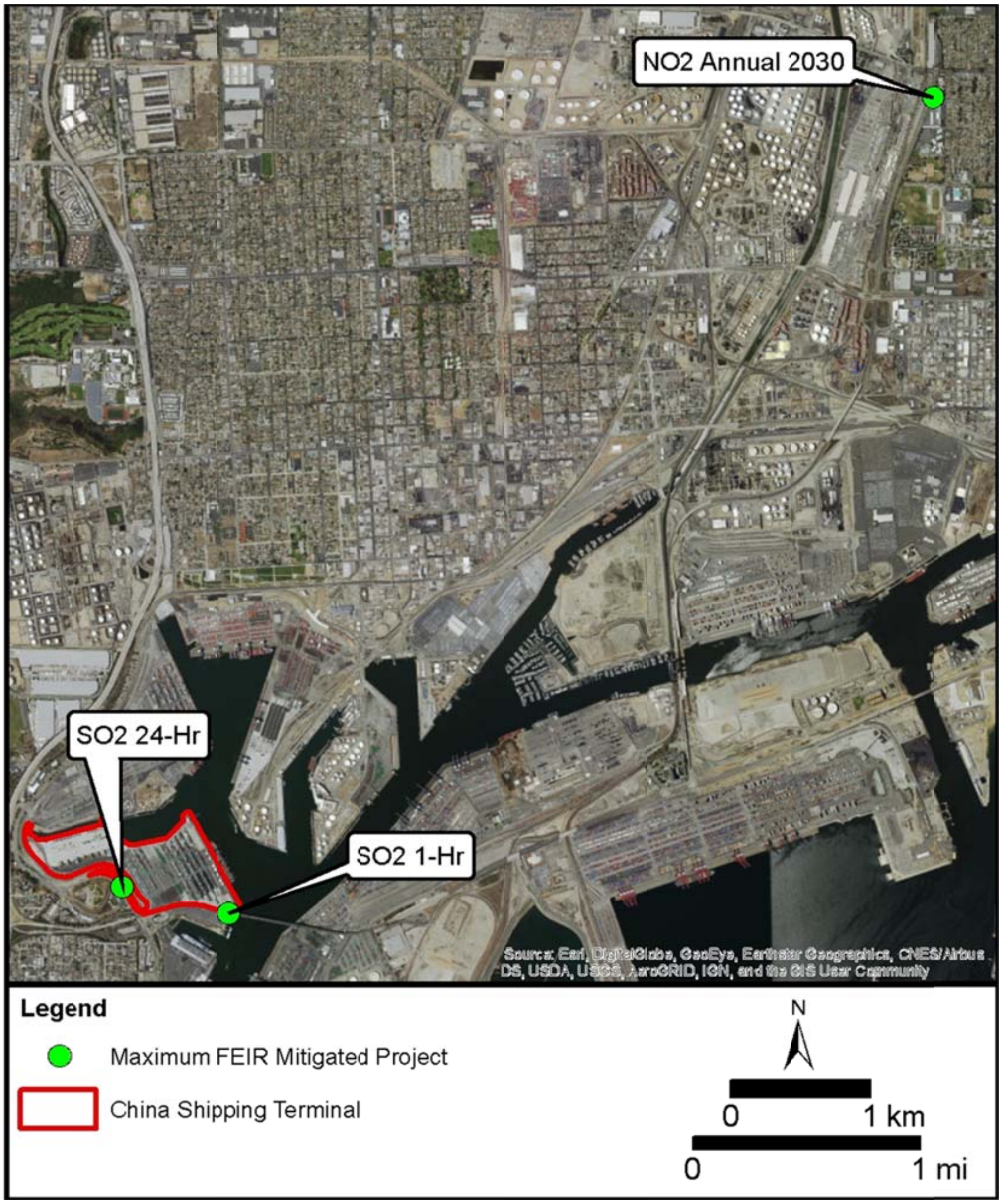


Figure B2-13. Locations of Maximum Modeled Concentrations of PM_{10} and $PM_{2.5}$ for the FEIR Mitigated Project minus Mitigated Baseline

Figure B2-14. Locations of Maximum Modeled Concentrations of PM_{10} and $PM_{2.5}$ for the FEIR Mitigated Project minus Unmitigated Baseline

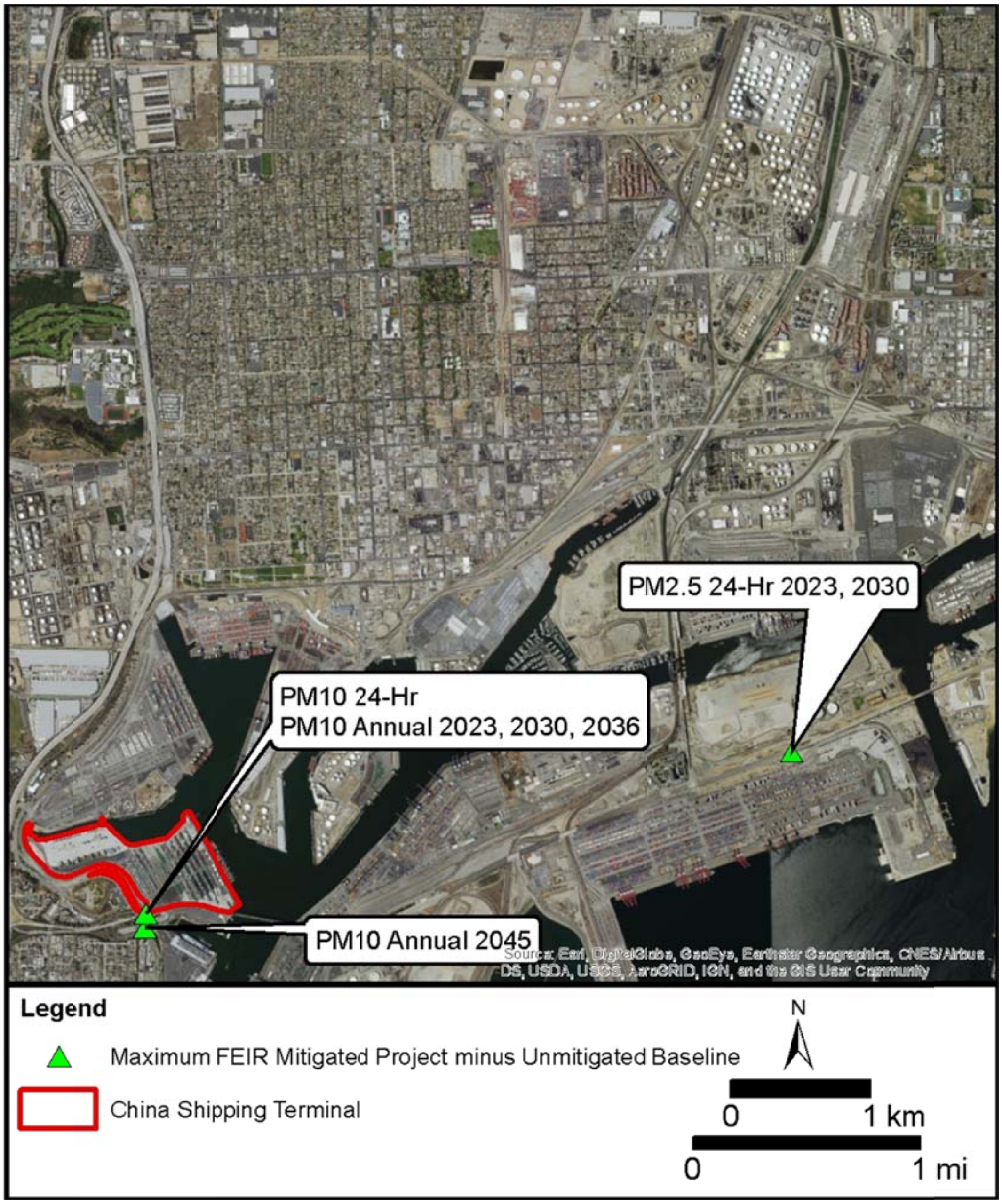
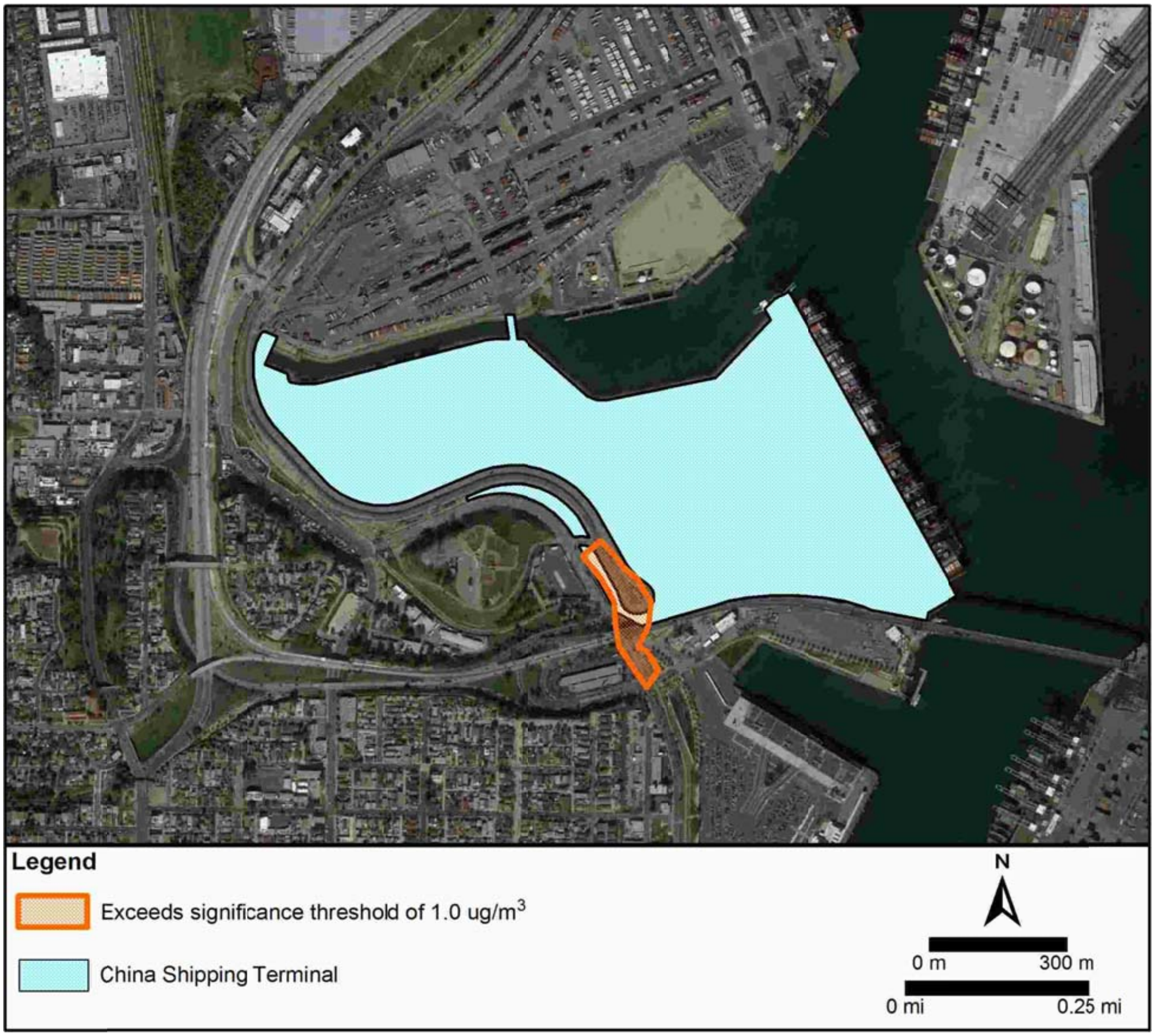


Figure B2-15 shows the area where the annual PM_{10} impacts of the FEIR Mitigated Project relative to the Mitigated Baseline would exceed the SCAQMD threshold in 2045. The area of exceedance is located near the southwest terminal boundary. It does not extend over a residential area.

Figure B2-15. Area of Threshold Exceedance for the FEIR Mitigated Project Minus Mitigated Baseline; 2045 Annual PM_{10} Concentrations



4.0 References

California Air Pollution Control Officers Association (CAPCOA), 2011. *Modeling Compliance of The Federal 1-Hour* NO_2 *NAAQS. CAPCOA Guidance Document.* October 27.

California Air Resources Board, 2004. *Roseville Rail Yard Study*. Stationary Source Division. October 14.

ENVIRON, 2013. Personal communication from Min Hou. May 28.

LAHD, 2008. Los Angeles Harbor District. *Berths 97-109 [China Shipping] Container Terminal Project EIS/EIR*. April.

LAHD, 2010. Los Angeles Harbor District. *2010 CAAP Update. Attachment I to Appendix B, Sphere of Influence Bay-Wide Sphere of Influence Analysis for Surface Meteorological Stations Near the Ports.* November 2010.

LAHD, 2011. Los Angeles Harbor District. *Berths 302-306 [APL] Container Terminal Project EIS/EIR*. December.

LAHD, 2014. *Berths 212-224 (YTI) Container Terminal Improvements Project Final EIS/EIR.* October.

Port of Los Angeles, 2014. *Air Quality Monitoring Program at the Port of Los Angeles. Year Nine Data Summary*. May 2013 – April 2014. September.

Port of Los Angeles, 2015. *Air Quality Monitoring Program at the Port of Los Angeles. Year Ten Data Summary*. May 2014 – April 2015. October.

Port of Los Angeles, 2016. *Air Quality Monitoring Program at the Port of Los Angeles. Year Eleven Data Summary*. May 2015 – April 2016. August.

Ramboll Environ, 2016. Personal communication from Tasko Olevski. December 27.

SCAQMD, 2009. AQMD Modeling Guidance for AERMOD. October 2.

SCAQMD, 2012a. South Coast Air Quality Management District. Personal communication with Tom Chico. May 10.

SCAQMD, 2012b. South Coast Air Quality Management District. Personal communication with Ian MacMillan. April 18.

SCAQMD, 2015. South Coast Air Quality Management District. SCAQMD Air Quality Significance Thresholds. March.

USEPA, 2000. *Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data*. EPA 420-R-00-002, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina. February.

USEPA, 2010. “Applicability of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard.” Memorandum from Tyler Fox to Regional Air Division Directors. June 28.

USEPA, 2011a. “Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard.” Memorandum from Tyler Fox to Regional Air Division Directors. March 1.

USEPA 2011b. United States Environmental Protection Agency. *Addendum – User's Guide for the AERMOD Terrain Preprocessor (AERMAP)*. EPA-454/B-03-003. Office of Air Quality Planning and Standards. Air Quality Assessment Division. Research Triangle Park, North Carolina. March.

USEPA, 2014. “Clarification on the Use of AERMOD Dispersion Modeling for Demonstrating Compliance with the NO_2 National Ambient Air Quality Standard.” Memorandum from R. Chris Owen and Roger Brode to Regional Dispersion Modeling Contacts. September 30.

USEPA, 2017. AERMOD Modeling System. Support Center for Regulatory Atmospheric Modeling (SCRAM). January 17.

USEPA, 2017b. *Revisions to the Guideline on Air Quality Models: Enhancements to the AERMOD Dispersion Modeling System and Incorporation of Approaches to Address Ozone and Fine Particulate Matter.* 40 CFR Part 51. January 17.

USEPA, 2017c. NAAQS Table. https://www.epa.gov/criteria-air-pollutants/naaqs-table. Website accessed April 1, 2017.