Appendix D: Supplemental Technical Information

This appendix contains additional information on technical datasets and analyses that were described in Chapter 5: Air Quality Overview and covers the topics below:

- **Air Monitoring Data**, including background on the air monitoring datasets and analyses that were used to develop air quality overview and connect air monitoring information to community concerns, and links to additional resources
- **Meteorological Summary**, including a description of wind patterns in the Oakland area using data from the Oakland Airport
- **Emissions Inventory Development**, including a description of the methods and datasets used to develop the emissions inventory
- **Dispersion Modeling**, including a description of the methods and datasets used to conduct dispersion modeling for key local sources
- **Emissions Forecasts**, including a summary of "business as usual" emissions inventories for 5- and 10-year milestones (2031 and 2036) after CERP adoption

Air Monitoring Data

Air monitoring data used for analyses that were included in the Plan came from several different air monitoring programs and projects. Data from the Air District's long-term air monitoring network were retrieved largely from the U.S. Environmental Protection Agency (U.S. EPA)'s Air Quality System (AQS), which is U.S. EPA's official repository for ambient air quality data.[1] These data are also available for download via the U.S. EPA's Air Data website, which has tools for visualizing and summarizing air quality data.[2] Each year U.S. EPA also develops an interactive, national report on the status and trends in key air pollutants using data from air monitoring stations operated by state, local, and tribal air quality agencies nationwide.[3] Data for some pollutants measured at Air District monitoring sites, such as black carbon and ultrafine particles, were retrieved from Air District database systems. More information on the Air District's fixed-site air monitoring network, including the locations of air quality monitoring sites and the specific pollutants measured at different sites, is available in the latest version of the Annual Air Monitoring Network Plan.[4] The Air District's air monitoring network is designed for compliance with U.S. EPA network design and data quality requirements, including acceptable instrumentation, monitor siting and operation, and laboratory analysis methods. More information about the requirements of U.S. EPA's national air monitoring programs as implemented by the Air District is available through U.S. EPA's Ambient Monitoring Technology Information Center (AMTIC).[5]

Aggregated air monitoring data from different projects or programs were shown in several plots, such as daily or annual average concentrations of different pollutants. In general, to calculate average pollutant concentrations, valid data must be available for at least 75% of the averaging period. For example, to calculate a valid 24-hour average pollutant concentration from hourly data, at least 18 hours of valid data must be available. For criteria pollutants, there are specific

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[1] EPA's Air Quality System (AQS), the official repository for ambient air quality data: https://www.epa.gov/aqs
[2] EPA's Air Data webpage: https://www.epa.gov/outdoor-air-quality-data
[3] EPA's Air Quality Trends Report webpage: https://www.epa.gov/air-trends
[4] Air District webpage for the Annual Air Monitoring Network Plan: https://www.baaqmd.gov/about-air-quality/air-quality-measurement/ambient-air-monitoring-network
[5] EPA's Ambient Monitoring Technology Information Center (AMTIC) website: https://www.epa.gov/amtic

data completeness and data handling requirements for calculating design values for comparisons with the National Ambient Air Quality Standards (NAAQS).[6]

Meteorological Summary

Air quality is highly influenced by meteorological (weather) conditions. Wind patterns, for example, determine the downwind transport and dispersion of pollutants from their sources. Variations in temperature with elevation above the ground determine whether pollutants will be trapped near ground level (which occurs when temperatures increase with elevation, known as a temperature inversion) or will be ventilated and mixed through the lower atmosphere. Sunlight and temperature also affect reactions that form other pollutants, such as ozone.

Weather conditions, including wind patterns, in East Oakland are highly influenced by its proximity to San Francisco Bay and the Pacific Ocean. Winds in East Oakland prevail from the west to west-northwest, referred to as onshore winds since these winds blow from the ocean and bay onto land, as shown in the wind rose in Figure D-1. A wind rose is a graphical representation of how often different wind speeds and directions occur at a specific location over a certain time. These onshore winds are driven by strong temperature differences between the ocean and land and are most prevalent during the spring and summer months and during the afternoon and evening hours (see Figure D-2 and Figure D-3). Winds during the fall and winter are typically more variable in direction and speed from day to day and are closely tied to passing storm systems (see Figure D-4 and Figure D-5). Winds also tend to be stronger during the daytime hours and lighter and more variable in direction during the nighttime hours (see Figure D-6 and Figure D-7).

While prevailing winds may transport emissions from a pollution source generally away from a given community, non-prevalent wind patterns also occur that can transport those pollutants into the community and contribute to air quality impacts that are not readily apparent in annualized air quality datasets and tools. Periods of calm or light winds regularly occur, which reduce pollutant dispersion and allow pollutant concentrations to increase, especially if a temperature inversion is also present. In urban areas such as East Oakland, winds may vary considerably over short distances due to channeling of winds through roadway corridors/canyons and due to microcirculations around buildings or other obstructions. While periods of strong and gusty winds are generally associated with improved air quality for most pollutants, these winds can also loft dust and other substances into the air from certain facilities, construction lots, and unpaved surfaces, resulting in local-scale air quality issues near such sources.

The wind speed and direction data summarized in this section were downloaded through the Synoptic Data API service, though the data can also be retrieved through multiple other sources.[7] Year-round, seasonal, and daytime vs. nighttime wind roses were generated using the R-based OpenAir package.[8]

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[6] EPA's Air Quality Design Values website: https://www.epa.gov/air-trends/air-quality-design-values
[7] Website for the Synoptic API service for downloading meteorological data: https://synopticdata.com/weatherapi/
[8] GitHub page for the R-based OpenAir package: https://github.com/openair-project/openair

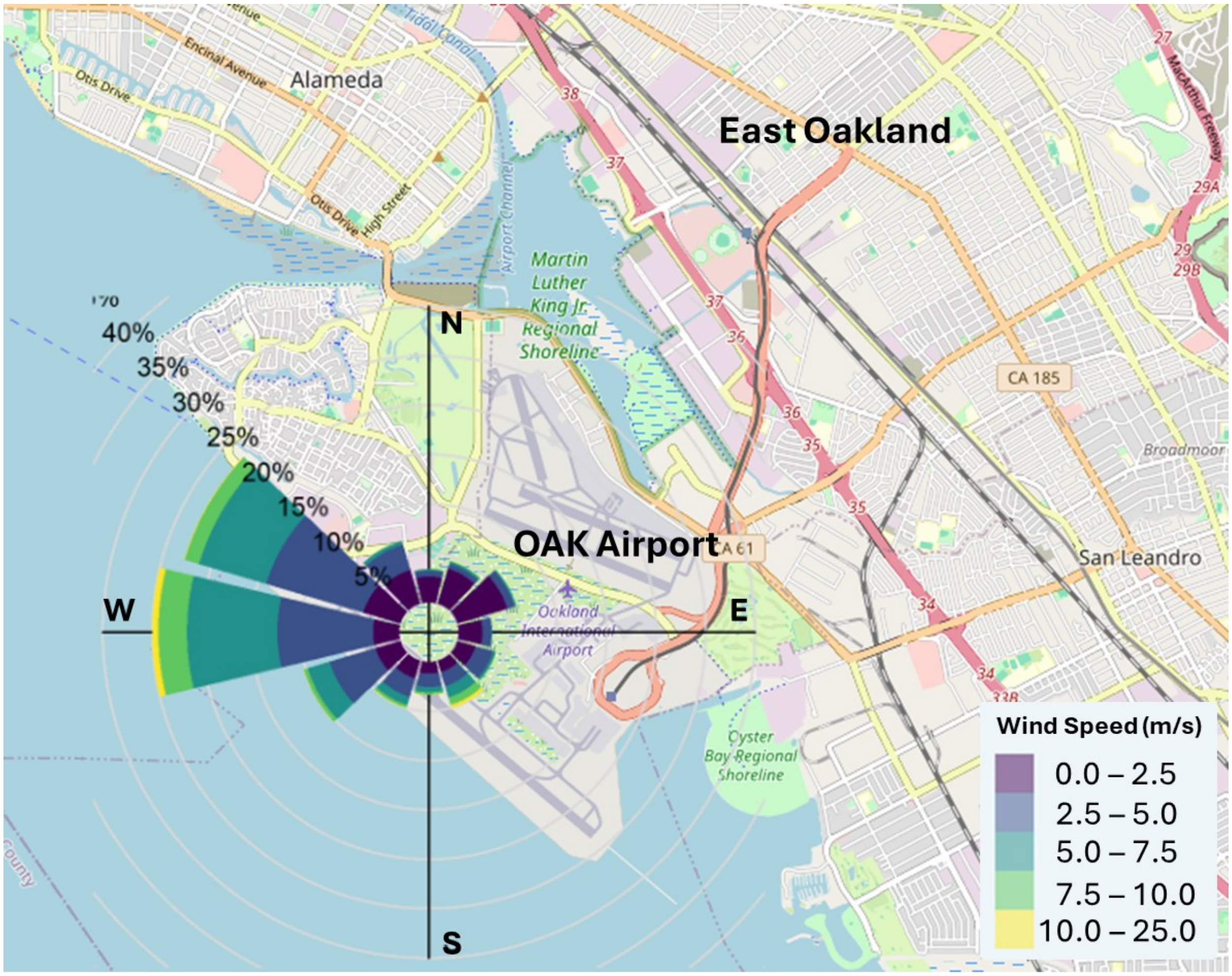

Figure D-1: Wind rose showing hourly wind speed and direction data from Oakland Airport for the period 2016-2020. Winds prevail from the west to west-northwest but can occur from any direction and vary by season, by time of day, and from day to day.

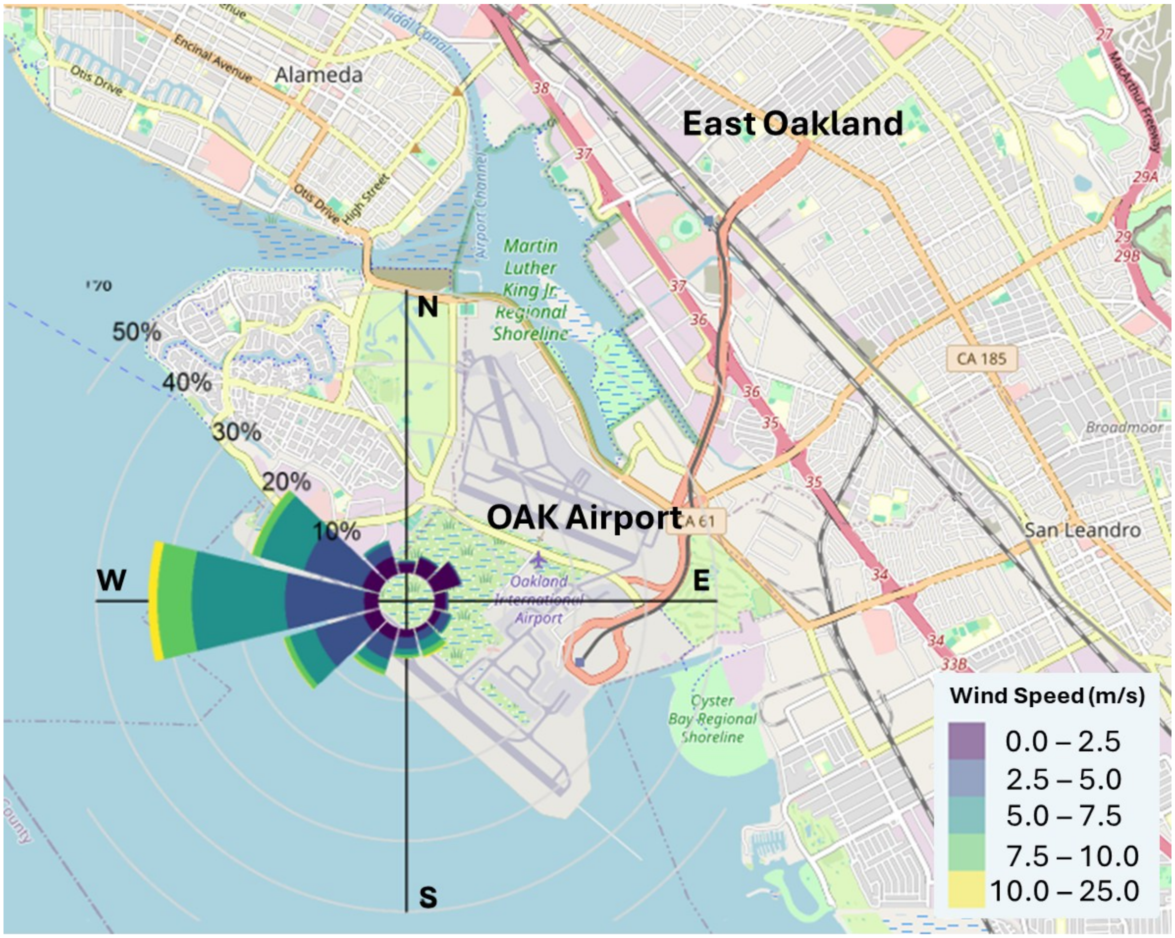

Figure D-2: Wind rose showing hourly wind speed and direction data from Oakland Airport during March, April, and May (meteorological spring) for the period 2016-2020. Winds prevail from the west and are typically stronger during meteorological spring compared to fall and winter.

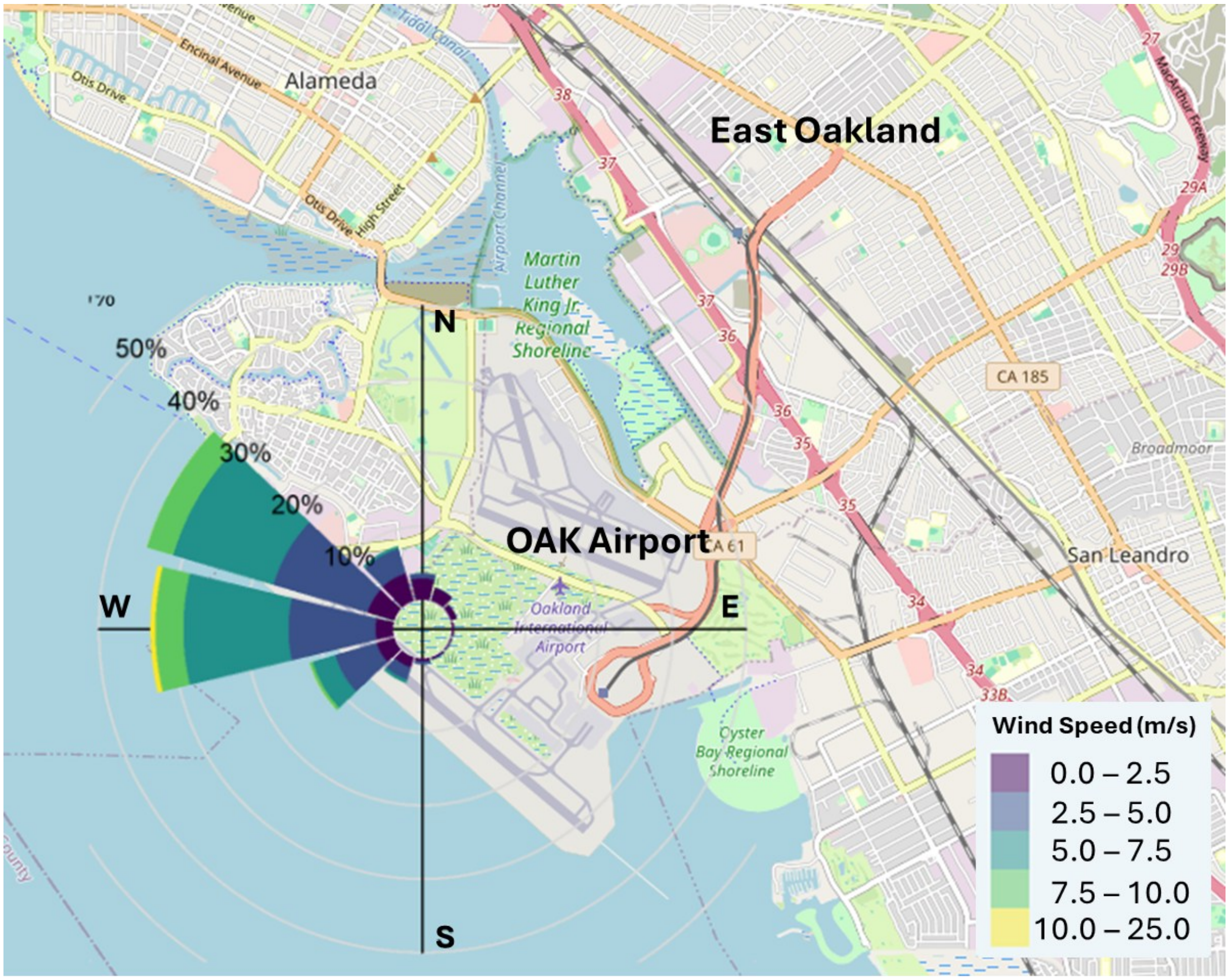

Figure D-3: Wind rose showing hourly wind speed and direction data from Oakland Airport during June, July, and August (meteorological summer) for the period 2016-2020. Winds prevail from the west to west-northwest and are typically stronger than during other times of the year and are strongest during the afternoon hours.

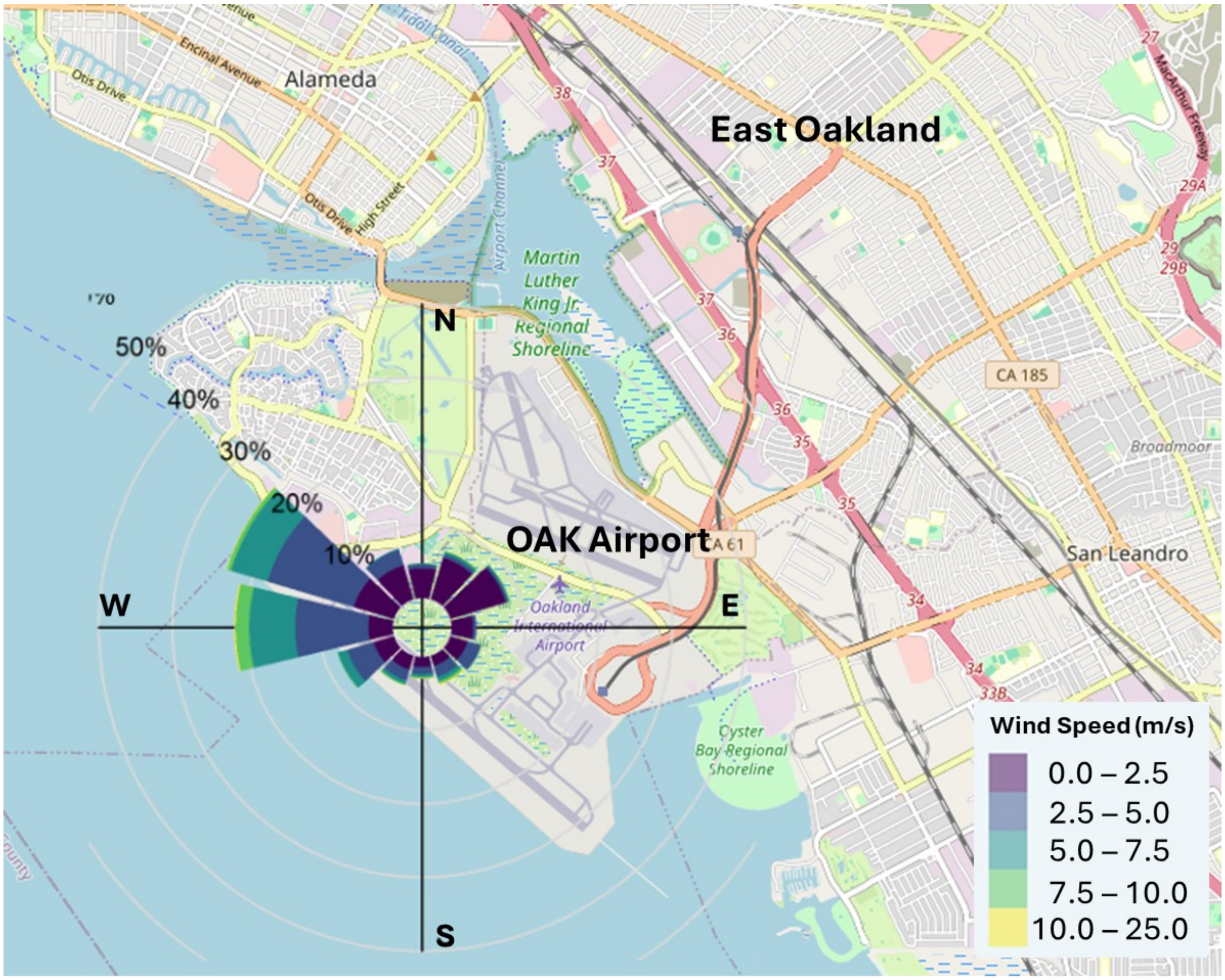

Figure D-4: Wind rose showing hourly wind speed and direction data from Oakland Airport during September, October, and November (meteorological fall) for the period 2016-2020. Winds prevail from the west to west-northwest but are typically not as strong and are more variable in direction compared to during the spring and summer seasons.

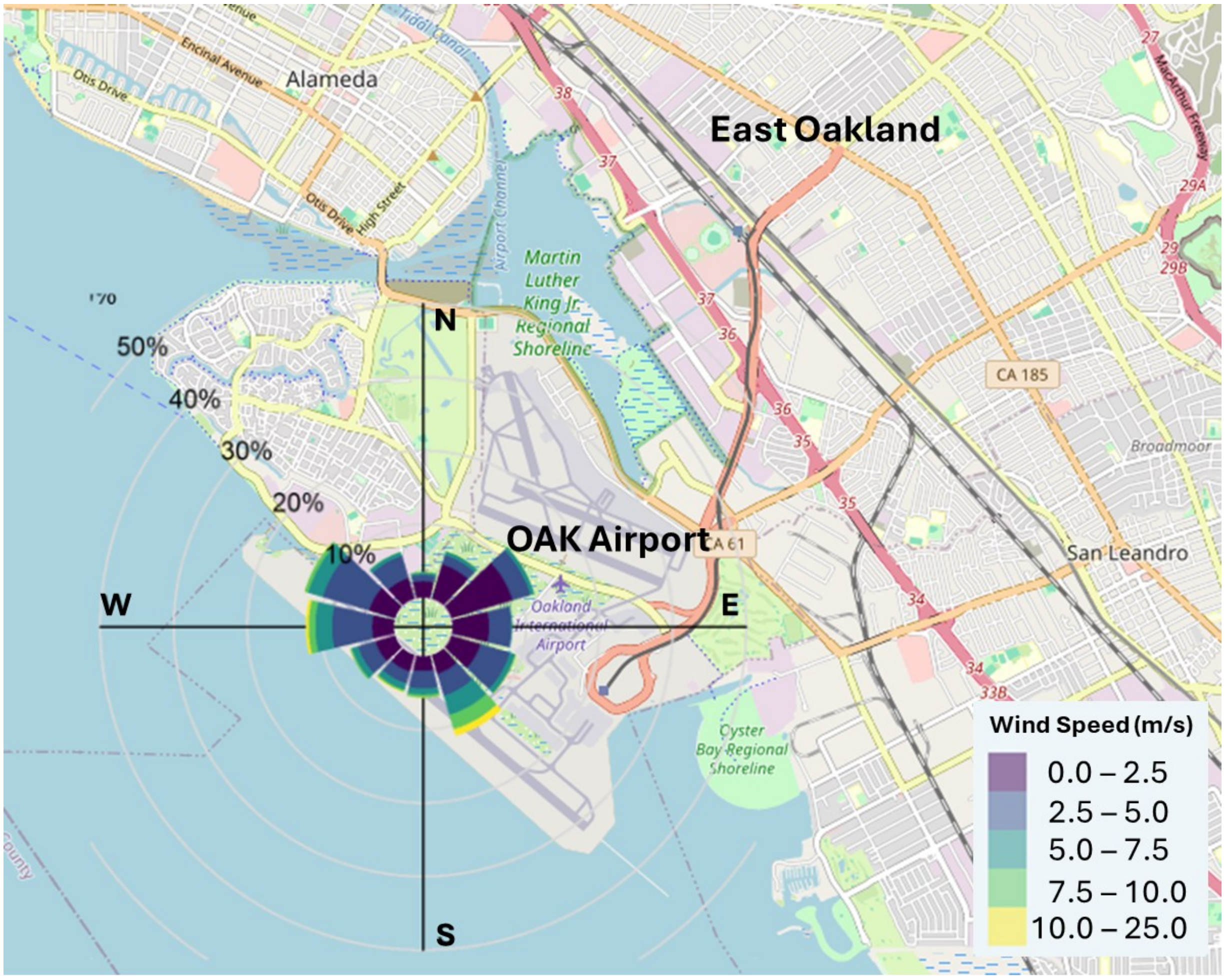

Figure D-5: Wind rose showing hourly wind speed and direction data from Oakland Airport during December, January, and February (meteorological winter) for the period 2016-2020. Compared to other times of the year, winds during meteorological winter are typically more variable in direction and are closely tied to passing storm systems.

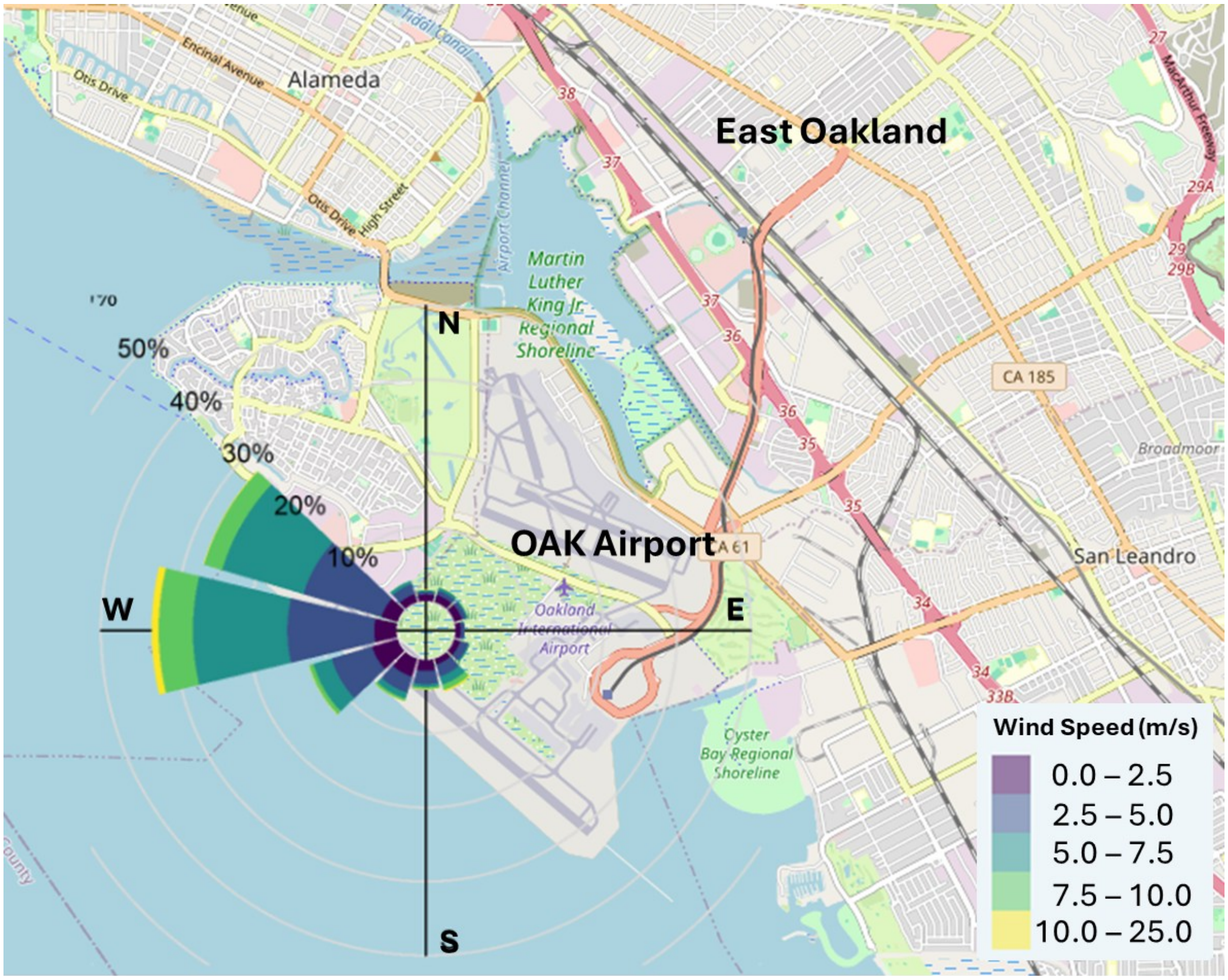

Figure D-6: Wind rose showing hourly wind speed and direction data from Oakland Airport during daytime hours for the period 2016-2020. Winds prevail from the west to west-northwest and are typically stronger during the daytime compared to nighttime.

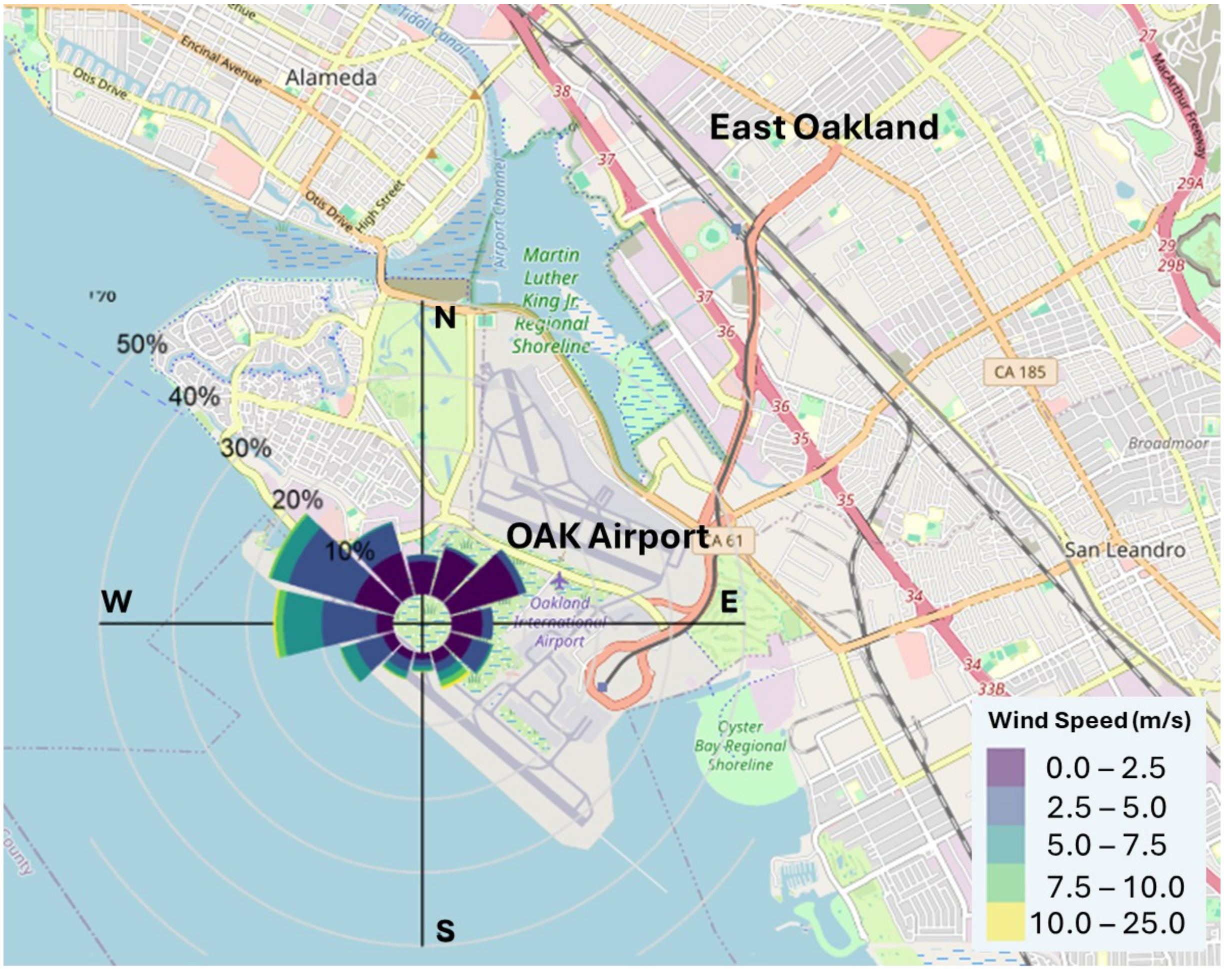

Figure D-7: Wind rose showing hourly wind speed and direction data from Oakland Airport during nighttime hours for the period 2016-2020. Compared to daytime hours, winds at night are typically lighter in speed and more variable in direction.

Emissions Inventory Development

As part of the technical assessment process, the California Air Resources Board (CARB) prescribes the development of a planning emissions inventory for all AB617 communities. This inventory must include criteria pollutants[9] and toxic air contaminants (TACs)[10] for all sources

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[9] Criteria pollutants include carbon monoxide (CO), nitrogen oxides (NOx), total organic gases (TOG), reactive organic gases (ROG), ammonia (NH_3), sulfur oxides (1), particulate matter 10 microns or smaller (PM_{10}), and particulate matter 2.5 microns or smaller ($PM_{2.5}$).

[10] TACs, or "air toxics," have been identified by CARB or the U.S. Environmental Protection Agency (EPA) as pollutants that may cause cancer or other serious health effects (e.g., birth defects).

within the community boundary for a selected base year.[11] The Air District worked with CARB to establish a base year (2021) and planning inventory domain for the East Oakland community. The inventory domain was defined as a rectangular area that aligns with a network of 1-km x 1-km grid cells from CARB's statewide modeling domain.[12] As shown in Figure D-8, this rectangular emissions inventory boundary covers the East Oakland area, as well as surrounding areas with emission sources that are likely to impact the community.

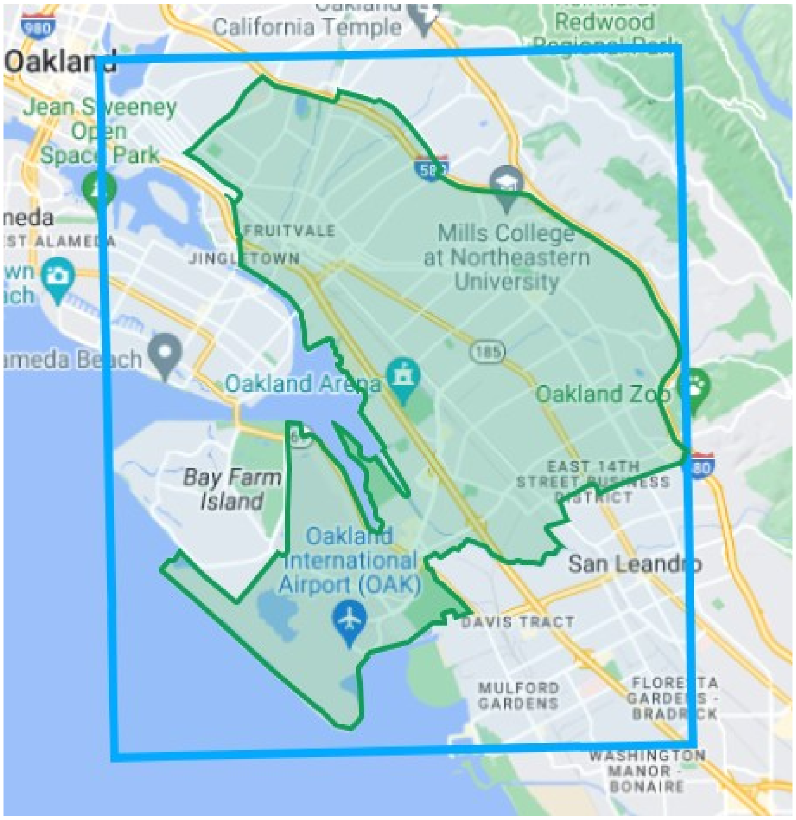

Figure D-8: Map showing the emissions inventory boundary (blue rectangle) in relation to the East Oakland community (green area).

As described in the Plan Chapter 5, the East Oakland emissions inventory is organized into four broad source sectors: stationary permitted sources, stationary non-permitted sources, on-road mobile sources, and off-road mobile sources. Table D-1 provides a definition of these source sectors and summarizes the general methods used to estimate their emissions in the East Oakland area. Note that the baseline inventory represents a combination of information from the Air District and CARB, and that detailed local data were used where available.

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[11] California Air Resources Board (2019). AB 617 Community Planning Emissions Inventory: Key Elements. Available at: https://ww2.arb.ca.gov/resources/documents/ab-617-community-planning-emission-inventory-key-elements.
[12] California Air Resources Board (2020). 2020 Community Recommendations Staff Report – DRAFT Preliminary Emission Inventory. Prepared by the Community Inventory Section, October.

Table D-1: Emissions inventory methods by source sector.

Source Sector	Definition	Methodology
Stationary – permitted	Individual facilities with sources that have been issued a permit or registered by the Air District, or that have been found exempt through an engineering evaluation	Emissions based on data reported to the Air District annually by each permitted facility and reviewed by District engineers. Emissions estimated at the process/device level using a variety of methods and datasets, including source tests and emission factors.
Stationary – non-permitted	Stationary sources that are too small or dispersed to be treated individually (e.g., restaurants, fireplaces, and water heaters)	Emissions estimated by CARB or the District at the county level and down-scaled using spatial surrogates such as land use or population data. For commercial cooking, the Air District developed restaurant-specific estimates that were based on generalized assumptions about the type and quantities of meat cooked at various types of restaurants.
On-road mobile	Vehicles that operate on roadways (e.g., cars, trucks, and buses)	Roadway emissions based on detailed traffic data from Bentley System's Streetlytics dataset and emission factors from CARB's EMFAC2021 model. Emissions also estimated for operations at truck-based businesses using results of a truck activity survey conducted by District staff.
Off-road mobile	Mobile sources such as aircraft, locomotives, and construction equipment that do not operate on roadways	Emissions for Oakland Airport, locomotives, and marine sources prepared by the Air District based on local data. Emissions for remaining off-road sources (e.g., construction equipment) were prepared by CARB using a variety of approaches.

Note that the emissions for sources at Oakland Airport were estimated using the Federal Aviation Administration (FAA) Aviation Environmental Design Tool (AEDT), Version 3e.[13] AEDT is a software system that models airport-related emissions in space and time and performs dispersion modeling using the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD). AEDT estimates emissions for the following sources:

[13] AEDT: Product Information. https://aedt.faa.gov/3e_information.aspx

- **Aircraft engines:** Airplane exhaust emissions are associated with takeoff, landing, taxiing, and idling on taxiways and aircraft apron areas.
- **Auxiliary power units (APUs)**: APUs are small aircraft engines, fueled by jet fuel, which are built into the airplane's airframe and provide power while the aircraft is on the ground.
- **Ground support equipment (GSE)**: GSEs are off-road equipment such as baggage tractors and belt loaders used to service aircraft during ground operations.

The AEDT input file containing the number of landings and takeoffs for each aircraft model in Oakland Airport's fleet mix was provided to the District by the Port of Oakland (Port).[14] The data imported into AEDT is based on the Port Airport Noise and Operations Monitoring System (ANOMS) database. This data contains a record of arrivals and departures by aircraft model and engine type. The Port also provided an emissions summary, which District staff validated using AEDT.[15]

More generally, the California Air Resources Board (CARB) has established a methodology for developing community-scale toxic air contaminant (TAC) emissions inventories and for comparing the relative toxicity of different compounds through the calculation of toxicity weighted emissions (TWE). In this methodology, point source emissions are based on toxics inventories reported to the Air District by individual permitted facilities. For stationary non-permitted sources and all mobile sources, TAC emissions are calculated by applying chemical speciation profiles to Particulate Matter (PM) and Total Organic Gases (TOG) emissions. These speciation profiles, which are maintained by CARB, break down PM and TOG emissions for a given source category into individual chemical species. Then all the species that are listed in Appendix A-I of AB 2588 Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines Regulation are filtered out as toxics.[16] TWE are then calculated by multiplying the mass emissions for each TAC by corresponding health values from the Office of Environmental Health Hazard Assessment (OEHHA). These health values include cancer potency factors and non-cancer chronic and acute reference exposure levels (RELs), and the TWE calculations also include molecular weight adjustment factors to account for the molecular weight fraction of a compound associated with the specific health effects.[17] As noted above, the resulting TWE provide a useful means of comparing the relative toxicity of TACs in an inventory; however, TWE do not quantify specific health risks, which are based on exposures to concentrations of specific TACs rather than emission levels only.

Once the emissions inventory was complete, emissions estimates for fine particulate matter ($PM_{2.5}$) and TACs were configured for use in dispersion modeling efforts. Modeling inventories were developed for all sources for which sufficient information (e.g., emissions rate, physical characteristics, spatiotemporal resolution) was available at the time of analysis.

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[14] Data provided by the Port of Oakland was in support of the Oakland International Airport Terminal Modernization and Development Project. Draft Environmental Impact Report dated July 2023. Available at: https://www.iflyoak.com/wp-content/uploads/2024/03/230717_Public-Draft-EIR_Web_v1.0.pdf.
[15] Activity and emissions estimates for the year 2019 were used in this analysis. The Port also provided data for 2021 and 2022, but activity was diminished during these years due to the COVID-19 pandemic. Therefore, the year 2019 was selected to represent "business as usual" operations at the airport.
[16] California Air Resources Board (2021). Draft Community Emission Inventory Methodology for Toxic Air Contaminants Emissions. Prepared by the Area Source Improvement and Community Inventory Development Sections, June.
[17] Ibid., 16

Dispersion Modeling

Once emitted to the atmosphere, pollutants are subject to processes such as dispersion and deposition. Air quality models use emissions inventories, meteorological data, and other inputs to simulate these processes and provide estimates of pollutant concentrations in specified locations of interest. To quantify concentrations of $PM_{2.5}$ and other pollutants in the East Oakland community, the Air District used the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD). AERMOD is U.S. EPA's preferred model for near-field dispersion modeling and is required for all health risk assessment (HRA) modeling performed by or for the Air District.[18] In addition, AERMOD is the only model currently approved by U.S. EPA for mobile source applications such as PM hot-spot analyses.[19] Because of its ability to handle multiple source types, AERMOD was used to model dispersion from all local sources assessed in the East Oakland emissions domain.

In general, AERMOD was applied using approaches consistent with those previously developed during the technical assessment for the West Oakland AB617 community.[20] One key difference from the West Oakland approach involves the meteorological data used for dispersion modeling. In West Oakland, the District operates a meteorological monitoring station at the Oakland Sewage Treatment Plant (OST) that measures wind speed, wind direction and temperature, parameters required by the AERMOD model. Because this station is centrally located within the relatively small and flat West Oakland study area, meteorological data from the OST station was used for all AERMOD runs. However, the East Oakland area is larger and has a more complex topography than West Oakland and also lacks a central monitoring station that would be representative of the entire study area. Therefore, the Air District relied on modeled meteorological data from the Weather Research and Forecasting (WRF) model to run AERMOD. WRF provided gridded meteorological data at a 1-km resolution, and a U.S. EPA utility program called the Mesoscale Model Interface Program (MMIF) was used to convert WRF outputs into AERMOD-ready meteorological inputs. All sources in East Oakland were modeled using WRF outputs from the 1-km grid cell in which the source was located.

AERMOD also requires a receptor file defining locations for which the model will estimate pollutant concentrations. A master receptor grid was generated with receptors spaced every 50 m in the x and y directions within the receptor domain, resulting in 52,800 discrete receptor locations. For East Oakland, AERMOD was used to estimate $PM_{2.5}$ concentrations, DPM concentrations, cancer risk, and chronic hazard index (HI) at each of these receptors. Because separate AERMOD runs were performed for individual sources (e.g., road segments, industrial processes), this modeling approach provided hyper-local, source-specific information.

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[18] Bay Area Air Quality Management District (2020). BAAQMD Health Risk Assessment Modeling Protocol, December. https://www.baaqmd.gov/~/media/files/ab617-community-health/facility-risk-reduction/documents/baaqmd_hra_modeling_protocol-pdf.pdf?la=en.
[19] U.S. Environmental Protection Agency (2021). Transportation Conformity Guidance for Quantitative Hot-spot Analyses in PM2.5 and PM10 Nonattainment and Maintenance Areas. EPA-420-B-21-037, October.
[20] Bay Area Air Quality Management District (2019). Owning Our Air: The West Oakland Community Action Plan – Volume 2: Appendices, October. Available at: https://www.baaqmd.gov/en/community-health/community-health-protection-program/west-oakland-community-action-plan.

Emissions Forecasts

In addition to the 2021 baseline emissions inventory presented in the Plan Chapter 5, the Air District worked with the California Air Resources Board (CARB) to develop forecast emissions estimates for the years 2031 and 2036. The years represent 5- and 10-year milestones from 2026, the year of Plan adoption. Forecasted emissions were estimated by combining the baseline 2021 data with ancillary datasets that provide growth factors and control factors based on "business as usual" (BAU) conditions. Here, "growth" refers to anticipated changes in activity (e.g., increases in vehicle miles traveled for the on-road fleet), while "control" refers to changes in emissions characteristics (e.g., lower motor vehicle emission rates due to new technology introduced into the fleet). The BAU scenarios only consider controls resulting from existing ("on the books") regulations and can be viewed as conditions that are projected to occur in the East Oakland area without the implementation of the Plan. These BAU conditions could also be called "without Plan" or "no Plan" scenarios. When the Plan implementation processes reach the 5-year mark in 2031, a new emissions inventory will be developed for that year that accounts for reductions achieved through the Plan actions. That new 2031 inventory will be compared to the original 2031 forecast presented here and used as one means of assessing progress.

The BAU forecasts described above were prepared using a variety of datasets:

- Growth profiles and control factors developed by the Air District as part of a recent trends analysis for criteria air pollutants.[21]
- Forecasting scalars provided by CARB that combine growth and control factors for future years out to 2036. These scalars were based on data from CARB's California Emissions Projection Analysis Model (CEPAM) and reflect forecasts from the 2022 ozone state implementation plan (SIP) emissions inventory.
- Emissions reduction factors from CARB that reflect impacts of recently adopted statewide regulations that were not considered in the CEPAM data referenced above. These statewide regulations largely address NO_x and PM emissions from mobile sources, and descriptions of these regulations are provided in Table D-2.

Table D-2: Descriptions of recently adopted statewide regulations.

Regulation	Description	Adoption Date
Advanced Clean Cars II (ACCII)	Reduces emissions from new light- and medium-duty vehicles beyond the 2025 model year and increases the number of zero-emission vehicles for sale.	November 2022
Advanced Clean Fleets (ACF)	Aims to achieve a zero-emission truck and bus fleet by 2045 and significantly earlier for certain	April 2023

[21] Bay Area Air Quality Management District (2023). Bay Area Emissions Inventory: Summary Report for Criteria Air Pollutants, April.

Regulation	Description	Adoption Date
	market segments (e.g., last-mile delivery and drayage applications)	
Heavy-Duty Inspection and Maintenance (HDIM)	Expands existing I&M programs to ensure all vehicle control systems (e.g., diesel particulate filters) are adequately maintained	December 2021
Small Off-Road Engine (SORE) Amendment	Accelerates the transition of SORE equipment (e.g., leaf blowers, portable generators) to zero-emission equipment starting in 2024	December 2021
Transport Refrigeration Unit (TRU) Regulation	Requires diesel-powered TRU to transition to zero-emission technology in two phases	February 2022
Commercial Harbor Craft (CHC) Regulation	Requires zero-emission options where feasible and Tier 3 and 4 engines on all other vessels	March 2022
In-Use Locomotive Regulation	Reduces harmful emissions from locomotives, in part to address long-standing environmental justice concerns for communities near railyards	April 2023

Note that for permitted sources in East Oakland, emissions were generally held constant for the 5- and 10-year BAU forecasts. For Oakland Airport, forecasts were based on a recent statewide inventory prepared by CARB for California airports.[22] For consistency, these forecasts were compared to future year emissions estimates recently published in a final environmental impact report for the airport's proposed expansion (Port of Oakland, 2024). The sub-sections that follow contain summary information about the forecasted inventories for 2031 and 2036 and how they compare to the 2021 baseline emissions.

Criteria Air Pollutants (CAPs)

This section provides a comparison between CAP emission levels for the 2021 baseline (Table D-3) and forecasted years 2031 (Table D-4) and 2036 (Table D-5). As shown in the last row of Table D-4, 2031 emissions are generally lower for most pollutants, with reductions ranging from 5.5% for TOG to 29.5% for carbon monoxide (CO). For $PM_{2.5}$, which is of special concern due to its health effects, emissions are forecast to decrease by 12.5% between 2021 and 2031, in part due to anticipated reductions in residential combustion of wood and natural gas. Note that PM_{10} emissions show a slight increase (0.2%) between 2021 and 2031, with anticipated increases in road dust emissions offsetting reductions in emissions from other source categories. Sulfur

[22] California Air Resources Board (2024). California Aircraft Emissions Inventory (CAI2024) Technical Documentation, December. Available at: https://ww2.arb.ca.gov/sites/default/files/2024-12/CAI2024_main_document_1211_ada.pdf.

oxides (SO_x) emissions are forecasted to increase by 7.7% between 2021 and 2031 due to increased aircraft activity at Oakland Airport.

Emissions for 2036 in Table D-5 show a similar pattern, with forecasted reductions relative to 2021 ranging from 1.3% (PM_{10}) to 36.8% (CO). SOx is the only pollutant for which emissions are forecasted to increase between 2031 and 2036, which is again due to increased aircraft activity.

Table D-3: East Oakland 2021 CAP emissions by source sector in tons per year (tpy).

Source Type	SourceSector	$PM_{2.5}$	PM_{10}	NO_x	SO_x	CO	TOG	ROG
Stationary	Permitted	76.3	114.2	60.8	0.7	53.1	783.0	196.4
	Non-permitted	122.7	310.2	227.2	4.6	461.0	2,335.0	1,650.8
Mobile	On-Road	54.1	269.5	794.5	9.4	4,167.2	594.5	517.6
	Off-road	28.3	29.5	1,147.6	67.6	6,527.3	636.9	591.6
TOTAL		281.5	723.4	2,230.2	82.3	11,208.6	4,349.4	2,956.4

Table D-4: East Oakland 2031 CAP emissions by source sector in tons per year (tpy).

Source Type	Source Sector	$PM_{2.5}$	PM_{10}	NO_x	SO_x	CO	TOG	ROG
Stationary	Permitted	76.3	114.2	60.8	0.7	53.1	783.0	196.4
	Non-permitted	95.9	307.6	176.3	3.7	327.9	2,515.7	1,802.7
Mobile	On-Road	52.3	277.8	274.7	7.7	3,047.8	384.7	337.9
	Off-road	23.0	25.0	1,049.0	76.5	4,477.6	428.0	403.3
TOTAL		247.5	724.5	1,560.7	88.6	7,906.3	4,111.4	2,740.3
Percent change from 2021		-12.1%	+0.2%	-30.0%	+7.7%	-29.5%	-5.5%	-7.3%

Table D-5: East Oakland 2036 CAP emissions by source sector in tons per year (tpy).

Source Type	Source Sector	$PM_{2.5}$	PM_{10}	NO_x	SO_x	CO	TOG	ROG
Stationary	Permitted	76.3	114.2	60.8	0.7	53.1	783.0	196.4
	Non-permitted	85.6	297.2	134.0	3.0	261.6	2,571.1	1,855.9
Mobile	On-Road	50.2	277.6	201.3	7.3	2,881.2	315.4	276.9
	Off-road	22.9	24.9	1,105.8	83.3	3,889.9	399.3	376.8
TOTAL		235.0	714.0	1,502.0	94.3	7,085.8	4,068.8	2,706.0
Percent change from 2021		-16.5%	-1.3%	-32.7%	+14.6 %	-36.8%	-6.5%	-8.5%

Toxic Air Contaminants (TACs)

This section provides a comparison between toxic air contaminants (TAC) emission levels for the 2021 baseline (Table D-6) and forecasted years 2031 (Table D-7) and 2036 (Table D-8). Comparisons are provided for all TACs combined and for toxicity-weight emissions (TWE). As explained in the Plan Chapter 5, toxicity weighting provides a way of accounting for the relative toxicities of carcinogens (cancer TWE) and TACs that cause other kinds of chronic health effects (chronic TWE). As shown in the last row of Table 7, total TAC emissions are forecast to decrease by 4.6% between 2021 and 2031, and a similar reduction of 6.5% is anticipated for chronic TWE. These changes are associated with reductions in mobile source emissions due to regulatory impacts and fleet turnover. For cancer TWE, which are dominated by diesel particulate matter (DPM) emissions, anticipated reductions are much larger (43.3%) due to statewide regulations targeting diesel-fueled vehicles and equipment.

Emissions for 2036 in Table D-8 show a similar pattern, with forecasted reductions relative to 2021 of 4.7% for total TACs and 8.0% for chronic TWE. Cancer TWE emissions are forecast to decrease much more sharply (48.9%) between 2031 and 2036, which is again due to regulations targeting diesel-fueled vehicles and equipment.

Table D-6: East Oakland 2021 TAC emissions by source sector.

Source Type	Source Sector	Total TAC mass (lbs)	Cancer TWE	Chronic TWE
Stationary	Permitted	38,107	1,569	28
	Non-permitted	1,216,726	11,543	374
Mobile	On-Road	458,238	70,971	738

Source Type	Source Sector	Total TAC mass (lbs)	Cancer TWE	Chronic TWE
	Off-road	568,864	26,872	420
TOTAL		2,281,935	110,955	1,560

Table D-7: East Oakland 2031 TAC emissions by source sector.

Source Type	Source Sector	Total TAC mass (lbs)	Cancer TWE	Chronic TWE
Stationary	Permitted	38,107	1,569	28
	Non-permitted	1,329,021	12,975	405
Mobile	On-Road	486,627	12,679	311
	Off-road	324,213	35,694	715
TOTAL		2,177,968	62,917	1,459
Percent change from 2021		-4.6%	-43.3%	-6.5%

Table D-8: East Oakland 2036 TAC emissions by source sector.

Source Type	Source Sector	Total TAC mass (lbs)	Cancer TWE	Chronic TWE
Stationary	Permitted	38,107	1,569	28
	Non-permitted	1,362,151	13,513	399
Mobile	On-Road	460,594	10,689	274
	Off-road	313,868	30,909	734
TOTAL		2,174,719	56,680	1,435
Percent change from 2021		-4.7%	-48.9%	-8.0%

Emissions Tracking

Though it is difficult to do an up-front estimate of the impact of Plan actions, it is anticipated that implementation of the Plan will bring about additional emissions reductions, resulting in even lower future year emissions than the ones presented in this appendix. When implementation has been underway for 5 years, a new 2031 emissions inventory will be developed to track progress in achieving emissions reductions. That updated 2031 inventory will then be compared to the forecasts presented here.