



Sunnyvale

Air Quality and Environmental Justice Background Report

for the City of Sunnyvale General Plan Update

Prepared for:

City of Sunnyvale
456 West Olive Avenue
Sunnyvale, CA 94086

May 2020

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LIST OF ABBREVIATIONS

AB	Assembly bill
BAAQMD	Bay Area Air Quality Management District
BACT	Best Available Control Technology
CAA	Clean Air Act
CAAQS	California ambient air quality standards
CAP	climate action plan
CARB	California Air Resources Board
CARE	Community Air Risk Evaluation
CCAA	California Clean Air Act
CEJA	California Environmental Justice Alliance
CO	carbon monoxide
EPA	U.S. Environmental Protection Agency
HAPs	hazardous air pollutants
HRA	health risk assessment
LUTE	Land Use and Transportation Element
NAAQS	national ambient air quality standards
NO	nitric oxide
NO ₂	nitrogen dioxide
NO _x	oxides of nitrogen
OEHHA	Office of Environmental Health Hazards Assessment
OPR	Office of Planning and Research
PM _{2.5}	fine particulate matter (particulate matter with an aerodynamic diameter of 2.5 micrometers or less)
PM ₁₀	respirable particulate matter (particulate matter with an aerodynamic diameter of 10 micrometers or less)
ROG	reactive organic gases
SB	Senate bill
SFBAAB	San Francisco Bay Area Air Basin
SIP	state implementation plan
SO ₂	sulfur dioxide
TAC	toxic air contaminant
VMT	vehicle miles traveled
VOC	volatile organic compound

1 INTRODUCTION

This report provides a summary of important laws, regulations, and guidance documents relevant to air quality and land use planning in California and the city; an overview of existing air quality and environmental justice issues and conditions; a summary of modeled future air emissions; a description of local and regional air quality issues and programs; and a summary of findings. The findings from this analysis will inform the development of goals and policy updates to the “Environmental Management” chapter of the City’s General Plan.

2 REGULATORY SETTING

2.1 AIR QUALITY

Air quality in the City and Santa Clara County is regulated through the efforts of various federal, state, regional, and local government agencies. These agencies work jointly, as well as individually, to improve air quality through legislation, planning, policy making, education, and a variety of programs. The agencies responsible for improving the air quality in the city and county are discussed below.

2.1.1 Federal

U.S. ENVIRONMENTAL PROTECTION AGENCY

The U.S. Environmental Protection Agency (EPA) has been charged with implementing national air quality programs. EPA’s air quality mandates draw primarily from the federal Clean Air Act (CAA), which was enacted in 1970. The most recent major amendments to the CAA were made by Congress in 1990. EPA’s air quality efforts address criteria air pollutants, ozone precursors, and hazardous air pollutants (HAPs). EPA regulations concerning criteria air pollutants and HAPs are presented in greater detail below.

Criteria Air Pollutants

The CAA required EPA to establish national ambient air quality standards (NAAQS) for seven common air pollutants found all over the United States, referred to as criteria air pollutants and precursors. EPA established primary and secondary NAAQS for the following criteria air pollutants: ozone, carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), PM₁₀, PM_{2.5}, and lead. The NAAQS are shown in Table 1. The primary standards protect public health, and the secondary standards protect public welfare. The CAA also required each state to prepare a state implementation plan (SIP) for attaining and maintaining the NAAQS. The federal Clean Air Act Amendments of 1990 added requirements for states with nonattainment areas to revise their SIPs to incorporate additional control measures to reduce air pollution. California’s SIP is modified periodically to reflect the latest emissions inventories, planning documents, and rules and regulations of the air basins as reported by their jurisdictional agencies.

Table 1 National and California Ambient Air Quality Standards

Pollutant	Averaging Time	CAAQS ^{ab}	NAAQS ^c Primary ^{bd}	NAAQS ^c Secondary ^{be}
Ozone	1 hour	0.09 ppm (180 µg/m ³)	— ^e	Same as primary standard
	8 hours	0.070 ppm (137 µg/m ³)	0.070 ppm (147 µg/m ³)	Same as primary standard
Carbon monoxide (CO)	1 hour	20 ppm (23 mg/m ³)	35 ppm (40 mg/m ³)	Same as primary standard
	8 hours	9 ppm ^f (10 mg/m ³)	9 ppm (10 mg/m ³)	Same as primary standard
Nitrogen dioxide (NO ₂)	1 hour	0.18 ppm (339 µg/m ³)	100 ppb (188 µg/m ³)	—
	Annual arithmetic mean	0.030 ppm (57 µg/m ³)	53 ppb (100 µg/m ³)	Same as primary standard
Sulfur dioxide (SO ₂)	1 hour	0.25 ppm (655 µg/m ³)	75 ppb (196 µg/m ³)	—

Pollutant	Averaging Time	CAAQS ^{ab}	NAAQS ^c Primary ^{bd}	NAAQS ^c Secondary ^{be}
Respirable particulate matter (PM ₁₀)	3 hours	—	—	0.5 ppm (1,300 µg/m ³)
	24 hours	0.04 ppm (105 µg/m ³)	—	—
	24 hours	50 µg/m ³	150 µg/m ³	Same as primary standard
Fine particulate matter (PM _{2.5})	Annual arithmetic mean	20 µg/m ³	—	Same as primary standard
	24 hours	—	35 µg/m ³	Same as primary standard
	Annual arithmetic mean	12 µg/m ³	12 µg/m ³	15.0 µg/m ³
Lead ^f	30-day average	1.5 µg/m ³	—	—
	Calendar quarter	—	1.5 µg/m ³	Same as primary standard
	Rolling 3-month average	—	0.15 µg/m ³	Same as primary standard
Hydrogen sulfide	1 hour	0.03 ppm (42 µg/m ³)	No National standards	
Sulfates	24 hours	25 µg/m ³		
Vinyl chloride ^f	24 hours	0.01 ppm (26 µg/m ³)		
Visibility-reducing particulate matter	8 hours	Extinction of 0.23 per km		

Notes: µg/m³ = micrograms per cubic meter; CAAQS = California ambient air quality standards; km = kilometers; mg/m³ = milligrams per cubic meter; NAAQS = national ambient air quality standards; ppb = parts per billion; ppm = parts per million (by volume).

^a California standards for ozone, carbon monoxide, SO₂ (1- and 24-hour), NO₂, particulate matter, and visibility-reducing particles are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

^b Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based on a reference temperature of 25 degrees Celsius (°C) and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

^c National standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic means) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration in a year, averaged over 3 years, is equal to or less than the standard. The PM₁₀ 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m³ is equal to or less than one. The PM_{2.5} 24-hour standard is attained when 98 percent of the daily concentrations, averaged over 3 years, are equal to or less than the standard.

^d National primary standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

^e National secondary standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

^f CARB has identified lead and vinyl chloride as toxic air contaminants with no threshold of exposure for adverse health effects determined. This allows for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

Source: CARB 2016a

Hazardous Air Pollutants and Toxic Air Contaminants

TACs, or in federal parlance, HAPs, are a defined set of airborne pollutants that may pose a present or potential hazard to human health. A TAC is defined as an air pollutant that may cause or contribute to an increase in mortality or in serious illness, or that may pose a hazard to human health. TACs are usually present in minute quantities in the ambient air; however, their high toxicity or health risk may pose a threat to public health even at low concentrations.

A wide range of sources, from industrial plants to motor vehicles, emit TACs. The health effects associated with TACs are quite diverse and generally are assessed locally, rather than regionally. TACs can cause long-term health effects, such as cancer, birth defects, neurological damage, asthma, bronchitis, and genetic damage, or short-term acute effects, such as eye watering, respiratory irritation (a cough), running nose, throat pain, and headaches.

For evaluation purposes, TACs are separated into carcinogens and noncarcinogens based on the nature of the physiological effects associated with exposure to the pollutant. Carcinogens are assumed to have no safe threshold below which health impacts would not occur. This contrasts with criteria air pollutants for which acceptable levels of exposure can be determined and for which the ambient standards have been established (Table 1). Cancer risk from TACs is expressed as excess cancer cases per 1 million exposed individuals, typically over a lifetime of exposure.

EPA regulates HAPs through its National Emission Standards for Hazardous Air Pollutants. The standards for a source category require the maximum degree of emission reduction that EPA determines to be achievable, which is known as the Maximum Achievable Control Technology standards. These standards are authorized by Section 112 of the CAA, and the regulations are published in 40 Code of Federal Regulations Parts 61 and 63.

EPA and, in California, CARB regulate HAPs and TACs, respectively, through statutes and regulations that generally require the use of the Maximum Achievable Control Technology or Best Available Control Technology (BACT) for air toxics to limit emissions.

2.1.2 State

CARB is the agency responsible for coordination and oversight of state and local air pollution control programs in California and for implementing the California Clean Air Act (CCAA). The CCAA, which was adopted in 1988, required CARB to establish California ambient air quality standards (CAAQS) (Table 1).

CRITERIA AIR POLLUTANTS

CARB has established CAAQS for sulfates, hydrogen sulfide, vinyl chloride, visibility-reducing particulate matter, and the above-mentioned criteria air pollutants. In most cases, the CAAQS are more stringent than the NAAQS. Differences in the standards are generally explained by the health effects studies considered during the standard-setting process and the interpretation of the studies. In addition, the CAAQS incorporate a margin of safety to protect sensitive individuals.

The CCAA requires that all local air districts in the state endeavor to attain and maintain the CAAQS by the earliest date practical. It specifies that local air districts should focus attention on reducing the emissions from transportation and areawide emission sources. The CCAA also provides air districts with the authority to regulate indirect emission sources.

TOXIC AIR CONTAMINANTS

TACs in California are regulated primarily through the Tanner Air Toxics Act (Assembly Bill [AB] 1807, Chapter 1047, Statutes of 1983) and the Air Toxics Hot Spots Information and Assessment Act of 1987 (Hot Spots Act) (AB 2588, Chapter 1252, Statutes of 1987). AB 1807 sets forth a formal procedure for CARB to designate substances as TACs. Research, public participation, and scientific peer review are required before CARB can designate a substance as a TAC. To date, CARB has identified 21 TACs and adopted EPA's list of HAPs as TACs. Particulate matter exhaust from diesel engines (DPM) is one of the TACs identified by CARB.

After a TAC is identified, CARB adopts an airborne toxics control measure for associated source types. If a safe threshold exists for a substance at which there is no toxic effect, the control measure must reduce exposure below that threshold. If no safe threshold exists, the measure must incorporate BACT for toxics to minimize emissions.

The Hot Spots Act requires that existing facilities that emit toxic substances above a specified level prepare an inventory of toxic emissions, prepare a risk assessment if emissions are significant, notify the public of significant risk levels, and prepare and implement risk reduction measures.

California AB 617 of 2017 aims to help protect air quality and public health in environmental justice communities that are disproportionately affected by air pollution. It imposes a new state-mandated community-scale program to address nonvehicular sources (e.g., refineries, manufacturing facilities) of criteria air pollutants and TACs. The bill requires CARB to identify heavily polluted communities suffering from a high exposure burden and directs regional air districts to focus air quality improvement efforts through implementation of community air monitoring plans and adoption of emission reduction programs in these identified areas. Currently, air districts use command-and-control strategies to review individual stationary sources and impose emissions limits on emitters based on BACT, pollutant type, and proximity to nearby existing land uses. AB 617, however, addresses the cumulative and additive nature of air pollutant health effects on a community by requiring local air quality assessment and emission reduction planning.

Industrial sources subject to cap-and-trade limits on greenhouse gas (GHG) emissions are also subject to an expedited schedule for implementing Best Available Retrofit Control Technology (BARCT). In the City, these industrial sources include the Lockheed Martin Corporation and Northrop Grumman Marine Systems Corporation, which must implement BARCT by December 31, 2023. This is intended to improve local air quality for residents living near industrial sources.

CARB has adopted diesel exhaust control measures and more stringent emission standards for various on-road mobile sources of emissions, including transit buses, and off-road diesel equipment (e.g., tractors, generators). Recent milestones included the low-sulfur diesel fuel requirement and tighter emission standards for heavy-duty diesel trucks (effective in 2007 and subsequent model years) and off-road diesel equipment (2011). Over time, replacing older vehicles will result in a vehicle fleet that produces substantially lower levels of TACs than the current fleet. Mobile-source emissions of TACs (e.g., benzene, 1-3-butadiene, DPM) in California have been reduced substantially over the last decade; such emissions will be reduced further through a progression of regulatory measures (e.g., low emission vehicle/clean fuels and Phase II reformulated-gasoline regulations) and control technologies. With implementation of CARB's Risk Reduction Plan, it is expected that DPM concentrations will be 85 percent less in 2020 than they were in 2000 (CARB 2000). Adopted regulations are also expected to continue to reduce formaldehyde emissions emitted by cars and light-duty trucks. As emissions are reduced, it is expected that risks associated with exposure to the emissions will also be reduced.

Air Quality and Land Use Handbook

In 2005, CARB published the *Air Quality and Land Use Handbook: A Community Health Perspective*, a guidance document for siting sensitive land uses near major stationary and nonstationary sources such as freeways, distribution centers, rail yards, ports, refineries, chrome plating facilities, dry cleaners, and gasoline-dispensing facilities. The document includes recommendations for distances and details regarding siting new sensitive land uses (e.g., residences, schools, daycare centers, playgrounds, and medical facilities) near major stationary and nonstationary sources. For example, CARB recommends avoiding siting of new sensitive land uses within 500 feet of roadways that experience an average daily traffic (ADT) volume of 100,000. See Table 2 below for CARB-recommended siting distances for various sources.

Table 2 Recommendations on Siting New Sensitive Land Uses Such as Residences, Schools, Daycare Centers, Playgrounds, or Medical Facilities

Source Category	Advisory Recommendations
Freeways and High-Traffic Roads	▶ Avoid siting new sensitive land uses within 500 feet of a freeway, urban roads with 100,000 vehicles/day, or rural roads with 50,000 vehicles/day.
Distribution Centers	▶ Avoid siting new sensitive land uses within 1,000 feet of a distribution center (that accommodates more than 100 trucks per day, more than 40 trucks with operating transport refrigeration units (TRUs) per day, or where TRU unit operations exceed 300 hours per week). ▶ Take into account the configuration of existing distribution centers and avoid locating residences and other new sensitive land uses near entry and exit points.
Rail Yards	▶ Avoid siting new sensitive land uses within 1,000 feet of a major service and maintenance rail yard. ▶ Within one mile of a rail yard, consider possible siting limitations and mitigation approaches.
Ports	▶ Avoid siting of new sensitive land uses immediately downwind of ports in the most heavily impacted zones. Consult local air districts or the ARB on the status of pending analyses of health risks.
Refineries	▶ Avoid siting new sensitive land uses immediately downwind of petroleum refineries. Consult with local air districts and other local agencies to determine an appropriate separation.
Chrome Platers	▶ Avoid siting new sensitive land uses within 1,000 feet of a chrome plater.
Dry Cleaners Using Perchloroethylene	▶ Avoid siting new sensitive land uses within 300 feet of any dry cleaning operation. For operations with two or more machines, provide 500 feet. For operations with 3 or more machines, consult with the local air district.

Source Category	Advisory Recommendations
	▶ Do not site new sensitive land uses in the same building with perc dry cleaning operations.
Gasoline Dispensing Facilities	▶ Avoid siting new sensitive land uses within 300 feet of a large gas station (defined as a facility with a throughout of 3.6 million gallons per year or greater). A 50 foot separation is recommended for typical gas dispensing facilities.

PLANNING GUIDELINES AND AIR QUALITY

In 2017, the Governor’s Office of Planning and Research (OPR) completed the *General Plan Guidelines*, which serves as the guidance document for jurisdictions in California that are developing or updating their general plans. It identifies important regulations that guide the development of general plans and land use planning at the local level. Chapter 4, “Required Elements,” provides guidance for local jurisdictions on air quality and land use planning issues, providing recommendations for goals and policies in a general plan element that addresses air quality issues. Specifically, the *General Plan Guidelines* provides recommendations for strategies to avoid health impacts for residents near high-volume roadways, including site design considerations to avoid pollutant exposure, vegetation for pollutant dispersion, and indoor high-efficiency air filters for buildings near high-volume roadways (OPR 2017). The chapter also includes a set of examples of policies included in general plans related to air quality and air quality mitigation. Finally, throughout the *General Plan Guidelines*, air quality issues are given consideration in the discussion of related policies, including those related to land use, transportation, health, safety, DACs, and environmental justice. The following example strategies from the *General Plan Guidelines* may be relevant to the City’s air quality-related General Plan policies:

- ▶ Require that new multifamily residential buildings and other sensitive land uses in areas with high levels of localized air pollution be designed to achieve good indoor air quality through landscaping, ventilation systems, or other measures.
- ▶ Provide incentives to promote air pollution reductions, including incentives for developers that go beyond applicable requirements and mitigate pollution for facilities and operations that are not otherwise regulated.
- ▶ Employ strategies in the Community Design Element that reduce driving rates and improve air quality through land use and urban design. These strategies include transit-oriented development, compact development, an appropriate mix of land uses, a jobs/housing balance, transit-oriented development, and walkable streets.
- ▶ Minimize exposure to air pollution and hazardous substances.
- ▶ Encourage nonpolluting industry and clean green technology companies to locate to the city.

2.1.3 Regional and Local

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

BAAQMD maintains and manages air quality conditions in the San Francisco Bay Area Air Basin (SFBAAB), including Santa Clara County and the city of Sunnyvale, through a comprehensive program of planning, regulation, enforcement, technical innovation, and promotion of the understanding of air quality issues. The clean air strategy of BAAQMD includes the preparation of plans and programs for the attainment of the NAAQS and CAAQS, adoption and enforcement of rules and regulations, and issuance of permits for stationary sources. BAAQMD also inspects stationary sources, responds to citizen complaints, monitors ambient air quality and meteorological conditions, and implements other programs and regulations required by the CAA and CCAA.

In addition, the BAAQMD provides guidance to local agencies for preparing air quality and GHG analyses for the purpose of complying with the California Environmental Quality Act (CEQA). BAAQMD has adopted thresholds of significance that are used for determining potentially significant impacts to air quality and climate change from

proposed discretionary actions. Projects that meet the adopted thresholds of significance would not contribute substantially to the nonattainment status of the region. Through the development approval process, local jurisdictions are responsible for enforcing mitigation measures to ensure projects reduce their emissions to the extent feasible and comply with BAAQMD guidance as well as CEQA.

Air Quality Plans

To achieve the CAAQS, BAAQMD prepares and updates air quality plans regularly. The air quality plans published by BAAQMD and other local air districts in the state are incorporated into California's SIP Strategy and meet CAA requirements.

For state air quality planning purposes, the SFBAAB is classified as a serious nonattainment area with respect to the 1-hour ozone standard. The "serious" classification triggers various plan submittal requirements and transportation performance standards. One such requirement is that BAAQMD update its Clean Air Plan every 3 years to reflect progress in meeting the NAAQS and CAAQS and to incorporate new information regarding the feasibility of control measures and new emission inventory data. BAAQMD's record of progress in implementing previous measures must also be reviewed. BAAQMD prepares these plans in cooperation with the Metropolitan Transportation Commission and the Association of Bay Area Governments. On April 19, 2017, BAAQMD adopted the most recent revision to the Clean Air Plan, titled the *2017 Clean Air Plan: Spare the Air, Cool the Climate* (BAAQMD 2017a). This plan serves to:

- ▶ define a vision for transitioning the region to a post carbon economy needed to achieve 2030 and 2050 GHG reduction targets;
- ▶ decrease emissions of air pollutants most harmful to Bay Area residents, such as particulate matter, ozone, and TACs;
- ▶ reduce emissions of methane and other potent climate pollutants; and
- ▶ decrease emissions of carbon dioxide by reducing fossil fuel combustion.

Planning Healthy Places Guidebook

In 2016, BAAQMD published the *Planning Healthy Places: A Guidebook for Addressing Local Sources of Air Pollutants in Community Planning*. The guidebook provides guidance and strategy recommendations for planners to reduce emission in communities, as well as reduce residence exposure to pollutants. The guidebook provides details on best practices for each measure, as well as guidance implementation and example policies (BAAQMD 2016). The following policies from the guidebook are recommended for local jurisdictions:

- ▶ Reduce emissions of local air pollution
 - Retrofit generators to low or zero emitting technology
 - Electrify loading docks
 - Limit idling times for trucks and large vehicles
 - Promote zero emission vehicles and alternative fuels
 - Promote or require the use of transportation refrigeration units
 - Implement transportation demand management strategies for residents and employers
 - Implement traffic management strategies for congestion and safety
- ▶ Reduce exposure to local air pollution
 - Employ health protective distances for sensitive land uses
 - Install air filters in residential and sensitive land uses
 - Use project phasing for new development
 - Use building site design and operations to reduce exposure to sensitive receptors

- Construct barriers (sound walls) to block pollution
- Use vegetation to absorb and block pollution
- Consider limiting ground floor uses near heavily traveled roadways and freeways
- Adopt alternative truck routes through nonresidential neighborhoods

BAAQMD CEQA Guidelines

The BAAQMD's most recent guidelines are the California Environmental Quality Act Air Quality Guidelines (Guidelines), published in May 2017. The Guidelines include thresholds of significance, which are tied to achieving or maintaining attainment designations with the NAAQS and CAAQS. The BAAQMD's project level thresholds, which are scientifically substantiated, are numerical concentrations of criteria air pollutants considered to be protective of human health. Further, the Guidelines address issues related to odors, carbon monoxide, and TACs. To reduce pollution and health risk exposure in the region, the Guidelines address both construction-related and operational-related emissions associated with new development.

Odors

Odors are generally regarded as an annoyance rather than a health hazard, and federal and state air quality regulations do not contain any requirements for their control. However, manifestations of a person's reaction to foul odors can range from psychological (e.g., irritation, anger, anxiety) to physiological (e.g., circulatory and respiratory effects, nausea, vomiting, headache).

BAAQMD identifies odor sources of concern to include wastewater treatment plants, stationary landfills, composting facilities, recycling facilities, petroleum refineries, manufacturing plants, painting operations, rendering plants, and food packaging plants (BAAQMD 2017b:3-4).

SUNNYVALE GENERAL PLAN

The *Sunnyvale General Plan* contains the following goal and policies related to air quality:

GOAL EM-11 Improved Air Quality: Improve Sunnyvale's air quality and reduce the exposure of its citizens to air pollutants.

- ▶ **Policy EM-11.1:** The City should actively participate in regional air quality planning.
- ▶ **Policy EM-11.2:** Utilize land use strategies to reduce air quality impact, including opportunities for citizens to live and work in close proximity.
- ▶ **Policy EM-11.3:** Require all new development to utilize site planning to protect citizens from unnecessary exposure to air pollutants.
- ▶ **Policy EM-11.4:** Apply the Indirect Source Rule to new development with significant air quality impacts. Indirect source review would cover commercial and residential projects as well as other land uses that produce or attract motor vehicle traffic.
- ▶ **Policy EM-11.5:** Reduce automobile emissions through traffic and transportation improvements.
- ▶ **Policy EM-11.6:** Contribute to a reduction in regional vehicle miles traveled.
- ▶ **Policy EM-11.7:** Reduce emissions from City of Sunnyvale fleet vehicles.
- ▶ **Policy EM-11.8:** Assist employers in meeting requirements of Transportation Demand Management (TDM) plans for existing and future large employers and participate in the development of TDM plans for employment centers in Sunnyvale.

Also, the City prepared a Climate Action Playbook (or "Playbook") to reduce greenhouse gas emissions and address climate change, confirming the City's commitment to sustainability and climate action. The Climate Action Playbook was born out of the Climate Action Plan 2.0 (CAP 2.0) Initiative (2017), a framework to update Sunnyvale's updated

Climate Action Plan (CAP 1.0) from 2014 and accelerate local action to further prevent climate change. The Climate Action Playbook was adopted in August 2019 and replaces the CAP 1.0.

2.2 ENVIRONMENTAL JUSTICE

The topic of environmental justice is gaining increasing importance in the planning process, particularly in terms of economic and racial disparities; public health impacts; and DACs, which are disproportionately exposed to and affected by pollution. This section provides an overview of key regulations and legislation in place in California relevant to DACs, environmental justice, land use planning, and the general plan process. Because environmental justice is a relatively new topic for general plan guidance for the state, guidance and regulations regarding environmental justice considerations are likely to become more comprehensive in the future and should be monitored for future changes and updates.

2.2.1 Senate Bill 1000

Senate Bill (SB) 1000 was signed into state law in 2016 to address the statewide problem of DACs, as defined in the legislation, often bearing a disproportionate burden of exposure to pollution and other environmental hazards. SB 1000 defines a DAC as “[a]n area identified by the California Environmental Protection Agency (CalEPA) pursuant to Section 39711 of the Health and Safety Code or an area that is a low-income area that is disproportionately affected by environmental pollution and other hazards that can lead to negative health effects, exposure, or environmental degradation.” The law requires local jurisdictions with DACs, designated at the census tract level, to address environmental justice when they update two or more general plan elements on or after January 1, 2018. The law requires that an environmental justice element be added to the general plan or that relevant environmental justice goals be integrated into other required elements identifying DACs and providing policies and objectives to reduce the disproportionate health risks in DACs. Objectives and policies should promote civic engagement in the public decision-making process. The purpose is to promote policies that improve the health and overall well-being of vulnerable and at-risk communities through reductions in pollution exposure, increased access to healthy foods, increased prevalence of healthy homes, improved air quality, and increased physical activity. The SB 1000 Toolkit, developed by the California Environmental Justice Alliance to guide implementation of SB 1000 requirements, provides screening methodologies for identifying DACs.

2.2.2 Assembly Bill 617 Community Air Protection Program

AB 617 of 2017 aims to help protect air quality and public health in communities around industries subject to the state’s cap-and-trade program for GHG emissions. It imposes a new state-mandated local program to address nonvehicular sources (e.g., refineries, manufacturing facilities) of criteria air pollutants and TACs. The bill requires CARB to identify high-pollution areas and directs air districts to focus air quality improvement efforts through the adoption of community emission reduction programs in these identified areas. Currently, air districts review individual sources and impose emissions limits on emitters based on BACT, pollutant type, and proximity to nearby existing land uses. This bill addresses the cumulative and additive nature of air pollutant health effects by requiring communitywide air quality assessment and emission reduction planning. CARB is developing a statewide blueprint, which will contain a menu of CARB-certified emission reduction measures that may be used in community programs to reduce emissions based on local needs and sources.

2.2.3 Senate Bill 535 and Assembly Bill 1550—Disadvantaged Communities

Authorized by the California Global Warming Solutions Act of 2006 (AB 32), the cap-and-trade program is one of several strategies that California uses to reduce GHGs that cause climate change. The funds generated by the program must be used for programs that further reduce emissions of GHGs known as the Greenhouse Gas Reduction Fund.

In 2012, the legislature passed SB 535 (de Leon), directing that 25 percent of the proceeds from the Greenhouse Gas Reduction Fund go to projects that provide a benefit to DACs. The legislation gave CalEPA responsibility for identifying those communities. In April 2017, CalEPA released its list of DACs for the purpose of SB 535. To inform its decision, CalEPA used CalEnviroScreen 3.0 results. In June 2018, to address a minor flaw in the software program algorithm, CalEPA added two census tracts (6067000800 in Sacramento and 6075012301 in San Francisco) to its Disadvantaged Communities List for Climate Investments in accordance with its designation report, which describes the methodology used for designating DACs.

In 2016, the legislature passed AB 1550 (Gomez), which requires that 25 percent of proceeds from the fund be spent on projects located in DACs. The law requires the investment plan to allocate (1) a minimum of 25 percent of the available moneys in the fund to projects located in, and benefiting individuals living in, DACs; (2) an additional minimum of 5 percent to projects that benefit low-income households or to projects located in, and benefiting individuals living in, low-income communities located anywhere in the state; and (3) an additional minimum of 5 percent either to projects that benefit low-income households that are outside of, but within one-half mile of, DACs or to projects located within the boundaries of, and benefiting individuals living in, low-income communities that are outside of, but within one-half mile of, DACs. Under SB 1550, the following definitions apply:

- ▶ “Low-income households” are those with household incomes at or below 80 percent of the statewide median income or with household incomes at or below the threshold designated as low income by the California Department of Housing and Community Development’s list of state income limits adopted pursuant to Section 50093.
- ▶ “Low-income communities” are census tracts with median household incomes at or below 80 percent of the statewide median income or with median household incomes at or below the threshold designated as low income by the California Department of Housing and Community Development’s list of state income limits adopted pursuant to Section 50093.

3 EXISTING COMMUNITY CONDITIONS

This section provides an overview of the environmental setting in the city with a focus on issues related to air quality, including climate, existing emission sources in and near the city, and existing planning related to air quality, and to environmental justice, as it relates to air quality, and potential environmental justice issues in the city.

3.1 AIR QUALITY

This section summarizes existing air quality in the city and the characteristics of the city and surrounding region that contribute to current air quality issues. It also includes a discussion of the land use and planning context in the city, as it relates to sources of air pollutants, as well as sensitive receptors that may be affected by exposure to pollutants. The discussion addresses both regional and local existing conditions.

3.1.1 Climate, Meteorology, and Topography

The City is in the Santa Clara Valley climatological subregion in Santa Clara County in the SFBAAB, which includes all of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, and Santa Clara Counties; the western portion of Solano County; and the southern portion of Sonoma County.

The Santa Clara Valley is bounded by the San Francisco Bay to the north and by mountains to the east, south, and west. Temperatures are warm on summer days and cool on summer nights, and winter temperatures are relatively mild. At the northern end of the valley, the mean maximum temperatures are in the low 80s (degrees Fahrenheit [°F]) during summer and high 50s in winter, and mean minimum temperatures range from the upper 50s in summer to the low 40s in winter. Further inland, where the moderating effect of the San Francisco Bay is not as strong, temperature extremes are more significant. Winds in the valley are greatly influenced by the terrain, resulting in a

prevailing flow that roughly parallels the valley's northwest-southeast axis. A north-northwesterly sea breeze flows through the valley during the afternoon and early evening, and a light south-southeasterly drainage flow occurs during the late evening and early morning. In summer, the southern end of the valley sometimes becomes a "convergence zone," and air flowing from Monterey Bay gets channeled northward into the southern end of the valley and meets the prevailing north-northwesterly winds. Wind speeds are greatest in spring and summer and weakest in fall and winter. Nighttime and early morning hours frequently have calm winds in all seasons, while summer afternoons and evenings are breezy. Strong winds are rare, associated mostly with the occasional winter storm.

The local meteorology of the city can be represented by measurements recorded at the Western Regional Climate Center Palo Alto station. The normal annual precipitation is approximately 15 inches. January temperatures range from a normal minimum of 39°F to a normal maximum of 57°F. July temperatures range from a normal minimum of 54°F to a normal maximum of 78°F (WRCC 2016). The prevailing wind direction is from the north (WRCC 2002).

The ambient concentrations of air pollutant emissions in the region are determined by the amount of emissions released by the sources of air pollutants and the atmosphere's ability to transport and dilute such emissions. Natural factors that affect transport and dilution include terrain, wind, atmospheric stability, and sunlight. Existing air quality conditions in the area are determined by such natural factors as topography, meteorology, and climate, in addition to the amount of emissions released by existing air pollutant sources, as discussed separately below.

Atmospheric conditions, such as wind speed, wind direction, and air temperature gradients, interact with the physical features of the landscape to determine the movement and dispersal of air pollutants. The climate of the SFBAAB is determined largely by a high-pressure system that is often present over the eastern Pacific Ocean. High-pressure systems are characterized by an upper layer of dry air that warms as it descends, restricting the mobility of cooler marine-influenced air near the ground surface, resulting in subsidence inversions. During summer and fall, locally generated emissions can, under the restraining influences of topography and subsidence inversions, cause conditions that are conducive to the formation of photochemical pollutants, such as ozone and secondary particulates (e.g., nitrates and sulfates). In winter, the Pacific high-pressure system shifts southward, allowing storms to pass through the area (BAAQMD 2017b:C-1 to C-4).

The potential for high pollutant concentrations to develop at a given location depends on the quantity of pollutants emitted into the atmosphere in the surrounding area or upwind and on the ability of the atmosphere to disperse the contaminated air. The topographic and climatological factors discussed above influence the atmospheric pollution potential of an area. Atmospheric pollution potential, as the term is used here, is independent of the location of emission sources and is instead a function of factors described below (BAAQMD 2017b).

INVERSIONS

An inversion is a layer of warmer air over a layer of cooler air. Inversions affect air quality conditions significantly because they influence the mixing depth (i.e., the vertical depth in the atmosphere available for diluting air contaminants near the ground). The highest air pollutant concentrations in the SFBAAB generally occur during inversions. Two types of inversions occur regularly in the SFBAAB. One is more common in summer and fall, while the other is most common during winter. The frequent occurrence of elevated temperature inversions in summer and fall months acts to cap the mixing depth, limiting the depth of air available for dilution. Elevated inversions are caused by subsiding air from the subtropical high-pressure zone and from the cool marine air layer that is drawn into the SFBAAB by the heated low-pressure region in the Central Valley. The inversions typical of winter, called radiation inversions, are formed as heat quickly radiates from the earth's surface after sunset, causing the air in contact with it to rapidly cool. Radiation inversions are strongest on clear, low-wind, cold winter nights, allowing the buildup of such pollutants as CO and particulate matter. When wind speeds are low, there is little mechanical turbulence to mix the air, resulting in a layer of warm air over a layer of cooler air next to the ground. Mixing depths under these conditions can be as shallow as 50–100 meters, particularly in rural areas. Urban areas usually have deeper minimum mixing layers because of heat island effects and increased surface roughness. During radiation inversions, downwind transport is slow, the mixing depths are shallow, and turbulence is minimal, all factors that contribute to ozone

formation. Although each type of inversion is most common during a specific season, either inversion mechanism can occur at any time of the year. Sometimes, both occur simultaneously. Moreover, the characteristics of an inversion often change throughout the course of a day. The terrain of the SFBAAB also induces significant variations among subregions (BAAQMD 2017b).

SOLAR RADIATION

The frequency of hot, sunny days during the summer months in the SFBAAB is another important factor that affects air pollution potential. It is at the higher temperatures that ozone is formed. In the presence of ultraviolet sunlight and warm temperatures, reactive organic gases (ROG) and oxides of nitrogen (NO_x) form secondary photochemical pollutants, including ozone. Because temperatures in many of the SFBAAB inland valleys are so much higher than near the coast, the inland areas are especially prone to photochemical air pollution. In late fall and winter, solar angles are low, resulting in ultraviolet light and warming of the atmosphere insufficient to drive the photochemical reactions. Ozone concentrations do not reach significant levels in the SFBAAB during these seasons (BAAQMD 2017b).

3.1.2 Land Use Context

The City was incorporated in 1912 and remained a mostly rural agricultural community until the 1930s, when the U.S. Navy developed Moffett Federal Airfield, which is located directly northwest of the city. Like many communities during the post–World War II era, the City experienced significant growth between 1950 and 1960. The aircraft manufacturer Lockheed moved its headquarters to the city in 1956, further supporting growth in the city. Since the 1960s, numerous high-tech companies have established offices and headquarters in the city, which now includes major employment centers in the northern and central portions of the city.

In 2017, the City had a population of 152,000 with a median age of 36 and median household income of \$118,314. The population estimate for 2019 is 155,567, according to the latest data released by the California Department of Finance. The most common occupations for residents were computer and mathematical, management, and architecture and engineering jobs, based on North American Industry Classification System classifications. In 2017, 74 percent of residents in the city commuted in single-occupancy vehicles, 10 percent carpooled, and 7 percent took public transit. The average commute time for all modes was 23 minutes. The average car ownership in the city is two cars per household (U.S. Census Bureau 2017).

Land uses in the city are largely low-density residential uses in the southern portion of city. The middle portion of the city, between El Camino Real and U.S. 101, has low- to mid-density residential, commercial, office, and mixed-use areas, including a commercial corridor along El Camino Real and industrial uses in the Peery Park Specific Plan. This portion of the city also includes a railroad line that runs east-west through the city and has two Caltrain stations (Sunnyvale and Lawrence). The northern portion of the city has residential mobile homes, low-density residential, commercial uses, and the Moffett Park Specific Plan area north of SR 237, which includes industrial, office park, and commercial uses, including light-rail train stations as part of the Santa Clara Valley Transportation Authority (VTA) light-rail system. While the City has been developed, there are several approved and proposed revitalization projects that are redeveloping underutilized areas with research and development, office, and residential uses.

The Sunnyvale General Plan was most recently updated in 2017 with the update to the Land Use and Transportation Element; however, other sections within the General Plan were last updated between 1992 and 2017. The Environmental Management Chapter of the General Plan identifies one goal and eight policies devoted to air quality and was last updated in 1992. The policies address the relationship between transportation, land uses, and air quality issues related to both stationary and ambient sources. The policies related to air quality in the Environmental Management Chapter of the City's current General Plan are listed in Section 3.1.3 of this report.

3.1.3 Existing Air Quality

CRITERIA AIR POLLUTANTS

Concentrations of emissions from criteria air pollutants are used to indicate the quality of the ambient air. A brief description of key criteria air pollutants in the SFBAAB and their health effects is provided below. Criteria air pollutants include ozone, CO, NO₂, SO₂, PM₁₀ and PM_{2.5}, and lead. However, for purposes of this report, criteria air pollutants of primary concern because of their nonattainment status include ozone (and ozone precursors) and particulate matter. A description of the sources and health effects for each criteria pollutant is summarized in Table 3.

Table 3 Sources and Health Effects of Criteria Air Pollutants

Pollutant	Sources	Acute ¹ Health Effects	Chronic ² Health Effects
Ozone	Secondary pollutant resulting from the reaction of ROG and NO _x in the presence of sunlight; ROG emissions result from the incomplete combustion and evaporation of chemical solvents and fuels, and NO _x results from the combustion of fuels	Increased respiration and pulmonary resistance; cough, pain, shortness of breath, and lung inflammation	Permeability of respiratory epithelia, possibility of permanent lung impairment
Carbon monoxide (CO)	Incomplete combustion of fuels; motor vehicle exhaust	Headache, dizziness, fatigue, nausea, vomiting, and death	Permanent heart and brain damage
Nitrogen dioxide (NO ₂)	Combustion devices (e.g., boilers, gas turbines, and mobile and stationary reciprocating internal combustion engines)	Coughing, difficulty breathing, vomiting, headache, eye irritation, chemical pneumonitis or pulmonary edema, breathing abnormalities, cyanosis, chest pain, rapid heartbeat, and death	Chronic bronchitis and decreased lung function
Sulfur dioxide (SO ₂)	Coal and oil combustion, steel mills, refineries, and pulp and paper mills	Irritation of upper respiratory tract and increased asthma symptoms	Insufficient evidence linking SO ₂ exposure to chronic health impacts
Respirable particulate matter (PM ₁₀), Fine particulate matter (PM _{2.5})	Fugitive dust, soot, smoke, mobile and stationary sources, construction, fires and natural windblown dust, and formation in the atmosphere by condensation and/or transformation of SO ₂ and ROG	Breathing and respiratory symptoms, aggravation of existing respiratory and cardiovascular diseases, and premature death	Alterations to the immune system and carcinogenesis
Lead	Metal processing	Reproductive/developmental effects (fetuses and children)	Numerous effects, including neurological, endocrine, and cardiovascular effects

¹ "Acute" refers to effects of short-term exposures to criteria air pollutants, usually at fairly high concentrations.

² "Chronic" refers to effects of long-term exposures to criteria air pollutants, usually at lower, ambient concentrations.

Notes: NO_x = oxides of nitrogen; ROG = reactive organic gases.

Sources: EPA 2016

ATTAINMENT DESIGNATIONS

Although air pollution potential is strongly influenced by climate and topography, the air pollution that occurs in a location also depends on the amount of air pollutant emissions in the surrounding area or transported from more distant places. Air pollutant emissions generally are highest in areas that have high population densities and high motor vehicle use and/or industrialization. Contaminants created by photochemical processes in the atmosphere, such as ozone, may result in high concentrations many miles downwind from the sources of their precursor chemicals (BAAQMD 2017b).

Criteria air pollutant concentrations are measured at several monitoring stations in the SFBAAB and are used by EPA and CARB to designate areas according to their attainment status for criteria air pollutants. The purpose of these designations is to identify those areas with air quality problems and thereby initiate planning efforts for improvement. The three basic designation categories are "nonattainment," "attainment," and "unclassified." An area in "attainment" is defined as any area that meets the national/State primary or secondary ambient air quality standard. An area in "nonattainment" is any area that does not meet the national/State primary or secondary ambient air quality standard. "Unclassified" is used in an area that cannot be classified on the basis of available information as meeting or not meeting the standards. In addition, the California designations include a subcategory of the nonattainment designation, called "nonattainment-transitional." The nonattainment-transitional designation is given to nonattainment areas that are progressing and nearing attainment. The current attainment designations for Santa Clara County are shown in Table 4.

Table 4 Attainment Status Designations for Santa Clara County

Pollutant	National Ambient Air Quality Standard	California Ambient Air Quality Standard
Ozone	Attainment (1-hour) ¹	Nonattainment (1-hour) classification ²
	Nonattainment (8-hour) ³ classification = marginal	Nonattainment (8-hour)
	Nonattainment (8-hour) ⁴ classification = marginal	Nonattainment (8-hour)
Respirable particulate matter (PM ₁₀)	Attainment (24-hour)	Nonattainment (24-hour)
	Attainment (24-hour)	Nonattainment (annual)
Fine particulate matter (PM _{2.5})	Nonattainment (24-hour)	No state standard for 24-hour
	Nonattainment (annual)	Nonattainment (annual)
Carbon monoxide (CO)	Attainment (1-hour)	Attainment (1-hour)
	Attainment (8-hour)	Attainment (8-hour)
Nitrogen dioxide (NO ₂)	Unclassified/attainment (1-hour)	Attainment (1-hour)
	Unclassified/attainment (annual)	Attainment (annual)
Sulfur dioxide (SO ₂) ⁵	(Attainment) (1-hour)	Attainment (1-hour)
	(Attainment) (1-hour)	Attainment (24-hour)
Lead (particulate)	Attainment (3-month rolling average)	Attainment (30-day average)
Hydrogen sulfide	No federal standard	Unclassified (1-hour)
Sulfates	No federal standard	Attainment (24-hour)
Visibly-reducing particles	No federal standard	Unclassified (8-hour)
Vinyl chloride	No federal standard	Unclassified (24-hour)

¹ Air quality meets federal 1-hour ozone standard (77 *Federal Register* 64036). The U.S. Environmental Protection Agency revoked this standard, but some associated requirements still apply.

² Per Health and Safety Code Section 40921.5(c), the classification is based on 1989–1991 data and therefore does not change.

³ 1997 standard.

⁴ 2008 standard.

⁵ 2010 standard.

Source: BAAQMD 2017b

COUNTY EMISSIONS INVENTORY

CARB provides estimates for Santa Clara County's 2012 emissions inventory, the most recent available inventory. According to this inventory, mobile sources are the largest contributor to the estimated annual average for air pollutant levels of ROG and NO_x (accounting for approximately 40 percent and 64 percent, respectively, of the total emissions). Areawide sources account for approximately 81 percent and 73 percent of the county's PM₁₀ and PM_{2.5} emissions, respectively (CARB 2013).

MONITORING STATION DATA AND ATTAINMENT AREA DESIGNATIONS

BAAQMD and CARB operate a regional monitoring network that measures the ambient concentrations of the six criteria air pollutants in the Bay Area. Existing and probable future levels of air quality in Santa Clara County can generally be inferred from ambient air quality measurements conducted by BAAQMD at its nearby monitoring stations.

Table 5 shows a 3-year summary of monitoring data from the San Jose-Jackson Street station, the station closest to the City, for ozone, PM_{2.5}, and PM₁₀, the main pollutants of concern in Santa Clara County. The corresponding federal and state air quality standards are listed in Table 1. The CAA required EPA to establish NAAQS, which regulate criteria air pollutants. The CCAA required CARB to establish CAAQS. Standards and Santa Clara County attainment status are shown above in Table 4.

Table 5 Summary of Annual Air Quality Data (2016–2018)

Ozone ¹	2016	2017	2018
Maximum concentration (1-hour/8-hour, ppm)	0.087/0.061	0.121/0.098	0.078/0.062
Number of days state standard exceeded (1-hour/8-hour)	0/0	3/4	0/0
Number of days national standard exceeded (1-hour/8-hour)	0/0	0/4	0/0
Respirable Particulate Matter (PM ₁₀) ¹	2016	2017	2018
Maximum concentration (µg/m ³)	41.0	69.8	121.8
Number of days state standard exceeded (measured ²)	0	6	4
Number of days national standard exceeded (measured ²)	0	0	1
Fine Particulate Matter (PM _{2.5}) ¹	2016	2017	2018
Maximum concentration (µg/m ³)	22.6	49.7	133.9
Annual average (µg/m ³)	8.4	*	12.9
Number of days national standard exceeded (measured ²)	0	6	15

Notes: µg/m³ = micrograms per cubic meter; ppm = parts per million; * = data insufficient to determine the value.

¹ Data from the San Jose-Jackson Street station.

² Measured days are those days that an actual measurement was greater than the level of the state daily standard or the national daily standard. The number of days above the standard is not necessarily the number of violations of the standard for the year.

Source: CARB 2019b

Both CARB and EPA use this type of monitoring data to designate areas according to their attainment status for criteria air pollutants. The purpose of these designations is to identify those areas with air quality problems and thereby initiate planning efforts for improvement. The three basic designation categories are “nonattainment,” “attainment,” and “unclassified.” “Unclassified” is used in an area that cannot be classified on the basis of available information as meeting or not meeting the standards. Attainment designations for 2016–2018 in Santa Clara County are shown in Table 5 for each criteria air pollutant.

As shown in Table 5, in 2017 and 2018 this station experienced exceedances on several days for both PM₁₀ and PM_{2.5} as well as exceedance of ozone standards in 2017. The number of these exceedances is, in part, likely attributable to the wildfire events affecting the San Francisco Bay Area in 2017 (Napa, Sonoma, and Mendocino fires) and 2018 (Carr, Mendocino Complex, and Camp fires), including periods of heavy wildfire smoke that covered much of the SFBAAB. As noted by BAAQMD, 14 of the 18 exceedance days for the air district in 2017 were attributable to wildfires (BAAQMD 2019a).

STATIONARY SOURCES

As discussed in Section 3.1.3, stationary sources of pollutants are regulated by BAAQMD and mitigated through requirements for BACT and emission offsets. Large stationary sources of emissions are more comprehensively

regulated than mobile sources and can sometimes include requirements for additional mitigation (BAAQMD 2017b). The city has two large stationary sources, Lockheed Martin Corporation and Northrop Grumman Marine Systems Corporation, that are included on CARB's inventory of large stationary source facilities in the state that emit more than 10 tons of criteria air pollutants per year (CARB 2019a). The facilities also report annual TAC and GHG emissions through the CARB reporting guidelines.

Lockheed Martin Corporation is an aeronautics manufacturing facility in the northern portion of the city, located adjacent to Moffett Federal Airfield. The facility is in an industrial area of the city, surrounded by industrial uses, Moffett Airfield, and office uses. The facility generates emissions of benzene, DPM, formaldehyde, chromium, and nickel, all of which are TACs. Regarding TACs, this facility does not exceed the BAAQMD's prioritization risk threshold of 10, which would trigger the need for preparing a Health Risk Assessment (HRA). Regarding criteria air pollutants, in 2017, this facility generated 25 tons of NO_x, less than 1 ton of PM₁₀ and PM_{2.5}, and 8.4 tons of volatile organic compounds (VOCs), not exceeding BAAQMD's limit for major stationary sources of 100 tons per year for criteria air pollutants (BAAQMD 2017b). Northrop Grumman Marine Systems Corporation is a marine hardware manufacturing facility located along East Hendy Avenue and North Fair Oaks Avenue, adjacent to the Caltrain rail line (CARB 2019a). The facility is in a mixed-use portion of the city, surrounded by residential uses but near other industrial and commercial uses. The facility generates emissions of benzene, DPM, formaldehyde, chromium, and nickel. Regarding TACs, this facility does not exceed the BAAQMD's prioritization risk threshold of 10, which would trigger the need for preparing a Health Risk Assessment (HRA). In 2017, this facility generated 1.8 tons of NO_x, less than 1 ton of PM₁₀ and PM_{2.5}, and 9.47 tons of VOCs, not exceeding BAAQMD's limit for major stationary sources of 100 tons per year for criteria air pollutants (BAAQMD 2017b).

MOBILE SOURCES

The city is located near several large roadways: U.S. 101, SR 82, SR 237, Lawrence Expressway, Central Expressway, I-280, and SR 85. Emissions from mobile sources are a large portion of the anticipated increase in emissions in the city and one of the largest sources of criteria air pollutants and ozone precursors in the city.

From a land use planning perspective, high-volume roadways are a concern because they typically are the primary source of TACs in an urban setting. CARB defines a high-volume road as an urban road with 100,000 or more vehicle trips per day or a rural road with 50,000 or more vehicle trips per day (CARB 2005). The BAAQMD uses similar designations but also considers major local roads with 10,000 or more vehicle trips per day as potential sources of TACs. BAAQMD recommends that receptors within 1,000 feet of highways and major roads be evaluated for TAC exposure.

According to the California Department of Transportation, for the year 2017, the following roadways had a daily ADT volume of more than 100,000 (Caltrans 2017):

- ▶ U.S. 101 near the juncture with SR 237 (170,100 ADT),
 - ▶ SR 237 near the Lawrence Expressway (130,200 ADT),
 - ▶ SR 85 near Fremont Avenue (126,000 ADT), and
 - ▶ I-280 near the juncture with SR 85 (146,000 ADT).
- ▶ Caltrain is also a noted source of TACs in the area but is in the process of electrification.

TOXIC AIR CONTAMINANTS

According to the *California Almanac of Emissions and Air Quality* (CARB 2013), most of the estimated health risks from TACs can be attributed to relatively few compounds, the most important being DPM. DPM differs from other TACs in that it is not a single substance but rather a complex mixture of hundreds of substances. Although DPM is emitted by diesel-fueled internal combustion engines, the composition of the emissions varies depending on engine type, operating conditions, fuel composition, and lubricating oil and on whether an emission control system is being

used. Unlike the other TACs, no ambient monitoring data are available for DPM because no routine measurement method currently exists. However, CARB has made preliminary concentration estimates based on a PM exposure method. This method uses the CARB emissions inventory's PM₁₀ database, ambient PM₁₀ monitoring data, and the results from several studies to estimate concentrations of DPM. In addition to DPM, the TACs for which data are available that pose the greatest ambient risk in California are benzene, 1,3-butadiene, acetaldehyde, carbon tetrachloride, hexavalent chromium, para-dichlorobenzene, formaldehyde, methylene chloride, and perchloroethylene.

DPM poses the greatest health risk among these 10 TACs (OEHHA 2015:6-8). CARB evaluates the health risk associated with exposure to TACs on a cumulative basis with a focus on cancer risk. The risk for an individual TAC is calculated by multiplying its unit risk factor with its average concentration during the exposure period. The unit risk factor is expressed as the probability, or risk, of contracting cancer because of consistent exposure to an ambient concentration of 1 microgram per cubic meter ($\mu\text{g}/\text{m}^3$) for 70 years (i.e., the risk of contracting cancer, or excess cancer cases, per 1 million people exposed over a 70-year period) (CARB 2009:5-3). Using these receptor modeling techniques, CARB estimated that the background level of DPM in the SFBAAB in 2000 resulted in a cancer risk exposure of 480 in 1 million, which, when coupled with the average cancer risk from airborne exposure (i.e., cancer risk unrelated to DPM exposure) in the SFBAAB of 179 in 1 million, yields a combined cancer risk of 659 in 1 million. Since 1990, emissions of DPM have decreased in the SFBAAB even though population and diesel vehicle miles traveled have grown because more stringent emission standards for diesel engines have been adopted. State and local programs have reduced the average level of cancer risk in the SFBAAB from TAC exposure by 83 percent over the last two decades (BAAQMD 2017c:50).

ODORS

The ability to detect odors varies considerably among the population and overall is quite subjective. Some individuals can smell minute quantities of specific substances; others may not have the same sensitivity but may have sensitivities to odors of other substances. In addition, people may have different reactions to the same odor; an odor that is offensive to one person may be perfectly acceptable to another (e.g., odors from a fast-food restaurant). It is important to also note that an unfamiliar odor is more easily detected and is more likely to cause complaints than a familiar one. The reason for this is the phenomenon known as odor fatigue. A person can become desensitized to almost any odor, and recognition occurs only with an alteration in the intensity. As stated previously, odor sources of concern include wastewater treatment plants, sanitary landfills, composting facilities, recycling facilities, petroleum refineries, chemical manufacturing plants, painting operations, rendering plants, and food packaging plants (BAAQMD 2017b:3-4).

The City of Sunnyvale Water Pollution Control Plant, a wastewater treatment plant, is located on the northern edge of the city, adjacent to San Francisco Bay. The facility is approximately 0.85 mile from the nearest residential sensitive receptor. The SMaRT Station recycling facility is located adjacent to the city's wastewater treatment plant and is located 0.8 mile from the nearest residential sensitive receptor.

3.1.4 Sensitive Receptors

Sensitive receptors generally include those land uses at which exposure to pollutants could result in health-related risks to sensitive individuals, including children and the elderly. Residential dwellings, schools, hospitals, daycare facilities, and similar facilities are of primary concern because of the presence of individuals particularly sensitive to pollutants and/or the potential for increased and prolonged exposure of individuals to pollutants.

As discussed above, the southern portion of the city is comprised of residential uses with some commercial uses intermixed. Moving north through the city, the mix of sensitive land uses, particularly those associated with residential neighborhoods (e.g., residential dwellings, schools, daycare facilities), with other nonresidential land uses increases. As a result, the potential for land use conflicts to occur is higher in the central and northern parts of the city.

In the category of sensitive receptors, certain populations are at increased risk from air pollution. Individuals or concentrated areas in cities with increased rates of asthma and cardiovascular disease are disproportionately at risk

from air quality–related issues, particularly during periods of high ozone concentrations. Additionally, households or areas in a city with increased rates of low-income residents are also at a disadvantage, as discussed further in Section 4.2.2. Census tracts that include residential land uses in the city are within the 2nd to 43rd percentile for individuals with asthma, meaning they are higher than 2–43 percent of all census tracts in California. The rate of asthma in census tracts increases noticeably moving further north in the city.

Regarding criteria air pollutants, census tracts that include residential land uses in the city are within the 52nd to 76th percentile for DPM emissions, meaning they are higher than 52–76 percent of all census tracts in California. Sources of DPM within and nearby the populated parts of these census tracts emit between 17 and 25 kilograms per day. All census tracts in the city are in the 52nd percentile for PM_{2.5} emission (OEHHA 2018).

Existing stationary sources located in the city emit air pollutants, including benzene, DPM, formaldehyde, chromium, and nickel, all of which are TACs and contribute to increased exposure risk for sensitive receptors near these facilities.

3.2 ENVIRONMENTAL JUSTICE

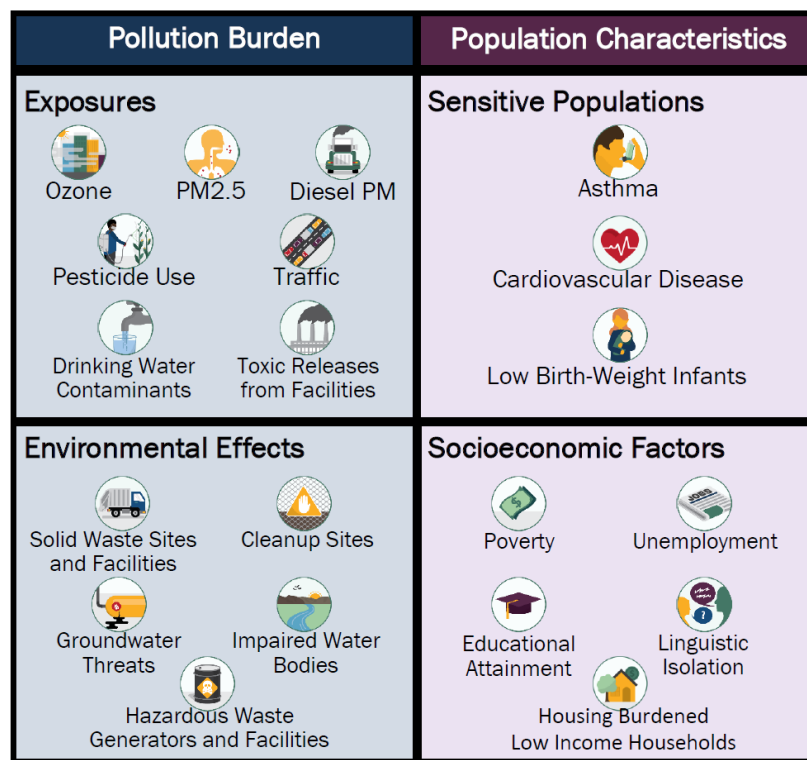
This section provides an overview of potential environmental justice concerns in the city, specifically as they relate to air quality and land use planning. The environmental justice movement developed its foundations in the 1960s and 1970s, at a time when the social and environmental justice movements were growing quickly in the United States. Currently, environmental justice issues persist in many places in the United States and are gaining increasing importance as the impacts of climate change worsen and are projected to exacerbate environmental justice issues and disproportionately affect DACs (CEJA 2017). As the state continues to push for climate change solutions and adaption strategies using funding programs and legislation, environmental justice issues will remain a central concern for low-income communities and DACs in the state, particularly how and where investments to address climate change are distributed (CEJA 2017).

The CalEnviroScreen 3.0 tool was used to identify DACs. Further, a discussion of some of the key pollutant indicators used in the CalEnviroScreen 3.0 that are important to the city (e.g., DPM exposure, ozone exposure levels) is provided.

3.2.1 Disadvantaged Communities

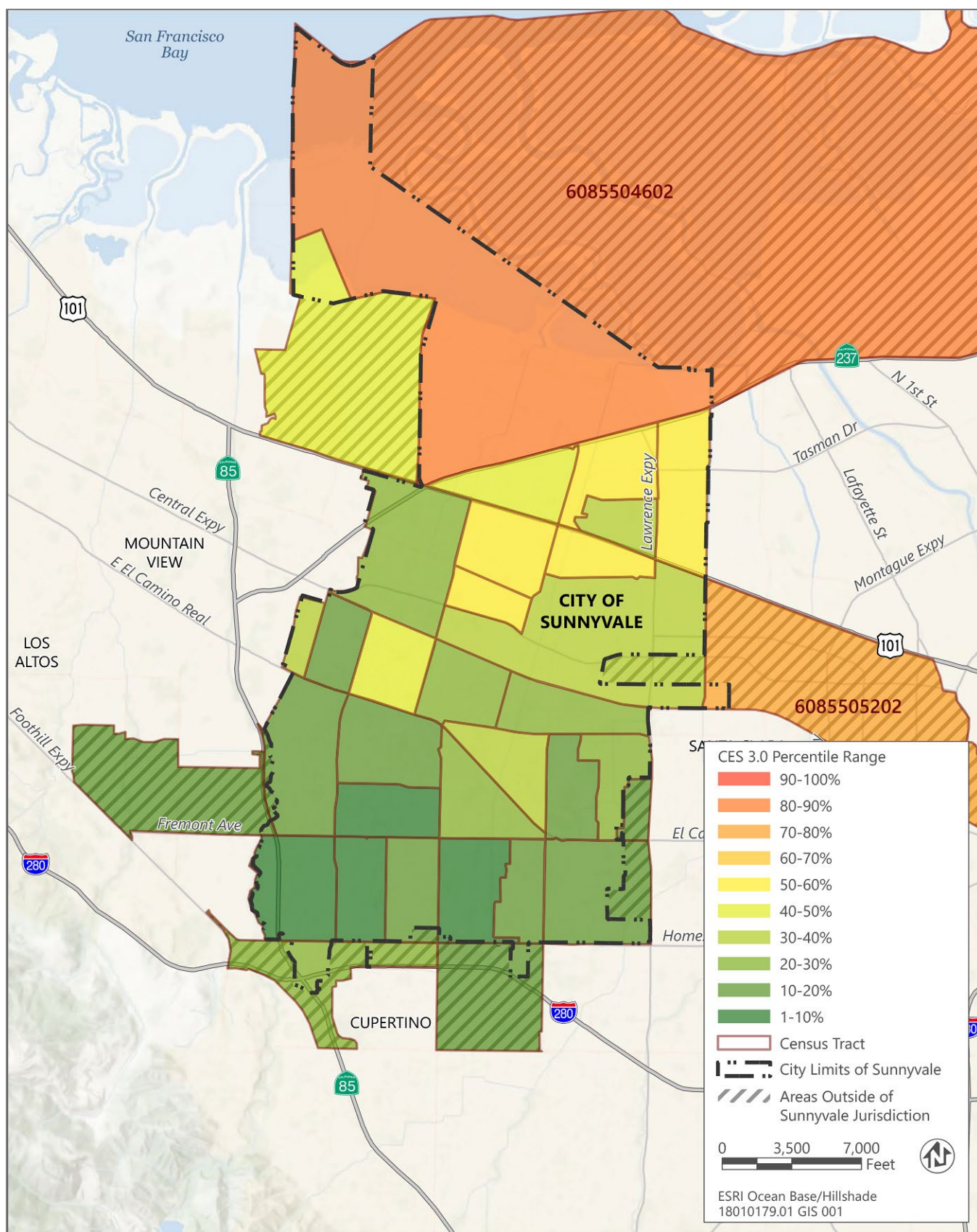
CalEnviroScreen identifies low-income census tracts in California that are disproportionately burdened by and vulnerable to multiple sources of pollution. DACs identified using CalEnviroScreen 3.0 are targeted for investment proceeds under SB 535. These investments are aimed at improving public health, the quality of life, and economic opportunity in California’s most burdened communities while at the same time reducing pollution that causes climate change. Scores are generated using 20 statewide indicators to characterize both pollution burden and population characteristics. There are four components (i.e., exposures, environmental effects, sensitive populations, and socioeconomic factors) with associated indicators that are ranked by percentile. These components are placed within either the Pollution Burden or Population Characteristics category to be scored. Pollution burden and population characteristics are then multiplied to generate the CalEnviroScreen score. Higher scores indicate a higher burden.

Figure 1 shows the 20 indicators, organized by the Pollution Burden and Population Characteristics categories and the four components, and Figure 2 shows the CalEnviroScreen scores in the city.



Source: OEHHA 2018

Figure 1 CalEnviroScreen 3.0 Indicators



Source: data downloaded from California Office of Environmental Health Hazard Assessment in 2020

Figure 2 CalEnviroScreen 3.0 Scores for the City of Sunnyvale

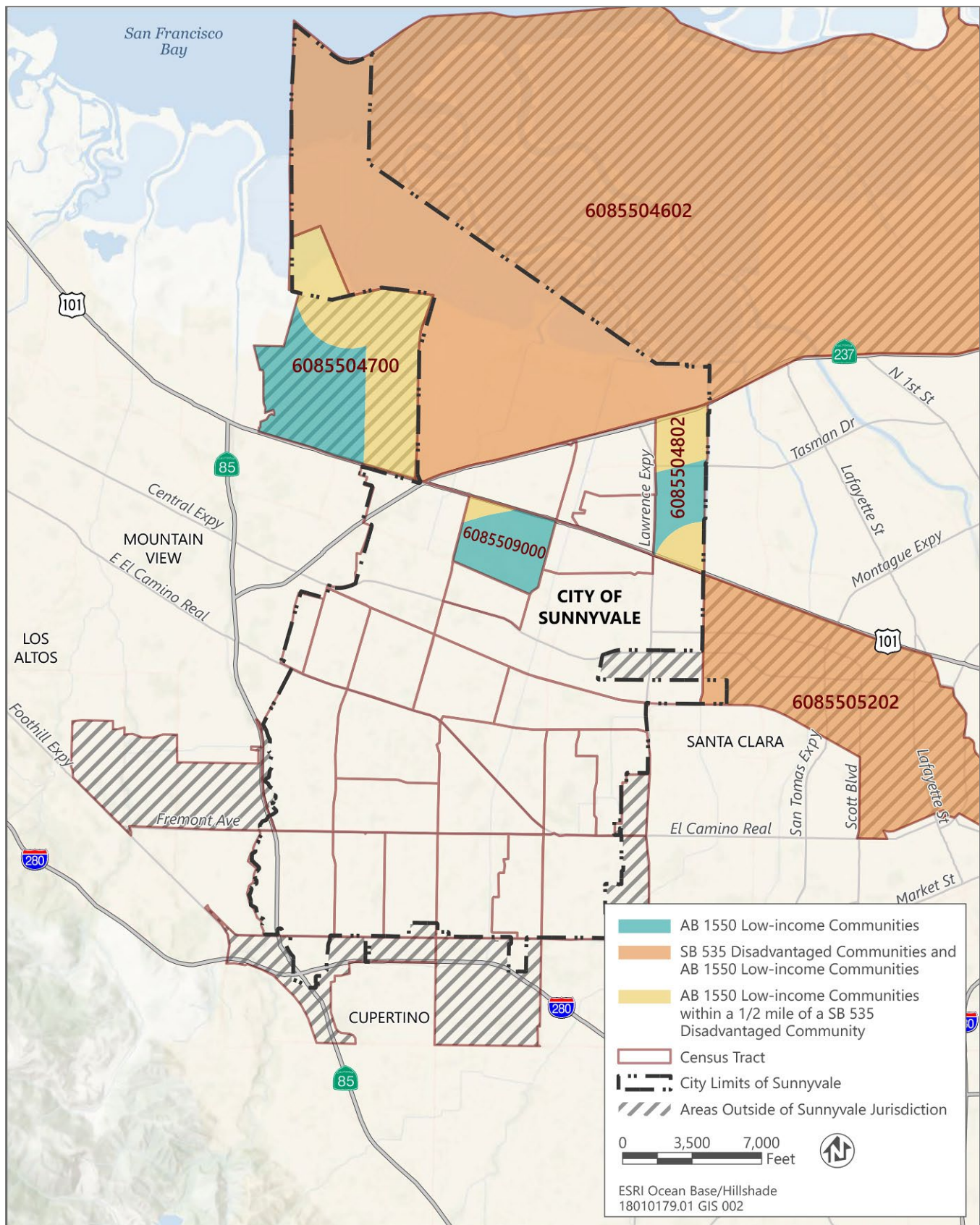
According to CalEnviroScreen 3.0, there are two census tracts within the City that are in the top 25 percent of highest scoring tracts for the state and may qualify as CalEPA-defined DACs (see Figure 3). Both census tracts extend beyond City limits, and are described below:

- ▶ Census tract 6085504602 is scored in the 80-85 percentile (i.e., this census tract has a higher overall CalEnviroScreen score than 80-85 percent of all other census tracts in the state). The tract is located at the northern end of the City adjacent to the southern tip of the San Francisco Bay and bounded by Enterprise Way to the west and the State Route (SR) 237 to the southeast. A large portion of this census tract is within the City of San Jose and includes the community of Alviso. The portion of this census tract that is within the City of Sunnyvale does not include residential uses and is composed of baylands, light industrial, office uses, restaurants, and hotels. This area is within the Moffett Park Specific Plan (MPSP), last updated in 2013, which includes zoning for industrial, office, and commercial uses. The City is currently conducting a comprehensive update to the MPSP.
- ▶ Census tract 6085505202 is scored in the 75-80 percentile (i.e., this census tract has a higher overall CalEnviroScreen score than 75-80 percent of all other census tracts in the state). The tract is located primarily within the City of Santa Clara. A small portion of the tract is in the eastern part of the City, near the Lawrence Caltrain Station. This area is bounded by Kifer Road to the north, the Caltrain tracks to the south, Calabazas Creek to the west, and Uranium Drive to the east. This area is within the Lawrence Area Specific Plan (LSAP), adopted in 2016, which includes flexible, mixed-use zoning for residential, commercial, office, research and development, and industrial and service uses. The portion of this census tract that is within the City does not include residential uses; however, the City is currently in the process of updating the LSAP to consider allowing residential uses in this area.

These tracts are in the top 25 percent of highest scoring tracts in the state due to a combination of high pollution burden and the presence of sensitive populations and socioeconomic challenges. However, it is important to note that the sensitive populations within these tracts reside outside of the City boundaries and fall under the jurisdiction of the City of San Jose and the City of Santa Clara. SB 535 is intended to provide funding to priority populations residing in an area with high pollution exposures. There are no residential uses in the portions of these census tracts within City boundaries; therefore, they would not be considered DACs for the City under SB 535. If the City allows for residential uses in these areas in the future, it will be important to consider the effects of existing air quality issues, contaminants, and other pollution sources.

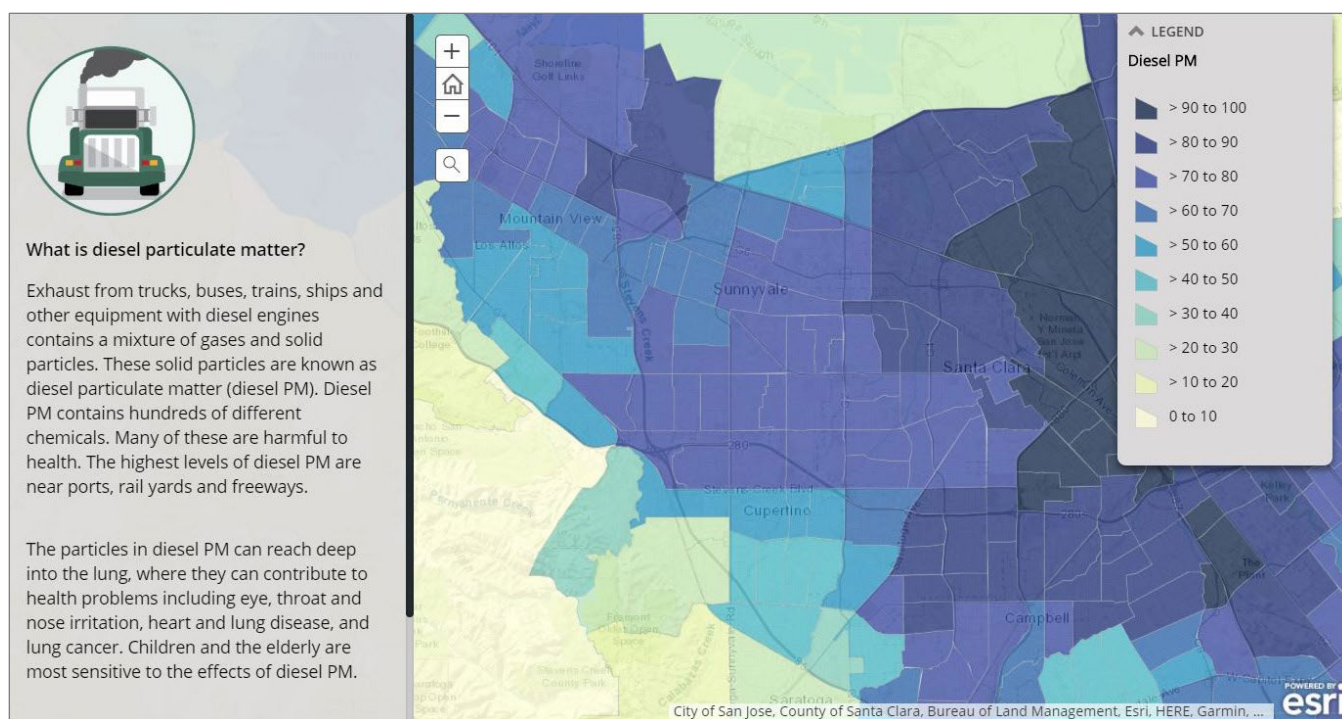
In terms of air pollution, CalEnviroScreen 3.0 includes data about criteria air pollutant concentrations and asthma rates in the city, shown in Figures 4 through 7. Air quality data is explained below.

- ▶ **Ozone**—Generally, the ozone percentile for census tracts in the city is 17, meaning that the summed concentration is higher than 17 percent of all the census tracts in California.
- ▶ **PM_{2.5}**—Generally, the PM_{2.5} percentile for census tracts is 53, meaning that the summed concentration is higher than 53 percent of all the census tracts in California.
- ▶ **DPM**—Generally, the DPM percentile for census tracts in the city ranges from 53 to 78, meaning that the summed concentration is higher than 53–78 percent of all the census tracts in California, depending on the census tract.
- ▶ **Traffic density**—The traffic density percentile for census tracts in the city ranges from 28 to 93, meaning that it is higher than 28–93 percent of the census tracts in California. Traffic density is measured by vehicle-kilometers per hour compared to the size of the census tract. Census tracts in the northern portion of the city, near SR 237 and SR 101, are within the 85th to 93th percentiles for traffic density, which is likely related to the higher than average DPM emissions for portions of the city.

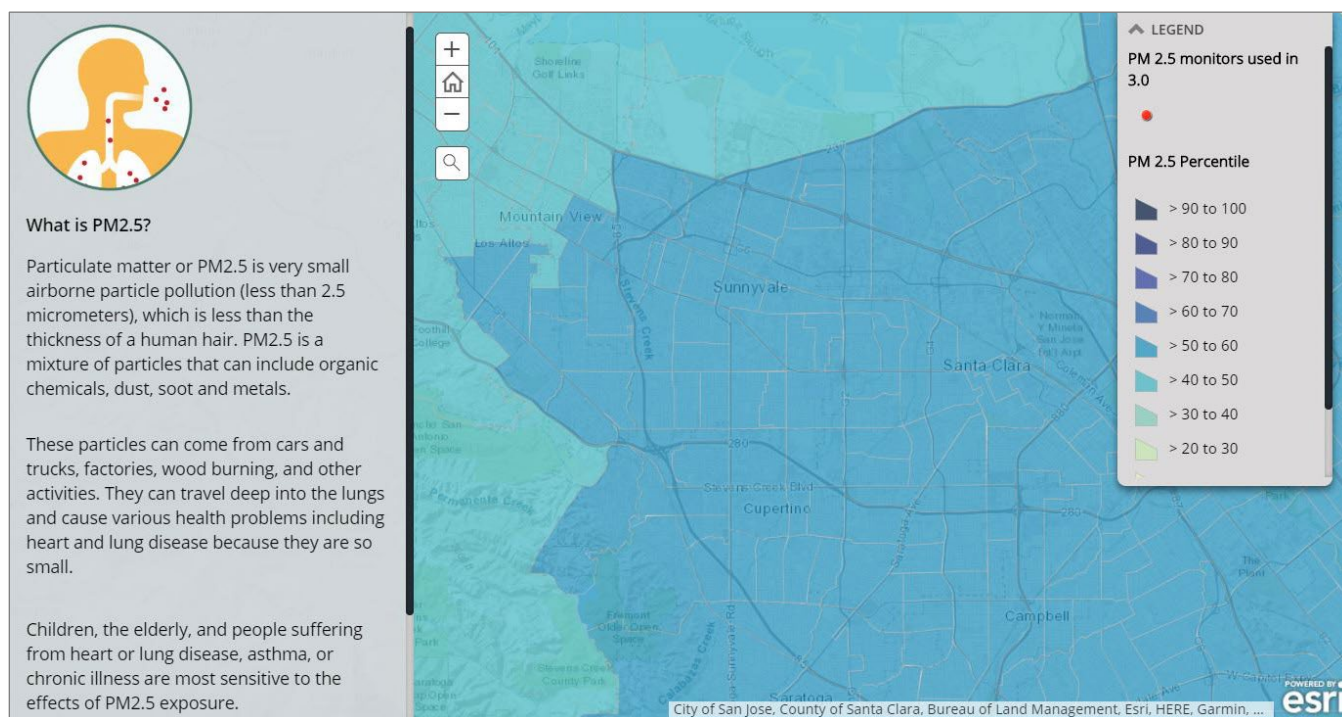


Source: Data downloaded from California Air Resources Board in 2020

Figure 3 Low-Income Areas in City of Sunnyvale

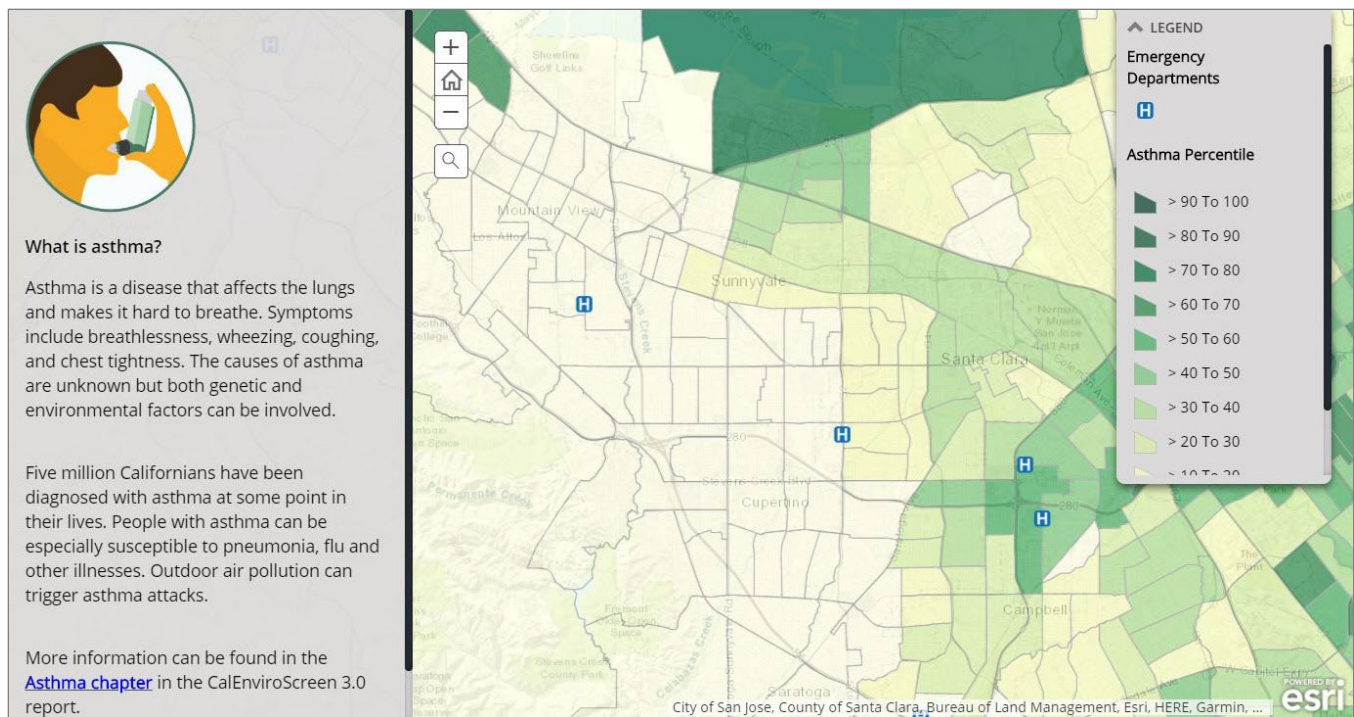


Source: OEHHA 2018

Figure 4 Diesel Particulate Matter Concentrations near City of Sunnyvale

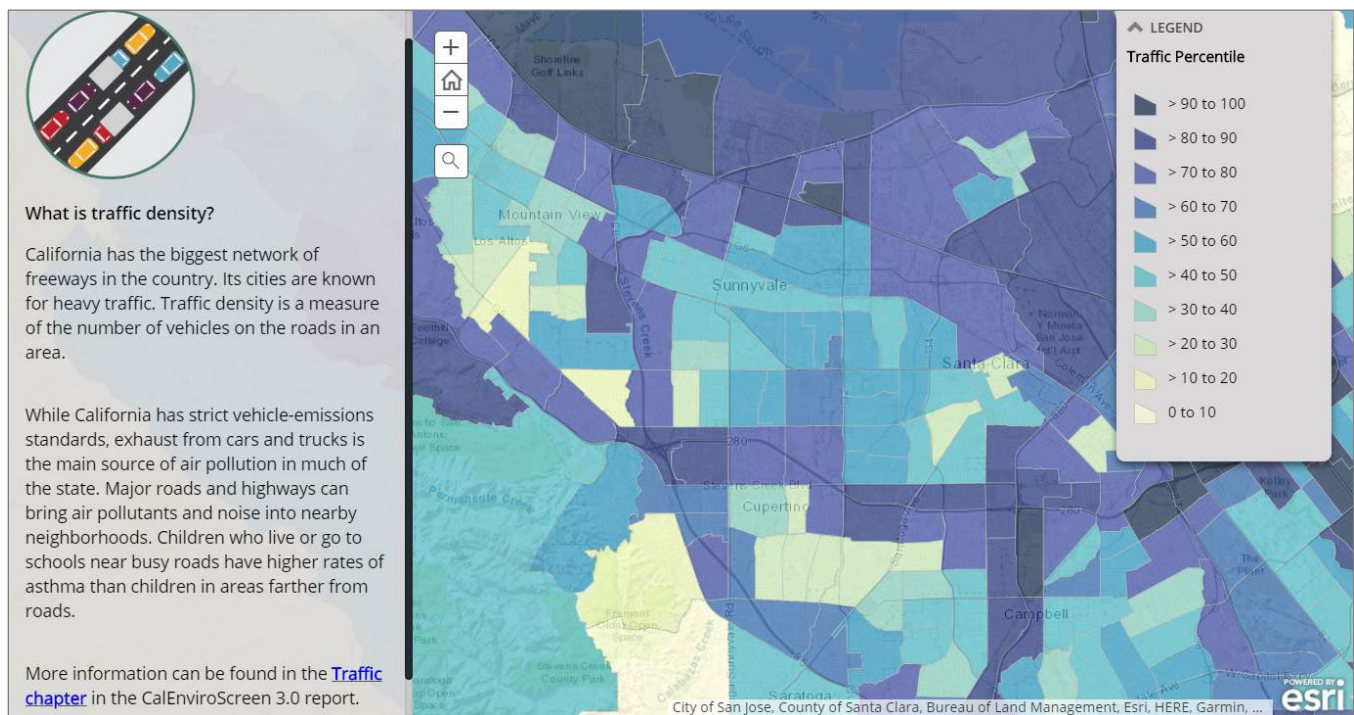
Source: OEHHA 2018

Figure 5 PM_{2.5} Concentrations near City of Sunnyvale



Source: OEHHA 2018

Figure 6 Asthma Rates near City of Sunnyvale



Source: OEHHA 2018

Figure 7 Traffic Densities near City of Sunnyvale

3.2.2 Low-Income Areas

SB 1000 allows for additional identification methods of DACs by identifying areas that are both 1) low income and 2) disproportionately affected by environmental pollution and other hazards that can lead to negative health effects, exposure, and/or environmental degradation (CEJA 2017). These additional definitions were included in the legislation to give jurisdictions the flexibility to adapt DAC identification to their local context. To identify DACs under these two definitions, planners must screen for areas that meet the conditions of both definitions. However, in 2016, AB 1550 (Gomez, Statutes of 2016) modified the investment minimums to DACs, requiring at least 25 percent of funds to go to projects in and benefitting DACs and at least an additional 10 percent of funds to go to low-income households or communities. A low-income census tract, defined under AB 1550, is a tract with a median household income at or below 80 percent of the statewide median income for American Community Survey 2011–2015 data (CEJA 2017).

Research has found that poverty may lead to greater susceptibility to the effects of chronic stress (Brunner and Marmot 2006). Burdens of preexisting illness and co-exposure to one or more pollutants can also increase health risks in low-income populations (O'Neill et al. 2003). Research has found that the income level neighborhoods can affect the relationship between particulate air pollution and preterm birth (Yi et al. 2010), as well as the relationship between traffic volumes and low birth weights (Zeka et al. 2008).

As shown in Figure 3, the City has two census tracts—6085509000 and 6085504802—that meet the definition of a low-income census tract under AB 1550. Census tract 6085509000, located in the northern portion of the city, is bounded by US 101 to the north, East Maude Avenue to the south, North Mathilda Avenue to the west, and North Fair Oaks Avenue to the east. This neighborhood is known as SNAIL, and is identified as one of the City's neighborhood associations. This census tract is also in the 85th percentile for traffic density, located directly southeast of the juncture of SR 237 and US 101, two major roadways with high daily traffic rates. This census tract is located in the 69th percentile for DPM emissions, meaning DPM emissions in this tract are higher than in 69 percent of all census tracts in California.

Census tract 6085504802, located in the northern portion of the city, is bounded by SR 237 to the north, US 101 to the south, Calabazas Creek to the east, and Lawrence Expressway/Lawrence Station Road to the west. A portion of the Lakewood Village neighborhood association is located within this tract, south of the Adobe Wells Mobile Home Park. This census tract is in a census tract in the 86th percentile for traffic density, located east of the juncture of SR 237 and US 101, two major roadways with high daily traffic rates. It is located in the 60th percentile for DPM emissions, meaning DPM emissions in this tract are higher than in 60 percent of all census tracts in California.

4 FUTURE CONDITIONS

4.1 AIR QUALITY

This section provides an overview of the projected future conditions in the city as they relate to air quality and land use planning. It includes a discussion of the City's General Plan, specifically the Land Use and Transportation Element (LUTE), as well as factors that may affect air quality in the future.

LAND USE AND TRANSPORTATION ELEMENT UPDATE

In 2017, the City updated the LUTE, which establishes the fundamental framework of how streets and buildings in the city will be laid out and how various land uses, development, and transportation facilities will function together. The LUTE helps the City guide land use planning and transportation decisions over an approximately 20-year horizon (2035). The LUTE update was also developed to integrate policy direction and land use patterns from specific plans in the city, including opportunities to increase density and transit-oriented development in the city. The LUTE update anticipated an estimated addition of 27,445 residents and 42,410 jobs over existing conditions by 2035 (City of Sunnyvale 2016).

The LUTE update was also developed to help the City address climate change through a "complete" Sunnyvale strategy to ensure that the entire community has adequate resources and that it shares land use, transportation, and resource

planning with adjacent communities and the region. The complete community strategy includes 12 features that define the end state for the “Complete Sunnyvale,” including design principles, land use strategies, community characteristics, and quality-of-life features that can improve the city for residents and visitors (City of Sunnyvale 2017). As part of the LUTE planning process, the City developed a strategy to identify areas in the city that are anticipated to change and grow over the planning horizon for the LUTE. This strategy was motivated, in part, by efforts to improve the job-housing balance in the city and provide a land use strategy that increases density near transit and services and in turn reduces citywide vehicle miles traveled and reduces mobile source emissions of GHGs and criteria air pollutants.

The air quality analysis presented in the LUTE Environmental Impact Report (EIR) includes an assessment of how implementation of the LUTE would affect air quality in the city and the region. The analysis uses a specific set of significance thresholds related to air quality to determine the potential impacts associated with updating the LUTE. It looks at the total new development in residential and nonresidential land uses that could occur and estimates emissions that would be associated with various activities from the new development and population, including energy use, vehicle use, and household and business activities that generate emissions (e.g., area sources). Table 6 presents the results of emission modeling conducted for the LUTE EIR air quality analysis that conservatively assumed buildout of the City.

Table 6 Criteria Air Pollutant and Precursor Emissions Related to the Update of the Land Use and Transportation Element of the City of Sunnyvale General Plan (New Development in 2035)

Source	ROG	NO _x	CO	SO ₂	PM ₁₀	PM _{2.5}
New Development (Summer) – Pounds per Day						
Area sources	740.6	14.3	1,243.6	0.0	19.9	19.7
Energy sources	15.1	132.5	80.5	0.8	10.4	10.4
Mobile sources ²	309.9	465.0	2,602.9	10.4	736.9	204.5
Total	1,065.7	611.9	3,927.1	11.3	767.2	234.7
New Development (Winter) – Pounds per Day						
Area sources	740.6	14.3	1,243.6	0.0	19.9	19.7
Energy sources	15.1	132.5	80.5	0.8	10.4	10.4
Mobile sources ²	321.6	510.3	3,094.6	9.81	736.9	204.5
Total	1,077.4	657.2	4,418.9	10.7	767.3	234.7
New Development (Annual) – Tons per Year						
Area sources	128.3	1.29	111.8	0.0	0.6	0.6
Energy sources	2.7	24.1	14.7	0.1	1.9	1.9
Mobile sources ²	54.5	89.4	504.5	1.8	129.6	36.1
Total	185.6	114.9	631.1	1.9	132.1	38.6

Notes: CO = carbon monoxide; NO_x = oxides of nitrogen; PM_{2.5} = fine particulate matter; PM₁₀ = respirable particulate matter; ROG = reactive organic gases; SO₂ = sulfur dioxide.

Totals may not sum due to rounding.

Emission projections account for 15,100 new residential units and 12.5 million square feet of nonresidential square footage. Emission projections account for the trip generation rates, and vehicle miles traveled identified in the transportation impact analysis prepared for the project.

Source: City of Sunnyvale 2016

The LUTE EIR concluded that implementation of the LUTE update could result in air quality impacts and, as a result, identified mitigation measures to be implemented for future development to reduce impacts from construction emissions, TAC exposure from construction and operation, and odors. Mitigation measures are summarized herein. Short-term construction related emissions would be reduced through requirements to incorporate BAAQMD basic construction measures and minimum requirements for more efficient diesel use (i.e., CARB Tier 3 engines) into construction documents. For larger construction projects, construction pollutant mitigation plans would be required, which would include project-specific dispersion modeling to identify TAC impacts and incorporation of additional

mitigation such as limits on construction hours. To reduce TAC exposure to new residents from new operational sources, a site-specific analysis would be conducted to determine health risk. Where applicable thresholds are found to be exceeded, measures would be included to ensure risk thresholds are not exceeded, which could include relocation of sensitive uses and inclusion of indoor air filters. Finally, exposure to odor would be reduced through site planning consideration and coordinated land use planning efforts between the City and BAAQMD.

4.2 ENVIRONMENTAL JUSTICE

As shown in Figure 1, a variety of environmental and socioeconomic factors affect DACs and contribute to overall air quality impacts on the community. Because of the range of factors involved, projecting future environmental justice issues can be difficult. However, based on what is understood about existing conditions related to environmental justice issues in the city, educated assumptions can be made about how these conditions may change or remain the same in the future.

Current ozone and particulate matter issues in the SFBAAB will continue to disproportionately affect disadvantaged populations and individuals in the city until these issues are resolved at the regional level. As the population in the San Francisco Bay Area continues to grow, future increases in traffic volumes and other sources of pollution may exacerbate air quality issues affecting these populations. These issues are partly out of the City's control; however, the City can help reduce the number of new and existing sources of emissions, particularly mobile sources, through land use planning that promotes transportation options other than single-occupancy vehicle use. Additionally, the City can ensure that environmental justice issues are considered in future land use planning projects that involve sensitive land uses.

The current housing crisis in the state, and in the San Francisco Bay Area, could also exacerbate environmental justice issues in the city. Health-care costs for impacts related to air quality disproportionately affect low-income households. If the percentage of household income devoted to housing costs continues to rise, this issue will likely disproportionately affect certain disadvantaged populations. As discussed further in Section 6.1.3, the projected impacts of climate change, specifically increases in temperature and in the frequency of heat waves and wildfires, could exacerbate environmental justice issues in the city and the region.

5 LOCAL AND REGIONAL AIR QUALITY ISSUES AND PROGRAMS

This section provides an overview of programs and topics focused on specific air quality issues that may inform the policy development process for updates to the City's General Plan.

5.1.1 BAAQMD CARE Program

BAAQMD administers the Community Air Risk Evaluation (CARE) Program with the goal of identifying locations with high toxic emissions and sensitive populations and using the information to help the relevant air district establish policies regarding the use of its incentive funding, regulatory authority, and other programs to reduce toxic emissions in areas with high TAC exposures and sensitive populations. The CARE Program aims to reduce health impacts linked to local air quality. The goals of the CARE Program are to:

- ▶ identify areas where air pollution contributes most to health impacts and where populations are most vulnerable to air pollution,
- ▶ apply sound scientific methods and strategies to reduce health impacts in these areas, and
- ▶ engage community groups and other agencies to develop additional actions to reduce local health impacts.

No locations in the city are identified in the CARE Program as communities affected by toxic emissions. However, the program can still provide guidance and resources for potential future issues in the city related to high toxic emissions and sensitive populations.

5.1.2 Sunnyvale Climate Action Planning

In 2014, the City developed a climate action plan (CAP) to help achieve GHG emission reductions consistent with the state's GHG reduction targets. In August 2019, the City updated its CAP through the *Climate Action Playbook* document, which helps the City achieve communitywide reductions in GHG emissions consistent with the state's targets of reducing GHG emissions to 40 percent below 1990 levels by 2030 and 80 percent below by 2050 (City of Sunnyvale 2019). Strategies in the CAP, specifically Strategy 2: Decarbonizing Buildings and Strategy 3: Decarbonizing Transportation & Sustainable Land Use, if fully implemented, would contribute noticeably toward reducing the city's contribution to air quality issues. Increases in household electric vehicle adoption rates and the full electrification of appliances in new and existing buildings in the city would reduce GHG emissions and improve local air quality for residents. The following list of strategies would help achieve reductions in local criteria air pollutants while also reducing GHGs:

- ▶ Strategy 2: Decarbonizing Buildings
 - 2.A: Research energy disclosure and energy benchmarking requirements for commercial and multi-family residential buildings to encourage property owners and managers to invest in energy efficiency upgrades and building information systems.
 - 2.B: Advocate to regional providers of energy efficiency programs (such as Bay Area Regional Energy Network or BayREN, Silicon Valley Energy Watch or SVEW) that their offerings are more aggressively promoted to Sunnyvale residents and businesses.
 - 2.C: Develop a program to accelerate the adoption of heat pump water heaters and space heaters.
 - 2.D: Electrify municipal buildings upon rebuild or significant remodel, including the Civic Center.
 - 2.E: Evaluate code and permitting processes to streamline building electrification.
 - 2.F: Investigate the potential for implementing a differential Utility Use Tax that is at least revenue neutral, such that local taxes on electricity are lower than on natural gas, to incentivize electrification.
 - 2.G: Continue to incentivize energy efficient and high-performance buildings through the Green Building Program updates.
- ▶ Strategy 3: Decarbonizing Transportation & Sustainable Land Use
 - 3.A: Plan for additional housing, with the goal of diverse housing, to reduce long-distance commutes.
 - 3.B: Identify areas that are most appropriate for parking strategies that discourage vehicle use, such as pricing, time limits and supply reductions.
 - 3.C: Enhance City Transportation Demand Management (TDM) program implementation and monitoring to facilitate further reductions in single-occupant automobile trips, citywide.
 - 3.D: Advocate that regional service providers implement high quality transit service and a robust set of first- and last-mile strategies in over two-thirds of the cross-city corridors.
 - 3.E: Update and implement Active Transportation Plan to achieve a connected, safe and active network.
 - 3.F: Pilot and evaluate shared bicycle and scooter programs.
 - 3.G: Pilot shuttle service in Peery Park and consider options for expansion of a similar service in other areas undergoing redevelopment.

- 3.H: Develop design standards for streets and parking lots to accommodate increased pick-up and drop-off for rideshare passengers and apply as appropriate.
- 3.I: Monitor autonomous vehicle testing and deployment to inform proactive policy.
- 3.J: Develop a Community Electric Vehicle Readiness and Infrastructure Plan.
- 3.K: Promote and seek incentives for community adoption of electric vehicles.
- 3.L: Electrify Municipal Fleet as vehicles are replaced and continue to seek incentives for electric vehicles and charging infrastructure

5.1.3 Climate Change and Environmental Justice

Current air quality issues in the city are anticipated to be exacerbated by climate change, particularly from increases in average annual temperatures and the increased frequency and intensity of heat wave events. As noted in the California Department of Public Health's *Climate Change and Health Profile Report: Santa Clara County*, increased heat intensifies the photochemical reactions that produce smog and ground level ozone and PM_{2.5}, which contribute to and exacerbate respiratory disease in children and adults. Increased heat and carbon dioxide enhance the growth of plants that produce pollen, which are associated with allergies. Increased temperatures in urban areas can also add to the heat load of buildings, increase the temperature of urban heat islands, and increase ambient temperatures (CDHP 2017). Increased temperatures in the region and the state will increase the frequency and severity of wildfire events, which may affect the city, particularly the smoke generated by wildfires (OPR et al. 2018).

Cal-Adapt was used to predict the effect of climate change on future temperatures in the city. Cal-Adapt is a climate change scenario planning tool developed by the California Energy Commission that downscales global climate model data to local and regional resolution under two emission scenarios. The Representative Concentration Pathway (RCP) 8.5 scenario represents a business-as-usual future scenario in which emissions rise steadily through 2099. The RCP 4.5 scenario represents a future in which global emissions peak by 2040 and decrease substantially through 2099.

The city experienced an annual average high temperature of 69.2°F between 1961 and 1990. Under the RCP 4.5 scenario, the city's annual average high temperature is projected to increase by 3.4°F to 72.6°F by 2050 and increase by 4.6°F to 73.8°F by 2099 (Cal-Adapt 2017). Under the RCP 8.5 scenario, the city's annual average high temperature is projected to increase by 4.2°F to 73.4°F by 2050 and increase by 7.3°F to 76.5°F by 2099 (Cal-Adapt 2017).

The frequency and length of heat wave events in the city are also projected to increase over the 21st century. The city experienced an annual average of only 0.1 4-day heat wave in a year. A heat wave is defined as a period with daily maximum temperatures above the extreme heat threshold of 92.1°F. By 2050, the frequency will increase to 0.8 4-day heat wave under the RCP 4.5 scenario and 1.1 4-day heat waves under the RCP 8.5 scenario. By 2070, the city will experience an annual average of one 4-day heat wave under the RCP 4.5 scenario and 2.5 4-day heat waves under the RCP 8.5 scenario. Research conducted to examine the effects of climate change on air pollution found that climate change–related shifts in temperature, atmospheric water vapor, and biogenic VOC emissions each individually cause a 1- to 5-percent increase in the daily peak ozone under future climate conditions (Steiner et al. 2006).

Wildfire (i.e., total area burned, number of fires) has been increasing in the western United States because of climate change. Wetter winters and drier summers are likely to increase summer and fall wildfire activity, with increases in the amount of fuel for wildfire in the spring and summer months (OPR et al. 2018). Increases in the intensity and frequency of wildfires in northern California will likely increase the occurrence of periods when PM emissions in the SFVAAB will exceed BAAQMD PM thresholds, as discussed in Section 4.1.3. Figure 8 provides a snapshot of the PM_{2.5} concentrations in northern California during the Camp Fire in Paradise, California, in 2018. Health impacts from wildfire smoke can include eye, lung, and throat irritation; asthma attacks; breathing problems; increased risk of premature death; and worsened impacts of heart disease for affected residents (BAAQMD 2017d).

As with many regional air pollution issues, although the City may be unable to control regional emission sources contributing to climate change that affect residents, it can work to ensure that planning efforts do not increase

regional emissions, and it can prepare for potential impacts from future wildfire events and other climate change–related events that will affect the air quality in the city. The City's *Climate Action Playbook* includes strategies to adapt to climate change that can help in addressing climate-related air quality issues in the future and prepare for the projected long-term impacts of climate change.

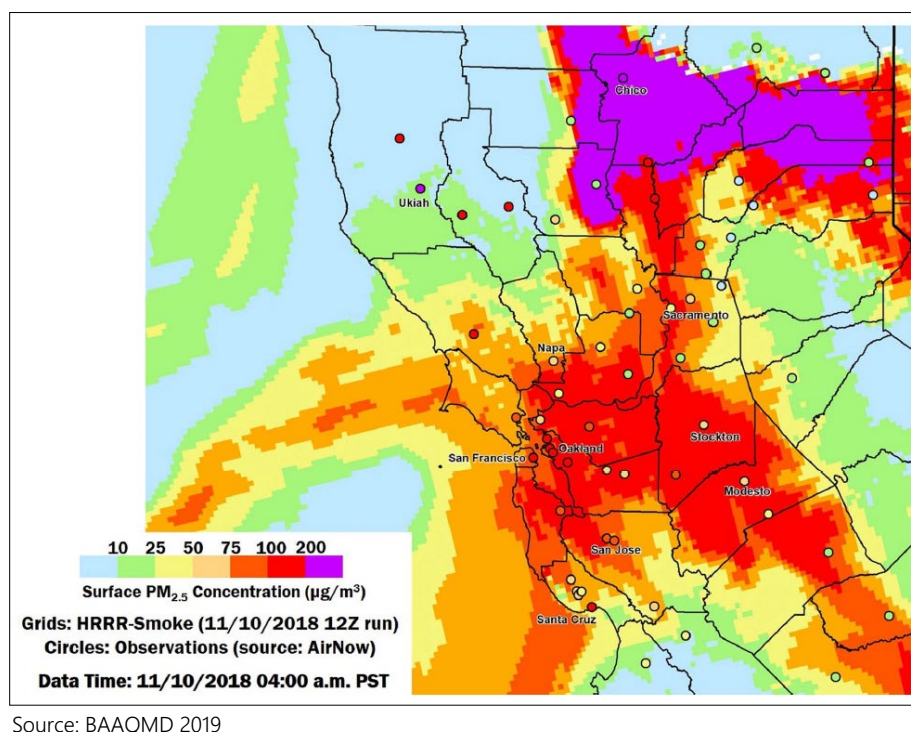


Figure 8 PM_{2.5} Levels during the 2018 Camp Fire in Paradise, California

6 FINDINGS AND RECOMMENDATIONS

6.1 FINDINGS

As discussed in this report, the city experiences air quality issues, most of which affect communities across the San Francisco Bay Area. Current air quality issues that affect the city are being addressed through regulations and programs at the federal, state, regional, and local levels. These regulations and programs have made considerable improvements to air quality in the region compared to its worst period, in the 1970s. However, certain air quality issues persist—specifically, emissions of ozone precursors and particulate matter, largely from mobile sources in the SFBAAB. Additionally, with renewed focus on environmental justice issues, air quality issues related to land use planning should be given increased importance in the planning process in the future. Finally, the impacts of climate change, including increased frequency of heat waves and wildfires, are projected to exacerbate existing air quality issues in the state.

As the City looks forward, air quality will remain an important issue for the community and should be given careful consideration in future planning efforts, particularly as they relate to sensitive receptors, including children and seniors, and the city's resident in general. Presented below are key findings based on the review of available guidance and existing Sunnyvale General Plan policies that will help inform policy development for updating the City's General Plan:

- ▶ To achieve the CAAQS and comply with the NAAQS, the BAAQMD prepares and updates air quality plans regularly. The air quality plans published by BAAQMD and other local air districts in the state are incorporated into California's SIP Strategy and meet CAA requirements. Current General Plan Policy EM-11.1 requires the City to actively participate in regional air quality planning. Additionally, recommended local measures discussed below would reduce local emissions, contributing to the overall regional and state efforts to reduce air pollution.
- ▶ The OPR General Plan Guidelines include recommendations to reduce pollutant exposure to sensitive receptors from high-volume roadways, including measures such as vegetative barriers and indoor air filters. Other recommendations include strategies to reduce vehicular traffic and minimize exposure from hazardous substances. The OPR Guidelines also specifically address reducing air pollution at sensitive receptors as well as within DACs. Overall, the current General Plan policies do address the intent of OPR's guidance, but lack source-specific recommendations, screening distances, and some specific reduction measures that could be included to further reduce pollution exposure. Specific recommendations based on OPR guidance are discussed below.
- ▶ The BAAQMD's Planning Healthy Places: A Guidebook for Addressing Local Sources of Air Pollutants in Community Planning provides specific measures to consider for the purpose of reducing emissions and exposure from local air pollution. Specific measures include cleaner technology for stationary sources, traffic reduction measures, screening distances for sensitive land uses, vegetative barriers, and residential air filters. Overall, the current General Plan policies do address the intent of the BAAQMD's recommendations, but lack source-specific recommendations, screening distances, and some specific reduction measures that could be included to further reduce pollution exposure. Specific recommendations based on BAAQMD's guidance are discussed below.
- ▶ The BAAQMD CEQA Guidelines provide thresholds of significance for local jurisdictions to consider when preparing CEQA documents. In addition, the Guidelines provide recommended mitigation measures to reduce construction-related and operational-related emissions of criteria air pollutants, TACs, and odors. Although the current General Plan does include policies that are consistent with the overall intent of the Guidelines (i.e., to reduce air pollution), more specific measures, such as standard construction emission reduction measures and odor-related site screening distances can be included as policies.
- ▶ The City is in Santa Clara County, which is in nonattainment status for the national and state standards for the following pollutants: PM_{2.5}, PM₁₀, and ozone. Because of the county's nonattainment status, the City should focus on these pollutants, which are primarily generated from mobile sources.
- ▶ The City is located near several large roadways: U.S. 101, SR 82, SR 237, Lawrence Expressway (County Route G2), Central Expressway (County Route G6), I-280, and SR 85. Vehicles using these roadways contribute to worsening air quality, notably higher levels of DPM, in areas in the city within 500 feet of these roadways. CARB and BAAQMD provide guidance for land use planning in these more sensitive areas.
- ▶ The City has two large stationary sources of criteria air pollutants and TACs: an aeronautics manufacturing facility in the northern portion of the city, adjacent to Moffett Federal Airfield, and a marine hardware manufacturing facility located along East Hendy Avenue and North Fair Oaks Avenue, adjacent to the Caltrain rail lines (CARB 2019a). Both are required to continue to report their emissions to CARB.
- ▶ According to CalEnviroScreen 3.0, two census tracts in the city are within the top 25 percent of highest scoring tracts for the state and may qualify as CalEPA-defined DACs. However, both census tracts extend beyond city limits and the sensitive populations within these tracts reside outside of the City boundaries, falling under the jurisdiction of the City of San Jose and the City of Santa Clara. Because there are no residential uses in the portions of these census tracts within City boundaries; they would not be considered DACs for the City under SB 535.
- ▶ There are two census tracts within the City —6085509000 and 6085504802—that meet the definition of a low-income census tract under AB 1550. Both of these tracts also experience high traffic density and DPM emissions. Mobile sources on major roads are the primary concern in these areas.

- ▶ PM_{2.5} and DPM concentrations are particularly high in the northern portion of the city in areas surrounding U.S. 101 and SR 237, with some census tracts in this portion of the city identified as low income. Mobile sources on major roads are the primary concern in these areas.
- ▶ Climate change is anticipated to exacerbate air quality issues in the city, with increased impacts expected during extreme heat days and heat-wave events. The projected increase in the frequency and magnitude of wildfires in northern California associated with climate change is likely to worsen air quality issues, primarily PM_{2.5} emissions from wildfire smoke during large wildfire events, for the city and its residents. Continue to implement strategies listed in CAP 2.0 to reduce impacts of air quality due to climate change.

6.2 RECOMMENDATIONS

The following section considers available guidance/recommendations by local and state agencies, discussed throughout this report and provides recommendations for future new policies that may be considered for adoption into the Sunnyvale General Plan. The recommendations describe specific issue areas where new policies may be recommended but do not represent actual adopted policy language.

Based on OPR guidance and BAAQMD's *Planning Healthy Places: A Guidebook for Addressing Local Sources of Air Pollutants in Community Planning*, new policies are recommended to reduce local air pollution and associated exposure. Policies would consider the following:

- ▶ When siting new receptors near existing sources, provide clear siting distances, by source, that trigger a site-specific assessment to determine what reduction measures are applicable
- ▶ When siting new receptors near existing sources in areas where risk may exceed BAAQMD recommended levels, provide recommendations for appropriate reduction measures
- ▶ When locating new sources, provide site-specific evaluation and the consideration of the best available technology to reduce pollution (e.g., electrification)
- ▶ Consider the use of vegetative barriers between major sources and new sensitive receptors. Policies should provide specific criteria for when this is applicable.

It is recommended to include policies that acknowledge the BAAQMD's CEQA Guidelines. Specific recommendations include:

- ▶ Policy to require the City to comply with BAAQMD Guidelines.
- ▶ Policies that require discretionary development to comply with construction best management practices.
- ▶ Policy that requires the City to consider site-specific assessments for odor-generating land uses.

Based on OPR guidance relating to reducing air pollution throughout the community and within DACs, the following recommendations are made:

- ▶ Encourage transportation improvements and urban tree cover projects, and parks and recreation projects in low-income and high pollution burden bearing communities, which are identified in Section 4, "Identifying Disadvantaged Communities."
- ▶ Coordinate with state and county agencies to prioritize hazardous site cleanup and remediation activities in low-income and high pollution burden bearing communities.
- ▶ Encourage the phasing out of non-conforming land uses from residential communities, especially for communities that are low-income and/or bear a high pollution burden.

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