BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

California Environmental Quality Act

Draft Air Quality Guidelines

Prepared by:

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September 2009

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ACRONYMS AND ABBREVIATIONS

$\mu g/m^3$	micrograms per cubic meter
AB	Assembly Bill
AB 1807	Tanner Air Toxics Act
AB 2588	Air Toxics Hot Spots Information and Assessment Act of 1987
ABAG	Association of Bay Area Governments
AERMOD	Regulatory Model
AMS	American Meteorological Society
AP	Air Pollutant
APS	Alternative Planning Strategy
AQP	Air Quality Plan
ARB	California Air Resources Board
ATCM	air toxics control measures
BAAQMD	Bay Area Quality Management District
BACT	Best Available Control Technology
BMPs	Best Management Practices
CCA	Community Choice Aggregation
CAAQS	California Ambient Air Quality Standards
CACP	Clean Air and Climate Protection
CALINE4	California Line Source Dispersion Model
CAP	criteria air pollutants
CARE	Community Air Risk Evaluation
CAPCOA	California Air Pollution Control Officers Association
CCAA	California Clean Air Act
CCAR	California Climate Action Registry
CCR	California Code of Regulations
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CFC	Chlorofluorocarbon
CH_4	methane
CHAPIS	Community Health Air Pollution Information System
CO	carbon monoxide
CO Protocol	Carbon Monoxide Protocol
CO_2	Carbon dioxide

CO_2e	carbon dioxide equivalent
CRA	California Resources Agency
DOE	Department of Energy
du	dwelling units
EIR	Environmental Impact Report
EMFAC	On-Road Mobile-Source Emission Factors
EPA	U.S. Environmental Protection Agency
FAR	Floor Area Ratio
FCAA	Federal Clean Air Act
FCAAA	Federal Clean Air Act Amendments of 1990
GHG	greenhouse gas
GRP	General Reporting Protocol
GVW	gross vehicle weight
GWP	global warming potential
H_2S	hydrogen sulfide
HEPA	High Efficiency Particulate Arresting
HI	Hazard Index
HRA	health risk assessment
HVAC	Heating, Ventilation, and Air Conditioning System
IPCC	Intergovernmental Panel on Climate Change
ISR	Indirect Source Review
ksf	thousand square feet
kwh	Kilowatt hour
lb/acre-day	pound per disturbed acre per day
lb/day	pounds per day
lb/kwh	pounds per kilowatt hour
LCFS	Low-Carbon Fuel Standard
LVW	loaded vehicle weight
MACT	maximum available control technology
mg	million gallons
MMT	million metric tons
mph	miles per hour
MPO	Metropolitan Planning Organizations
MT	metric tons
MTC	Metropolitan Transportation Commission

N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NESHAP	national emissions standards for hazardous air pollutants
NH_3	mercaptan, ammonia
NOA	Naturally Occurring Asbestos
NOP	Notice of Preparation
NO_X	oxides of nitrogen
OAP	ozone attainment plans
OEHHA	Office of Environmental Health Hazard Assessment
OPR	Governor's Office of Planning and Research
PM	particulate matter
PM_{10}	respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less
$PM_{2.5}$	fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less
ppm	parts per million
PUC	Public Utilities Commission
RoadMod	Roadway Construction Emissions Model
ROG	reactive organic gases
RTP	Regional Transportation Plan
SB	Senate Bill
SCS	Sustainable Communities Strategy
SF_6	sulfur hexafluoride
SFBAAB	San Francisco Bay Area Air Basin
SIP	State Implementation Plan
SMAQMD	Sacramento Metropolitan Air Quality Management District
SO_2	sulfur dioxide
SP	Service Population
SSIM	Sustainable Systems Integration Model
TAC	toxic air contaminant
T-BACT	Toxic Best Available Control Technology
TBPs	Toxic Best Practices
tons/day	tons per day
tpy	tons per year
UC	University of California
URBEMIS	Urban Land Use Emissions Model

VMT	vehicle miles traveled
VT	vehicle trips
yd^3	cubic yards
yr	year

1. INTRODUCTION

1.1. PURPOSE OF THE HANDBOOK

1.1.1. Background

The purpose of the Bay Area Air Quality Management District (BAAQMD or Air District) California Environmental Quality Act (CEQA) Guide is to assist lead agencies in evaluating air quality impacts of projects and plans proposed in the San Francisco Bay Area Air Basin (SFBAAB). The Guide provides BAAQMD-recommended procedures for evaluating potential air quality impacts during the environmental review process consistent with CEQA requirements. These revised Guidelines supersede the BAAQMD's previous CEQA guidance titled *BAAQMD CEQA Guidelines: Assessing the Air Quality Impacts of Projects and Plans* (BAAQMD 1999).

Discretionary actions, including land development projects and plans, have the potential to generate air pollutants that may degrade air quality. The Guide provides direction on the following:

- How to evaluate potential air quality impacts;
- How to determine if the air quality impacts are significant; and
- How to mitigate significant air quality impacts.

This Guide focuses on project- and plan-generated criteria air pollutant, greenhouse gas (GHG), toxic air contaminant, and odor emissions generated from construction and operation activities.

1.1.2. Role in Air Quality

BAAQMD is the primary agency responsible for assuring that the National and California Ambient Air Quality Standards (NAAQS and CAAQS, respectively) are attained and maintained in the SFBAAB. BAAQMD's jurisdiction includes all of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo and Santa Clara Counties, and the southern portions of Solano and Sonoma Counties, as shown in Figure 1-1.

In fulfilling Air District's mission, "to protect and improve public health, air quality, and the global climate," BAAQMD prepared this CEQA Guide to assist lead agencies in air quality analysis, as well as to promote sustainable development in the region. The transportation sector is the largest contributor to air pollution and GHG emissions in the SFBAAB, as well as in the state and country. BAAQMD does not have the authority to regulate the transportation sector or local land use decisions as they relate to transportation emissions. Instead, BAAQMD uses an array of tools to reduce transportation emissions, support smart growth, and address pollution exposure in impacted communities. The summary below provides a snapshot of existing BAAQMD programs that address land use and transportation emissions:

- CEQA Guidelines: The CEQA Guidelines support lead agencies in analyzing air quality impacts and offers numerous mitigation measures and general plan policies to implement smart growth and transit-oriented development principles, minimize construction emissions, and reduce population exposure.
- Community Air Risk Evaluation (CARE) Program: The CARE program, initiated in 2004, evaluates and reduces health risks associated with exposures to toxic air contaminants (TACs) in the SFBAAB. The program examines TAC emissions from stationary sources, area sources, and mobile sources with an emphasis on diesel exhaust, which is a major contributor to airborne health risk in California. The program's main objectives are to identify health risks associated with exposure to TACs; assess exposures to sensitive receptors;

identify significant TAC sources and impacted areas; and develop and implement mitigation measures.

- Clean Air Communities Initiative: This initiative is a multifaceted approach to address health concerns in communities disproportionally impacted with poor air quality and to minimize the effects of land use decisions on cumulative air quality impacts. A major program element is the development of an Indirect Source Review Rule (ISR) to reduce the potential adverse impacts from population growth and land use decisions. BAAQMD is currently developing an ISR to discourage development that increases vehicles miles traveled (VMT).
- Other BAAQMD Functions: The many responsibilities of BAAQMD include the preparation of air quality plans; adoption and enforcement of rules and regulations concerning stationary sources; issuance of permits for stationary sources of air pollutants; inspection of stationary sources of air pollutants; responding to citizen complaints; monitoring of ambient air quality and meteorological conditions; awarding and administering grants to reduce mobile source emissions; and conducting public education campaigns.
- Collaboration with Regional Partners: BAAQMD also works with many other agencies and organizations, including the U.S. Environmental Protection Agency (EPA), California Air Resources Board (ARB), Metropolitan Transportation Commission (MTC), Association of Bay Area Governments (ABAG), local cities and counties, and various non-governmental organizations to improve air quality.

1.1.3. BAAQMD CEQA Responsibilities

BAAQMD takes on various roles in the CEQA process, depending on the nature of the proposed project, including:

Lead Agency – BAAQMD acts as a Lead Agency when it has the primary authority to implement or approve a project, such as when it adopts air quality plans for the region, issues stationary source permits, or adopts rules and regulations.

Responsible Agency – BAAQMD acts as a Responsible Agency when it has limited discretionary authority over a portion of a project, but does not have the primary discretionary authority of a Lead Agency. As a Responsible Agency, BAAQMD may coordinate the environmental review process with the lead agency regarding BAAQMD's permitting process, provide comments to the Lead Agency regarding potential impacts, and recommend mitigation measures.

Commenting Agency – BAAQMD may act as a Commenting Agency when it is not a Lead or Responsible Agency (i.e., it does not have discretionary authority over a project), but when it may have concerns about the air quality impacts of a proposed project or plan. As a Commenting Agency, BAAQMD may review environmental documents prepared for development proposals and plans in the SFBAAB, and provide comments to the Lead Agency regarding the adequacy of the air quality impact analysis, the determination of significance and the mitigation measures proposed (if any).

Source: ESRI Satellite 2009

Bay Area Air Quality Management District Jurisdictional Boundaries **Figure 1-1**

1.2. GUIDELINE COMPONENTS

The recommendations contained in this Guide should be viewed as minimum considerations for analyzing air quality impacts. The Lead Agency is encouraged to tailor the air quality impact analysis to meet the needs of the local community and may conduct refined analysis that utilize more sophisticated models, more precise input data, innovative mitigation measures, and/or other features. The Guide contains the following components:

Introduction – Chapter 1 provides a summary of the purpose of the Guide, and an overview of BAAQMD responsibilities.

Thresholds of Significance and Screening Criteria – Chapter 2 outlines thresholds of significance and screening criteria for determining the significance of air quality impacts.

Assessing and Mitigating Impacts – Chapters 3 through 8 describe assessment methods and mitigation separately for operational-related, local community risk and hazards, plan-level, construction-related, local carbon monoxide (CO), and odor impacts.

Appendix A – Construction assessment tools.

Appendix B – Provides sample environmental setting information.

Appendix C – Provides justification statements for BAAQMD-adopted thresholds of significance.

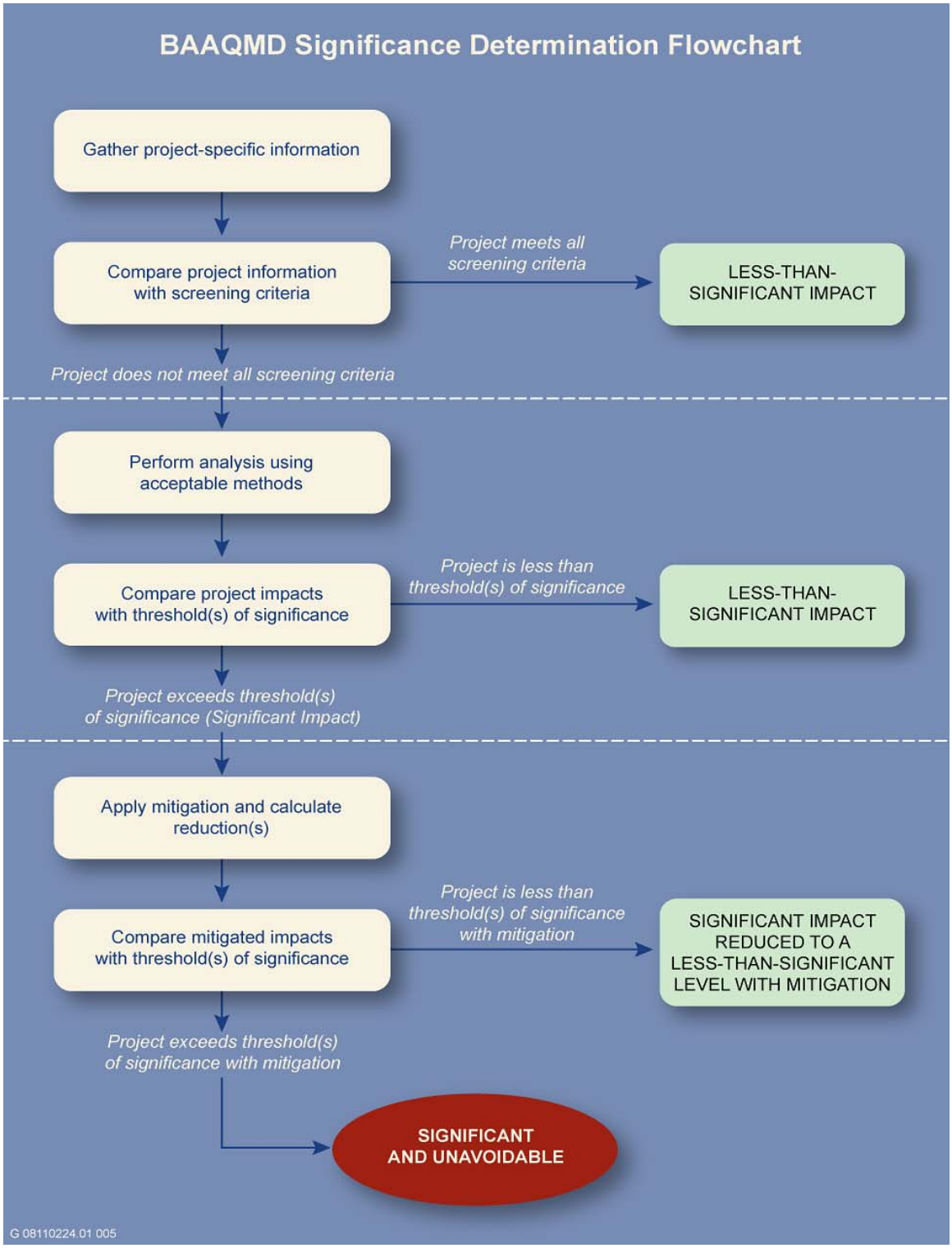
1.2.1. How To Use The Guidelines

Figure 1-2 illustrates the flowchart for using this Guide. The first step in evaluating a project for air quality impacts is to determine whether the air quality evaluation is for a project or plan. Once identified, the project or plan should be compared with the appropriate construction and operational screening criteria listed in Chapter 2.

If the project or plan meets the screening criteria, then its air quality impacts may be considered less than significant. Otherwise, lead agencies should evaluate potential air quality impacts of projects or plans using the analysis recommendations provided in this Guide. Chapter 2 explains how to analyze air quality impacts from criteria air pollutants, GHGs, local community risk and hazards, and odors associated with construction and operations of a project or plan.

If, after proper analysis, the project or plan's air quality impacts are found to be below the significance thresholds, then the air quality impacts may be considered less than significant. If not, the Lead Agency should implement appropriate mitigation measures to reduce associated air quality impacts. Lead agencies are responsible for considering and implementing all feasible mitigation measures in their CEQA review.

The mitigated project's or plan's impacts are then compared again to the significance thresholds. If a project succeeded in mitigating its adverse air quality impacts below the corresponding thresholds, air quality impacts may be considered less than significant. If a project still exceeds the thresholds, its air quality impacts must be considered significant and unavoidable.



General Steps for Determining Significance **Figure 1-2**

2. THRESHOLDS OF SIGNIFICANCE AND SCREENING CRITERIA

The SFBAAB is currently designated as a nonattainment area for state and national ozone standards and national particulate matter ambient air quality standards. SFBAAB's nonattainment status is attributed to the region's development history. Past, present and future development projects contribute to the region's adverse air quality impacts on a cumulative basis. By its very nature, air pollution is largely a cumulative impact. No single project is sufficient in size to, by itself, result in nonattainment of ambient air quality standards. Instead, a project's individual emissions contribute to existing cumulatively significant adverse air quality impacts. If a project's contribution to the cumulative impact is considerable, then the project's impact on air quality would be considered significant.

In developing thresholds of significance for air pollutants, BAAQMD considered the emission levels for which a project's individual emissions would be cumulatively considerable. If a project exceeds the identified significance thresholds, its emissions would be cumulatively considerable, resulting in significant adverse air quality impacts to the region's existing air quality conditions. In a sense, the project-level air quality impacts reflect a project's cumulative air quality impact as well. Therefore, additional analysis beyond project-level analysis for assessing cumulative impacts is unnecessary. The analysis to assess project-level air quality impacts should be as comprehensive and rigorous as possible.

Similar to regulated air pollutants, GHG emissions and global climate change also represent cumulative impacts. GHG emissions contribute, on a cumulative basis, to the significant adverse environmental impacts of global climate change. Climate change impacts may include an increase in extreme heat days, higher concentrations of air pollutants, sea level rise, impacts to water supply and water quality, public health impacts, impacts to ecosystems, impacts to agriculture, and other environmental impacts. No single project could generate enough GHG emissions to noticeably change the global average temperature. The combination of GHG emissions from past, present, and future projects contribute substantially to the phenomenon of global climate change and its associated environmental impacts.

BAAQMD's approach to developing a *Threshold of Significance* for GHG emissions is to identify the emissions level for which a project would not be expected to substantially conflict with existing California legislation adopted to reduce statewide GHG emissions. If a project would generate GHG emissions above the threshold level, it would be considered to contribute substantially to a cumulative impact, and would be considered significant. Refer to Appendix C for *Thresholds of Significance* documentation.

2.1. OPERATIONAL-RELATED IMPACTS

2.1.1. Criteria Air Pollutants

Thresholds of Significance

Table 2-1 presents the *Thresholds of Significance* for operational-related criteria air pollutant and precursor emissions. These represent the levels at which a project's individual emissions of criteria air pollutants or precursors would result in a cumulatively considerable contribution to the SFBAAB's existing air quality conditions. If daily maximum or annual emissions of operational-related criteria air pollutants or precursors would exceed any applicable *Threshold of Significance* listed in Table 2-1, the proposed project would result in a cumulatively significant impact.

Table 2-1
Thresholds of Significance for Operational-Related Criteria Air Pollutants and Precursors

Pollutant/Precursor	Annual Emissions (tpy)	Daily Maximum Emissions (lb/day)
ROG	10	54
NO_X	10	54
PM_{10}	15	82
$PM_{2.5}$	10	54

Notes: lb/day = pounds per day; NO_X = oxides of nitrogen; $PM_{2.5}$ = fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less; PM_{10} = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less; ROG = reactive organic gases; tpy = tons per year.
Refer to Appendix C for support documentation.

Screening Criteria

The Air District has developed screening criteria to provide the Lead Agency and project applicant with a conservative indication of whether the proposed project would result in the generation of operational-related criteria air pollutants and/or precursors that exceed the *Thresholds of Significance*, as shown in Table 2-1. If the project would not exceed the applicable screening level size shown in Table 2-2, the operation of the proposed project would result in a less-than-significant cumulative impact to air quality from criteria air pollutant and precursor emissions.

2.1.2. Greenhouse Gases

Thresholds of Significance

Land Use Projects

The *Threshold of Significance* for operational-related GHG emissions for land use projects is 1,100 metric tons per year (MT/yr) of CO_2e. If annual emissions of operational-related GHGs would exceed this level, the proposed project would result in a cumulatively considerable contribution of GHG emissions and a cumulatively significant impact to global climate change.

Stationary Source Projects

The *Threshold of Significance* for operational-related GHG emissions for stationary source projects is 10,000 metric tons per year (MT/yr) of CO_2e. If annual emissions of stationary source operational-related GHGs would exceed this level, the proposed project would result in a cumulatively considerable contribution of GHG emissions and a cumulatively significant impact to global climate change. If a land use project includes emissions from engines (e.g., back-up generators) and industrial sources subject to Air District Rules and Regulations, these emissions should be analyzed separately from the land use indirect and area source emissions. Stationary source emissions are not included in the screening estimates given below and must be added to the indirect and area source land use emissions.

Screening Criteria

The Air District has developed screening criteria to provide the Lead Agency and project applicant with a conservative indication of whether the proposed project would result in the generation of operational-related GHGs that exceed the *Threshold of Significance*. If the project would not exceed the applicable screening level size shown in Table 2-3, the operation of the proposed project would likely result in a less-than-significant cumulative impact to global climate change.

Table 2-2
Operational-Related Criteria Air Pollutant and Precursor Screening Level Sizes

Land Use Type	Unit Type	Screening Level Size	Pollutant to Trigger Threshold
Single-family	du	325	NO_X
Apartment, low-rise	du	451	ROG
Apartment, mid-rise	du	494	ROG
Apartment, high-rise	du	510	ROG
Condo/townhouse, general	du	451	ROG
Condo/townhouse, high-rise	du	511	ROG
Mobile home park	du	450	ROG
Retirement community	du	487	ROG
Congregate care facility	du	657	ROG
Day-care center	ksf	53	NO_X
Elementary school	ksf	271	NO_X
Elementary school	students	2,747	ROG
Junior high school	ksf	285	NO_X
Junior high school	students	2,460	NO_X
High school	ksf	311	NO_X
High school	students	2,390	NO_X
Junior college (2 years)	ksf	152	NO_X
Junior college (2 years)	students	2,865	ROG
University/college (4 years)	students	1,760	NO_X
Library	ksf	78	NO_X
Place of worship	ksf	439	NO_X
City park	acres	2,613	ROG
Racquet club	ksf	291	NO_X
Racquetball/health	ksf	128	NO_X
Quality restaurant	ksf	47	NO_X
High turnover restaurant	ksf	33	NO_X
Fast food rest. w/ drive thru	ksf	6	NO_X
Fast food rest. w/o drive thru	ksf	8	NO_X
Hotel	rooms	489	NO_X
Motel	rooms	688	NO_X
Free-standing discount store	ksf	76	NO_X
Free-standing discount superstore	ksf	87	NO_X
Discount club	ksf	102	NO_X
Regional shopping center	ksf	99	NO_X
Electronic Superstore	ksf	95	NO_X
Home improvement superstore	ksf	142	NO_X
Strip mall	ksf	99	NO_X
Hardware/paint store	ksf	83	NO_X
Supermarket	ksf	42	NO_X
Convenience market (24 hour)	ksf	5	NO_X
Convenience market with gas pumps	ksf	4	NO_X
Bank (with drive-through)	ksf	17	NO_X
General office building	ksf	346	NO_X
Office park	ksf	323	NO_X

Table 2-2
Operational-Related Criteria Air Pollutant and Precursor Screening Level Sizes

Land Use Type	Unit Type	Screening Level Size	Pollutant to Trigger Threshold
Government office building	ksf	61	NO_X
Government (civic center)	ksf	149	NO_X
Pharmacy/drugstore w/ drive through	ksf	49	NO_X
Pharmacy/drugstore w/o drive through	ksf	48	NO_X
Medical office building	ksf	117	NO_X
Hospital	ksf	226	NO_X
Hospital	beds	334	NO_X
Warehouse	ksf	864	NO_X
General light industry	ksf	541	NO_X
General light industry	acres	72	NO_X
General light industry	employees	1,249	NO_X
General heavy industry	ksf	1,899	ROG
General heavy industry	acres	281	ROG
Industrial park	ksf	553	NO_X
Industrial park	acres	61	NO_X
Industrial park	employees	1,154	NO_X
Manufacturing	ksf	992	NO_X

Notes: du = dwelling units; ksf = thousand square feet; NO_x = oxides of nitrogen; ROG = reactive organic gases. Screening levels include indirect and area source emissions. Emissions from engines (e.g., back-up generators) and industrial sources subject to Air District Rules and Regulations embedded in the land uses are not included in the screening estimates and must be added to the above land uses.
Refer to Appendix C for support documentation.
Source: Modeled by EDAW 2009.

Table 2-3
Operational-Related Greenhouse Gas Screening Level Sizes

Land Use Type	Unit Type	Screening Level Size
Single-family	du	56
Apartment, low-rise	du	78
Apartment, mid-rise	du	87
Apartment, high-rise	du	91
Condo/townhouse, general	du	78
Condo/townhouse, high-rise	du	92
Mobile home park	du	82
Retirement community	du	94
Congregate care facility	du	143
Day-care center	ksf	11
Elementary school	ksf	44
Junior high school	ksf	46
High school	ksf	49
Junior college (2 years)	ksf	28
University/college (4 years)	students	320

Table 2-3
Operational-Related Greenhouse Gas Screening Level Sizes

Land Use Type	Unit Type	Screening Level Size
Library	ksf	15
Place of worship	ksf	61
City park	acres	600
Racquet club	ksf	46
Racquetball/health	ksf	24
Quality restaurant	ksf	9
High turnover restaurant	ksf	7
Fast food rest. w/ drive thru	ksf	1
Fast food rest. w/o drive thru	ksf	1
Hotel	rooms	83
Motel	rooms	106
Free-standing discount store	ksf	15
Free-standing discount superstore	ksf	17
Discount club	ksf	20
Regional shopping center	ksf	19
Electronic Superstore	ksf	18
Home improvement superstore	ksf	26
Strip mall	ksf	19
Hardware/paint store	ksf	16
Supermarket	ksf	8
Convenience market (24 hour)	ksf	1
Convenience market with gas pumps	ksf	1
Bank (with drive-through)	ksf	3
General office building	ksf	53
Office park	ksf	50
Government office building	ksf	12
Government (civic center)	ksf	27
Pharmacy/drugstore w/ drive through	ksf	10
Pharmacy/drugstore w/o drive through	ksf	10
Medical office building	ksf	22
Hospital	ksf	39
Warehouse	ksf	84
General light industry	ksf	64
General heavy industry	ksf	121
Industrial park	ksf	65
Manufacturing	ksf	89

Notes: du = dwelling units; ksf = thousand square feet.
Screening levels include indirect and area source emissions. Emissions from engines (e.g., back-up generators) and industrial sources subject to Air District Rules and Regulations embedded in the land uses are not included in the screening estimates and must be added to the above land uses.
Refer to Appendix C for support documentation.
Source: Modeled by EDAW 2009.

2.2. LOCAL COMMUNITY RISK AND HAZARD IMPACTS

2.2.1. Thresholds of Significance

The *Thresholds of Significance* for local community risk and hazard impacts are identified separately below for siting a new source and for siting a new receptor. If emissions of TACs or fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less ($PM_{2.5}$) exceed any of the *Thresholds of Significance* listed below, or if the proposed project would not implement Toxic Best Available Control Technology (T-BACT) and/or Toxic Best Practices (TBPs), the proposed project would result in a significant impact.

Siting a New Source

Impacted Communities

- For impacted communities identified under the BAAQMD's CARE Program, and for projects within 500 feet of a K-12 school, an excess cancer risk level of more than 5 in one million, a chronic Hazard Index (HI) of more than 0.5 or an acute HI of more than 1.0 would be a cumulatively considerable contribution;
- For impacted communities, an incremental increase of greater than 0.2 micrograms per cubic meter ($\mu g/m^3$) annual average $PM_{2.5}$ would be a cumulatively considerable contribution.

Other Areas

- For all other areas, an excess cancer risk level of more than 10 in one million or a chronic or acute HI greater than 1.0 would be a cumulatively considerable contribution;
- For all other areas, an incremental increase of greater than 0.3 $\mu g/m^3$ annual average $PM_{2.5}$ would be a cumulatively considerable contribution.

Siting a New Receptor

Impacted Communities

- All projects in impacted communities siting new sensitive receptors must implement the following T-BACT/TBP measures:
    - Site design: locate livable structures and the Heating, Ventilation, and Air Conditioning System (HVAC) intake as far from source of risk or hazard as possible; and
    - Plant tiered redwood and/or deodar cedar trees between source of risk or hazard and livable structures.
- After installation of TBACT/TBP, an excess cancer risk level of 10 in one million or a chronic or acute HI greater than 1.0 from any single source would be a cumulatively considerable contribution.

Other Areas

- For all other areas, an excess cancer risk level of more than 10 in one million or a chronic or acute HI greater than 1.0 from any single source would be a cumulatively considerable contribution;

Cumulative Local Community Risk and Hazard Impacts

- If the aggregate total of all past, present, and foreseeable future sources within a 1,000-foot radius from the fence line of a source, or from the location of a receptor, plus the contribution from the project, exceeds a cancer risk level of more than 100 in one million, or a chronic or

acute HI greater than 1.0, or an increase of more than 2 µg/m^3 annual average $PM_{2.5}$, there would be a significant cumulative impact.

2.3. PLAN-LEVEL IMPACTS

The *Thresholds of Significance* for plans (e.g., general plans, community plans, specific plans, transportation plans, congestion management plans, etc.) within the SFBAAB are summarized in Table 2-4 and discussed separately below.

Table 2-4
Thresholds of Significance for Plans

Criteria Air Pollutants and Precursors	Construction: Best Management Practices; Consistency with Current AQP
GHGs	Construction: Best Management Practices; Operational: 4.6 MT CO_2e/SP/yr (mixed use) or 6.7 MT CO_2e/Capita/year (residential) or a CEQA-vetted, AB32 consistent Climate Action Plan (with legislative-based GHG reduction goal).
Local Community Risk and Hazards	Land use diagram identifies special overlay zones around existing and planned sources of TACs; Land use diagram identifies special overlay zones of at least 500 feet on each side of all freeways and high-volume roadways; Plan identifies goals, policies, and objectives to minimize the impact and create buffer distances between sources of TACs and receptors.
Odors	Land use diagram identifies special overlay zones around existing and planned sources of odors; Plan identifies goals, policies, and objectives to minimize the impact and create buffer distances between sources of odors and receptors.
Notes: AQP = Air Quality Plan; CO_2e = carbon dioxide equivalent; GHGs = greenhouse gases; MT = metric tons; SP = service population; TACs = toxic air contaminants; yr = year. Refer to Appendix C for support documentation.	

2.3.1. Construction-Related

Criteria Air Pollutants and Precursors

Thresholds of Significance

The *Threshold of Significance* for construction-related criteria air pollutant and precursor impacts is the presence of Best Management Practices (BMPs). If the plan does not include the most recent BAAQMD-recommended BMPs in goals, policies, and objectives, as appropriate, construction-related criteria pollutant emissions would result in a significant impact to air quality.

The *Threshold of Significance* for construction-related criteria pollutant emissions is the presence of the following performance-based best management practices:

1. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.
2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered.

3. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.
4. All vehicle speeds on unpaved roads shall be limited to 15 mph.
5. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.
6. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.
7. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.
8. Post a publicly visible sign with the telephone number and person to contact at the Lead Agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The phone number of the BAAQMD shall also be visible to ensure compliance with applicable regulations.

These best management practices may change over time. Contact District staff to ensure the most recent BMPs are used.

Greenhouse Gases

Thresholds of Significance
The *Threshold of Significance* for construction-related GHG emissions is the presence of Best Management Practices (BMPs). If the plan does not include the most recent BAAQMD-recommended BMPs in goals, policies, and objectives, as appropriate, construction-related GHG emissions would result in a significant impact to air quality.

The *Threshold of Significance* for construction-related GHG emissions is the presence of the following performance-based best management practices:

1. Alternative-fueled (e.g., biodiesel, electric) construction vehicles/equipment of at least 15 percent of the fleet;
2. Local building materials (within 100 miles) of at least 10 percent; and
3. Recycle at least 50 percent of construction waste or demolition materials.

These best management practices may change over time. Contact District staff to ensure you are using the most recent BMPs.

2.3.2. Operational-Related

Criteria Air Pollutants

Thresholds of Significance
The *Threshold of Significance* for operational-related criteria air pollutant and precursor impacts for plans is consistency with the most recently adopted AQP. All of the following criteria must be

satisfied for a proposed plan to be consistent with the AQP, and to result in a less-than-significant impact.

Proposed plans must show over the planning period of the plan that:

- The plan incorporates current AQP control measures as appropriate to the plan area; and
- The rate of increase in VMT or vehicle trips (VT) (either measure may be used) within the plan area is equal to or lower than the rate of increase in population projected for the proposed plan.

Greenhouse Gases
The *Threshold of Significance* for operational-related GHG impacts of plans employs either a per Service Population (SP) for mixed-use projects, a per capita option for residential projects, or a Climate Action Plan option, as described below.

Thresholds of Significance – GHG Per Service Population Option
For plans with a mix of land use types, the *Threshold of Significance* for operational-related GHG impacts is 4.6 MT per SP per year of carbon dioxide equivalent (CO_2e). If annual maximum emissions of operational-related GHGs exceed this level, the proposed plan would result in a significant impact to global climate change.

Thresholds of Significance – GHG Per Capita Option
For plans where residential uses predominate, the *Threshold of Significance* for operational-related GHG impacts is 6.7 MT per capita per year of CO_2e. If annual maximum emissions of operational-related GHGs exceed this level, the proposed plan would result in a significant impact to global climate change.

Thresholds of Significance – Climate Action Plan Option
If a Lead Agency uses the Climate Action Plan option, all of the following criteria must be satisfied for a proposed plan to result in a less-than-significant impact to climate change.

The Climate Action Plan must:

1. Address the entirety of the plan area;
2. Have an adopted or certified CEQA-compliant document that analyzes its environmental impacts;
3. Include a base year GHG emissions inventory and GHG emissions projections for 2020 or beyond for community-wide and municipal emissions;
4. Identify a GHG reduction target that meets or exceeds Assembly Bill (AB) 32 and/or Executive Order S-3-05 reduction targets;
5. Specify a range of binding and enforceable GHG emission reduction measures, and demonstrate by way of substantial evidence that these measures, if implemented on a project-by-project basis, would achieve the specified GHG reduction target; and
6. Establish a mechanism to monitor the plan's progress toward achieving the GHG reduction target and require amendment if the plan does not meet the specified level.

2.3.3. Local Community Risk and Hazards

Thresholds of Significance
The *Thresholds of Significance* for plans with regard to community risk and hazard impacts are:

1. The land use diagram must identify:
    a. Special overlay zones around existing and planned sources of TACs; and
    b. Special overlay zones of at least 500 feet on each side of all freeways and high-volume roadways.
2. The plan must also identify goals, policies, and objectives to minimize potential impacts and create overlay zones around sources of TACs and hazards.

2.3.4. Odors

Thresholds of Significance

The *Thresholds of Significance* for plans with regard to odor impacts are:

1. The land use diagram must identify special overlay zones around existing and planned sources of odors; and
2. The plan must identify goals, policies, and objectives to minimize potential impacts and create buffer distances between sources of odors and receptors.

2.4. CONSTRUCTION-RELATED IMPACTS

2.4.1. Criteria Air Pollutants

Thresholds of Significance

Table 2-5 presents the *Thresholds of Significance* for construction-related criteria air pollutant and precursor emissions. These represent the levels at which a project's individual emissions of criteria air pollutants or precursors would result in a cumulatively considerable contribution to SFBAAB's existing air quality conditions. If daily maximum emissions of construction-related criteria air pollutants or precursors would exceed any applicable *Threshold of Significance* listed in Table 2-5, the proposed project would likely result in a significant cumulative impact.

Table 2-5
Thresholds of Significance for Construction-Related Criteria Air Pollutants and Precursors

Pollutant/Precursor	Daily Maximum Emissions (lb/day)
ROG	54
NO_X	54
PM_{10}	82*
$PM_{2.5}$	54*

* Applies to construction exhaust emissions only.

Notes: CO = carbon monoxide; lb/day = pounds per day; NO_X = oxides of nitrogen; $PM_{2.5}$ = fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less; PM_{10} = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less; ROG = reactive organic gases; SO_2 = sulfur dioxide.

Refer to Appendix C for support documentation.

Screening Criteria

This preliminary screening provides the Lead Agency with a conservative indication of whether the proposed project would result in the generation of construction-related criteria air pollutants and/or precursors that exceed the *Thresholds of Significance* shown in Table 2-5.

If all of the following *Screening Criteria* are met, the construction of the proposed project would likely result in a less-than-significant impact from criteria air pollutant and precursor emissions.

1. The project is below the applicable screening level size shown in Table 2-6; and
2. All *Basic Construction Mitigation Measures* would be included in the project design and implemented during construction; and
3. Construction-related activities would not include any of the following:
   a. Demolition;
   b. Simultaneous occurrence of more than two construction phases (e.g., paving and building construction would occur simultaneously);
   c. Simultaneous construction of more than one land use type (e.g., project would develop residential and commercial uses on the same site);
   d. Extensive (i.e., greater than default assumptions used by the Urban Land Use Emissions Model [URBEMIS]) site preparation (e.g., grading, cut/fill, or earth movement); or
   e. Extensive material transport (e.g., soil import/export) requiring a considerable amount of haul truck activity.

Table 2-6
Construction-Related Criteria Air Pollutant and Precursor Screening Level Sizes

Land Use Type	Unit Type	Screening Level Size	Pollutant to Trigger Threshold
Single-family	du	114	ROG
Apartment, low-rise	du	240	ROG
Apartment, mid-rise	du	240	ROG
Apartment, high-rise	du	249	ROG
Condo/townhouse, general	du	240	ROG
Condo/townhouse, high-rise	du	252	ROG
Mobile home park	du	114	ROG
Retirement community	du	114	ROG
Congregate care facility	du	240	ROG
Day-care center	ksf	277	ROG
Elementary school	ksf	277	ROG
Elementary school	students	3,904	ROG
Junior high school	ksf	277	ROG
Junior high school	students	3,261	ROG
High school	ksf	277	ROG
High school	students	3,012	ROG
Junior college (2 years)	ksf	277	ROG
Junior college (2 years)	students	3,012	ROG
University/college (4 years)	students	3,012	ROG
Library	ksf	277	ROG
Place of worship	ksf	277	ROG
City park	acres	67	PM_{10}

Table 2-6
Construction-Related Criteria Air Pollutant and Precursor Screening Level Sizes

Land Use Type	Unit Type	Screening Level Size	Pollutant to Trigger Threshold
Racquet club	ksf	277	ROG
Racquetball/health	ksf	277	ROG
Quality restaurant	ksf	277	ROG
High turnover restaurant	ksf	277	ROG
Fast food rest. w/ drive thru	ksf	277	ROG
Fast food rest. w/o drive thru	ksf	277	ROG
Hotel	rooms	554	ROG
Motel	rooms	554	ROG
Free-standing discount store	ksf	277	ROG
Free-standing discount superstore	ksf	277	ROG
Discount club	ksf	277	ROG
Regional shopping center	ksf	277	ROG
Electronic Superstore	ksf	277	ROG
Home improvement superstore	ksf	277	ROG
Strip mall	ksf	277	ROG
Hardware/paint store	ksf	277	ROG
Supermarket	ksf	277	ROG
Convenience market (24 hour)	ksf	277	ROG
Convenience market with gas pumps	ksf	277	ROG
Bank (with drive-through)	ksf	277	ROG
General office building	ksf	277	ROG
Office park	ksf	277	ROG
Government office building	ksf	277	ROG
Government (civic center)	ksf	277	ROG
Pharmacy/drugstore w/ drive through	ksf	277	ROG
Pharmacy/drugstore w/o drive through	ksf	277	ROG
Medical office building	ksf	277	ROG
Hospital	ksf	277	ROG
Hospital	beds	337	ROG
Warehouse	ksf	259	NO_X
General light industry	ksf	259	NO_X
General light industry	acres	11	NO_X
General light industry	employees	540	NO_X
General heavy industry	ksf	259	NO_X
General heavy industry	acres	11	NO_X
Industrial park	ksf	259	NO_X
Industrial park	acres	11	NO_X
Industrial park	employees	577	NO_X
Manufacturing	ksf	259	NO_X

Notes: du = dwelling units; ksf = thousand square feet; NO_x = oxides of nitrogen; ROG=reactive organic gases.
Refer to Appendix C for support documentation.
Source: Modeled by EDAW 2009.

2.4.2. Greenhouse Gases

Thresholds of Significance

The *Threshold of Significance* for construction-related GHG emissions is the presence of the following performance-based best management practices, as applicable:

1. Alternative-fueled (e.g., biodiesel, electric) construction vehicles/equipment of at least 15 percent of the fleet;
2. Use local (within 100 miles) building materials of at least 10 percent; and
3. Recycle at least 50 percent of construction waste or demolition materials.

2.4.3. Local Community Risk and Hazards

The *Threshold of Significance* for construction-related local community risk and hazard impacts is the same as that for project operations (*see* Section 2.2). Construction-related TAC impacts should be addressed on a case-by-case basis, taking into consideration the specific construction-related characteristics of each project and proximity to off-site receptors, as applicable. [Air District staff is developing a screening level to indicate the size of a construction project that will trigger the thresholds.]

2.5. LOCAL CARBON MONOXIDE IMPACTS

2.5.1. Thresholds of Significance

Table 2-7 presents the *Thresholds of Significance* for local CO emissions, the 1- and 8-hour California Ambient Air Quality Standards (CAAQS) of 20.0 parts per million (ppm) and 9.0 ppm, respectively. By definition, these represent levels that are protective of public health. If a project would cause local emissions of CO to exceed any of the *Thresholds of Significance* listed below, the proposed project would result in a significant impact to air quality.

Table 2-7
Thresholds of Significance for Local Carbon Monoxide Emissions

CAAQS Averaging Time	Concentration (ppm)
1-Hour	20.0
8-Hour	9.0

Notes: CAAQS = California Ambient Air Quality Standard; ppm = parts per million.
Refer to Appendix C for support documentation.

Screening Criteria

This preliminary screening methodology provides the Lead Agency with a conservative indication of whether the implementation of the proposed project would result in CO emissions that exceed the *Thresholds of Significance* shown in Table 2-7.

If all of the following *Screening Criteria* are met, the proposed project would result in a less-than-significant impact to localized CO concentrations.

1. Project is consistent with an applicable congestion management program established by the county congestion management agency for designated roads or highways, regional transportation plan, and local congestion management agency plans.

2. The project would not result in an affected intersection experiencing more than 44,000 vehicles per hour or 24,000 vehicles per hour where vertical and/or horizontal mixing is substantially limited (e.g., tunnel, parking garage, bridge underpass, natural or urban street canyon, below-grade roadway).

2.6. ODOR IMPACTS

2.6.1. Thresholds of Significance

The *Thresholds of Significance* for odor impacts are qualitative in nature. A project that would result in the siting of a new source or the exposure of a new receptor to existing odor sources should consider the odor parameters, screening distances, and complaint history. Please refer to Table 2-8 for the odor screening distances and *Chapter 8 Assessing and Mitigating Odor Impacts* for further discussion of each analysis parameter.

2.6.2. Screening Criteria

Table 2-8 presents odor screening distances recommended by BAAQMD for a variety of land uses. Projects that would site a new odor source or a new receptor farther than the applicable screening distance shown in Table 2-8 from an existing receptor or odor source, respectively, would not likely result in a significant odor impact. The odor screening distances in Table 2-8 should not be used as absolute screening criteria, rather as information to consider along with the odor parameters and complaint history. Refer to *Chapter 8 Assessing and Mitigating Odor Impacts* for comprehensive guidance on significance determination.

Table 2-8
Odor Screening Distances

Land Use/Type of Operation	Project Screening Distance
Wastewater Treatment Plant	2 miles
Wastewater Pumping Facilities	1 mile
Sanitary Landfill	2 miles
Transfer Station	1 mile
Composting Facility	1 mile
Petroleum Refinery	2 miles
Asphalt Batch Plant	2 miles
Chemical Manufacturing	2 miles
Fiberglass Manufacturing	1 mile
Painting/Coating Operations	1 mile
Rendering Plant	2 miles
Coffee Roaster	1 mile
Food Processing Facility	1 mile
Confined Animal Facility/Feed Lot/Dairy	1 mile
Green Waste and Recycling Operations	1 mile
Metal Smelting Plants	2 miles
Refer to Appendix C for support documentation.	

2.7. SIGNIFICANCE DETERMINATION

Refer to Figure 1-2 for a general flowchart for determining significance for projects and plans proposed within the SFBAAB. The process involves comparing project attributes to screening criteria. If the project meets the screening criteria, it is likely that the project would result in a less-than-significant air quality impact. If the project does not meet the screening criteria, a full analysis should be performed according to methodologies provided in the following sections of this Guide. Compare the results of the analysis to BAAQMD's Thresholds of Significance. If the results do not exceed the *Thresholds of Significance*, then the project would likely have a less-than-significant air quality impact. If the results would exceed the *Thresholds of Significance*, then the project would likely result in a significant air quality impact, and would require implementation of all feasible mitigation measures to reduce the impact. If, after mitigation, the *Thresholds of Significance* would not be exceeded, the impact would be less-than-significant. If the *Thresholds of Significance* would still be exceeded following implementation of all feasible mitigation, the air quality impact would remain significant and unavoidable.

3. ASSESSING AND MITIGATING OPERATIONAL-RELATED IMPACTS

3.1. INTRODUCTION

Operational emissions typically represent the majority of a project's air quality impacts. After a project is built, operational emissions are anticipated to occur continuously throughout the project's lifetime. Operational-related activities could generate criteria air pollutants and their precursors, GHG and toxic air contaminant emissions from mobile and area sources. Area sources could include fuel combustion from space and water heating, landscape maintenance equipment, and fireplaces/stoves, evaporative emissions from architectural coatings and consumer products and unpermitted emissions from stationary sources. Table 3-1 provides input parameters and overall guidance principles for assessing operational-related impacts when using the Urban Land Use Emissions (URBEMIS) computer model.

Table 3-1
Overall URBEMIS Guidance Principles for Operational-Related Impacts

Operational Input Parameters	Guidance Principle
Air District	Bay Area Air District
Analysis Year	Earliest possible year when project would be operational
Land Use Type and Units	Based on project description
Trip Rate	From project traffic study; or ITE Trip Generation Manual in the absence of a traffic study
Project Location	Urban
Road Dust	Category should not be turned off but can be modified if project information is known
Pass-by Trips	Category should not be used unless supported by a transportation analysis
Double Counting Correction	Category should not be used unless supported by a transportation analysis
Percentage of Land Uses using Natural Gas	100 percent for both residential and nonresidential development
Persons per Residential Unit (Consumer Products)	Based on estimated number of residents
All Other URBEMIS Inputs	Use default values, unless project-specific data is available[1]

[1] The rationale for changing default values should be disclosed in the CEQA document

The recommendations provided in this chapter only apply to assessing and mitigating operational-related impacts for individual projects. Please refer to Chapter 5 for recommendations for assessing and mitigating operational-related impacts at the plan-level.

3.2. SIGNIFICANCE DETERMINATION

3.2.1. Criteria Air Pollutant and Precursor Emissions

Step 1: Comparison of Project Attributes with Screening Criteria

The first step in determining the significance of operational-related criteria air pollutants and precursors is to compare the attributes of the proposed project with the applicable S*creening*

Criteria listed in Chapter 2. This preliminary screening provides a conservative indication of whether operation of the proposed project would result in the generation of criteria air pollutants and/or precursors that exceed the *Thresholds of Significance* listed in Chapter *2*. If all of the *Screening Criteria* are met, the operation of the proposed project would result in a less-than-significant impact to air quality. If the proposed project does not meet all the *Screening Criteria*, proceed to *Step 2: Emissions Quantification.*

Step 2: Emissions Quantification

If a proposed project does not meet the *Screening Criteria* referenced in Step 1, the following methodology should be used to estimate a project's operational-related air pollutant emissions. BAAQMD-recommended methodologies include using URBEMIS for proposed land use development projects.

If a proposed project involves the removal of existing emission sources BAAQMD recommends subtracting the existing emissions levels from the emissions levels estimated for the new proposed land use. This "net" calculation is permissible only if the existing emission sources were operational at the time that the Notice of Preparation (NOP) for the CEQA project was circulated and would continue if the proposed redevelopment project is not approved. This "net calculation" is not permitted for emission sources that ceased to operate (or the land uses were vacated and/or demolished) prior to circulation of the NOP.

Land Use Development Projects

For proposed land use development projects, BAAQMD recommends using the most current version of URBEMIS to quantify operational-related criteria air pollutants and precursors. URBEMIS provides two modules (*Enter Area Source Data* and *Enter Operational Data*) that quantify emissions from the following operational-related activities: natural gas fuel combustion for space and water heating, wood stoves and fireplace combustion, landscape maintenance equipment, consumer products, architectural coating, and mobile sources.

Input Parameters

BAAQMD-recommended input parameters and data requirements along with general URBEMIS user information for each operational-related activity are described below. Refer to the URBEMIS User's Guide for more detailed information.

Operational data needs that can be provided by URBEMIS default assumptions are identified below; however, the use of project-specific information results in a more accurate quantification of emissions.

Land Use Type and Size

Choose each individual land use type (e.g., single family housing, apartment high rise, regional shopping center, or office park) that is most applicable to the proposed development project in the *Enter Land Use Data* module and enter the size of the project (e.g., acres, thousand square feet [ksf], students, dwelling units [du], rooms, pumps, rooms, or employees). For several of the land use types, various size units are available (e.g., ksf and acres). Ensure that the unit type for the project-specific data is consistent with the unit type selected in URBEMIS. By default, URBEMIS estimates the trip generation rates for each land use type based on equations included in the ITE Trip Generation Manual. The trip rate represents the number of daily trips generated by a particular land use type by size. Override the default trip rate if project-specific data are available from the transportation analysis.

URBEMIS estimates the trip rate differently for residential land use types than for non-residential land use types. For residential land use types, URBEMIS adjusts the default trip rate based on residential density (i.e., dwelling units/residential acre). Therefore, overriding the default value for the number of acres for a residential land use type would automatically result in a change in the

trip rate value. If both the number of acres and the trip rates for a residential development are known, enter the unit amount for the land use first, then adjust the acreage second, and then adjust the trip rate last. Select the *Submit button* after completing the *Enter Land Use Data* module.

For nonresidential land use types, URBEMIS uses a default trip rate value that is directly based on the unit amount entered into the *Enter Land Use Data* module. URBEMIS also assumes a Floor Area Ratio (FAR) of 0.5 for all nonresidential uses. The FAR is the ratio of the total floor area of a building to the size of the parcel on which it is located. Override the value in the acres data field based on the FAR for the proposed nonresidential land uses. URBEMIS does not adjust the default trip rate if the acre value is adjusted.

The *Enter Land Use Data* module includes a default worker commute trip percentage for all nonresidential land use types, which is used to estimate percentages of other commercial trip types in the *Enter Operational Data* module. The *Enter Land Use Data* module also contains default percentages of primary, diverted, and pass-by trips for all land use types, residential and non-residential. As explained in the URBEMIS User's Guide, primary trips are trips made for the specific purpose of visiting the generator and URBEMIS assumes that primary trips travel a full trip length; pass-by trips are trips made as intermediate stops on the way from an origin to another trip destination; and diverted-linked trips are trips attracted from the traffic volume on roadways in the vicinity of the generator but which require a diversion from that roadway to another roadway to gain access to the site. Pass-by and diverted-linked trips are assigned a shorter trip distance than primary trips. URBEMIS assumes that pass-by trips result in virtually no extra travel, with an assumed trip length of 0.1 mile. Diverted-linked trip lengths are assumed to equal 25 percent of the primary trip length. URBEMIS allows the user to edit these data fields. URBEMIS incorporates this information for estimation of mobile-source emissions only if the check box for the Pass-by Trips category in the *Enter Operational Data* module is selected. When not selected, URBEMIS assumes all trips are primary trips. BAAQMD does not recommend editing these fields unless project-specific information is available. Additional discussion about pass-by trips is provided under the *Enter Operational Data* module guidance below.

When estimating emissions for a type of land use that is not listed in URBEMIS, select a similar land use type or add a new land use type on the Blank tab of the *Enter Land Use Data* module. When selecting a similar nonresidential land use type as a proxy, consider the worker commute trip percentage and the primary, diverted, and pass-by trip values. The name of the land use type is unimportant and can be overridden with new text if desired. BAAQMD recommends using one of the types of residential land uses listed in URBEMIS as a proxy when analyzing any type of unique residential project.

For unique nonresidential types of land uses, BAAQMD recommends either using another nonresidential land use type as a proxy or using a Blank land use type. If a new land use type is analyzed using a row on the Blank tab of the *Enter Land Use Data* module, enter a trip rate as URBEMIS does not provide default trip rate on the Blank tab. BAAQMD recommends using a trip rate from the ITE Trip Generation Manual, if an appropriate trip rate is available. If an applicable trip generation rate is not available, the Lead Agency should make a good faith effort to derive a trip generation rate for the proposed project.

Operational Data

The *Enter Operational Data* module allows the user to estimate vehicle exhaust emissions from trips (and associated VMT) generated by a project. The module consists of seven operational parameter categories including *Year & Vehicle Fleet*, *Trip Characteristics*, *Temperature Data*, *Variable Starts*, *Road Dust*, *Pass-by Trips*, and *Double-Counting Correction*. The first five operational categories are all needed to calculate vehicle exhaust emissions and; therefore,

cannot be turned off. Three of the seven operational categories can be turned off: *Road Dust*, *Pass-by Trips*, and *Double-Counting Correction*.

Guidance regarding each of the operational categories is provided below. In general, most of the default values for these seven source categories do not need to be changed, except where otherwise noted herein.

Year & Vehicle Fleet
The *Year & Vehicle Fleet* category allows the user to specify the operational year for the project. Use the earliest possible year when the project would be operational to estimate worst-case operational emissions. Be aware that changing the project start year also changes the vehicle fleet mix. The default fleet mix values (i.e., *Fleet %, Vehicle Type*, *Non-Catalyst*, *Catalyst*, *Diesel*) are based on values from EMFAC using the year and the location of the project that is specified when the user creates a new project in URBEMIS. The fleet mix should be modified only if it is known that the fleet mix for a project would be different from the average vehicle fleet mix in the project area. In that situation, select *Keep Current Fleet Mix When Changing Years*. Changes to the fleet mix data should be based on information provided by the transportation analysis and/or assumptions that are disclosed in the CEQA document. For instance, the fleet mix of motor vehicle trips generated by a school project would likely consist of a higher percentage of school buses and a lower percentage of motor homes and motorcycles than the URBEMIS average.

Trip Characteristics
The *Trip Characteristics* category includes trip data such as average speed, trip percentages, urban and rural trip lengths for different trip types. The trip percentages for home-based trips can be modified; however, it is not possible to modify the same for commercial-based trips, which URBEMIS calculates using the worker commute trip percentage entered in the *Enter Land Use Data* module. URBEMIS uses either the urban or rural trip length values depending on whether *Urban Project* or *Rural Project* is selected on the same screen. In general, the *Urban Project* option should be selected for most land use development projects under BAAQMD's jurisdiction. The trip length values can be changed if supported by information produced in a transportation analysis and/or reasonable assumptions about the project. For instance, the trip length for a proposed school might be adjusted according to the spatial distribution of the households that would be served by that school, particularly if the majority of trip generation would consist of parents driving their children to the school.

Temperature Data
The *Temperature Data* category contains default ambient winter and summer temperature values which are used to estimate winter and summer emissions, respectively. The default temperature values in these data fields are specific to SFBAAB and should only be modified in consultation with BAAQMD.

Variable Starts
The *Variable Starts* parameter category shows the percentage of vehicles in several time classes (minutes since the vehicle engine was turned off) for the six trip types defined in the *Trip Characteristics* parameter category. This information is derived from the applicable EMFAC file and should only be modified in consultation BAAQMD.

Road Dust
The *Road Dust* parameter category allows the user to specify the distribution of vehicle travel between paved and unpaved roads. This category is used to calculate entrained road dust emissions due to vehicle travel on paved and unpaved surfaces. Do not turn this category off, and the user can adjust the percentage of travel on paved and unpaved roads if detailed project information is known.

Pass-by Trips
The *Pass-by Trips* parameter category can only be turned on or off. When selected, this category divides all the project-generated trips into primary, pass-by, and diverted-linked trips (entered as percentages in *Enter Land Use Data* module). When this category is not selected, URBEMIS assumes 100 percent of the project-generated trips are primary trips. Pass-by trips are trips made as intermediate stops on the way from an origin to a primary trip destination. URBEMIS accounts for these trips by setting the trip length to 0.1 miles for each pass-by trip. These trips are most important for retail and commercial land uses, such as gas stations and fast food restaurants. This option is not applicable to all land use types. For example, most of the trips to and from a *Warehouse* are typically expected to be primary trips and the *Pass-by Trips* option should not be used. This category check box should not be selected unless the percentage of pass-by trips is supported by a transportation analysis or a set of reasonable assumptions discussed in the CEQA document. If the trip length values in the *Trip Characteristics* category or the trip rate values in the Enter Land Use Data module are overwritten using information provided by a transportation analysis, be aware of whether the traffic data incorporated the occurrence of pass-by trips. If the *Pass-By Trips* checkbox is selected then the Lead Agency should discuss its reasoning for assuming that some of the project-generated vehicle trips would be considered pass-by trips.

Double-Counting Correction
The *Double-Counting Correction* parameter category is designed to account for internal trips between residential and nonresidential land uses. The *Double-Counting Correction* is applicable to mixed-use projects that include both residential and nonresidential land use types in the *Enter Land Use Data* module. For example, a residential trip and a retail trip generated by a mixed-use project may be the same trip. The user has the option of entering the number of internal trips between residential and nonresidential land uses in the *Enter the gross internal trip* as desired. The value entered represents the number of internal trips that would not be included in the emissions estimate. This category should not be used unless the transportation analysis contains data to support the correction factor. In some cases, the transportation analysis may report project-specific trip generation that is already corrected for internal trips. Consult with a traffic engineer to determine the appropriate method to account for internal trips. The *Double-Counting Correction* checkbox should not be selected if detailed project information is unknown.

Area Source
The *Enter Area Source Data* module allows the user to adjust the five area-source emission categories including, natural gas fuel combustion, hearth fuel combustion, landscape fuel combustion, consumer products, and architectural coatings. The natural gas, hearth, and landscape maintenance categories relate to on-site fuel combustion and the consumer products and architectural coatings categories address on-site evaporative emissions.

Guidance regarding each of the area-source categories is provided below. In general, most of the default values for these five source categories do not need to be changed except where otherwise noted in this guide.

Natural Gas Fuel Combustion
Parameters in the *Natural Gas Fuel Combustion* category are used to estimate the natural gas combustion emissions from space and water heating. On the *Natural Gas* tab the default percentage for land uses using natural gas should be changed to 100 percent for both residential and nonresidential land use types, as is representative of most development projects in the SFBAAB, unless project-specific data is available. Similarly, do not override the default natural gas usage values unless project-specific data is available.

Hearth Fuel Combustion

The *Hearth Fuel Combustion* category consists of separate tabs for *Hearth Percentages*, *Wood Stoves*, *Wood Fireplaces*, *Natural Gas Fireplaces*, and *Natural Gas Emission Factors*. Each of the tabs is discussed separately below.

Hearth Percentages

The parameters on the *Hearth Percentages* tab are applicable only to projects that include residential units. The default percentages should be used for the wood stoves, wood fireplaces, and wood stoves unless project-specific information is available. URBEMIS does not estimate emissions from any hearth types for nonresidential land use types.

Wood Stoves

On the *Wood Stoves* tab, the default percent values for the types of wood stoves (i.e., *Noncatalytic*, *Catalytic*, *Conventional*, and *Pellet*) should be changed in accordance with District Regulation 6, Rule 3, which allows only EPA-certified wood burning fireplaces and pellet stoves in new construction projects. The values for *Wood Burned*, *Wood Stove Usage*, and *Pounds in a Cord of Wood* should not be changed unless project-specific information is available.

Wood Fireplaces

The *Wood Fireplaces* tab is similar to the *Wood Stoves* tab. The emission factors on this tab cannot be modified. The values for *Wood Burned*, *Wood Stove Usage*, and *Pounds in a Cord of Wood* should not be changed unless project-specific information is available. District Regulation 6, Rule 3 allows only EPA-certified wood burning fireplaces in new construction projects.

Natural Gas Fireplaces

The values in the data fields on the *Natural Gas Fireplaces* tab should only be modified in the case that project-specific information is available that supports overriding default values.

Natural Gas Emission Factors

The emission factors contained in the *Natural Gas Emission Factors* tab cannot be modified. These values are used to estimate emissions from natural gas combustion in fireplaces/stoves and, according to the URBEMIS User's Guide, are based on U.S. Environmental Protection Agency Air Pollutant (AP-42) emission factors.

Landscape Fuel Combustion

The *Landscape Fuel Combustion* source category calculates on-site emissions from landscaping equipment such as lawn mowers, leaf blowers, chain saws, and hedge trimmers that are powered by internal combustion engines. On this tab, only adjust the value for the year being analyzed. The year entered into this field should be the earliest year when the project could become fully operational. Landscaping emissions are estimated for the summer period only. URBEMIS uses emission rates from ARB's OFFROAD model to estimate of landscape maintenance equipment emissions.

Consumer Products

The *Consumer Products* source category is only relevant to projects that include residential land use types. The *Pounds of ROG (per person)* value should not be adjusted in this category. The persons per residential unit data field should be adjusted based on the estimated number of residents that would be supported by the proposed project, if available. The value should be consistent with the number of residents divided by the number of residential units.

Architectural Coating

Do not make changes to the values in the *Architectural Coating* source category without consulting BAAQMD.

Stationary-Source Facilities

A stationary source consists of a single emission source with an identified emission point, such as a stack at a facility. Facilities can have multiple emission point sources located on-site and sometimes the facility as a whole is referred to as a "stationary source." Stationary sources are typically associated with industrial processes. Examples include boilers, heaters, flares, cement kilns, and other types of combustion equipment, as well as non-combustion sources such as coating or printing operations. BAAQMD is responsible for issuing permits for the construction and operation of stationary sources to reduce air pollution, and to attain and maintain the national and California ambient air quality standards in the SFBAAB. Newly modified or constructed stationary sources subject to Air District permitting may be required to implement Best Available Control Technology (BACT), which may include the installation of emissions control equipment or the implementation of administrative practices that would result in the lowest achievable emission rate. Stationary sources may also be required to offset their emissions of criteria air pollutants and precursors to be permitted. This may entail shutting down or augmenting another stationary source at the same facility. Facilities also may purchase an emissions reduction credit to offset their emissions. Any stationary source emissions remaining after the application of BACT and offsets should be added to the indirect and area source emissions estimated above to arrive at total project emissions.

Emissions Estimation

URBEMIS is not equipped to estimate emissions generated by stationary sources. Instead from stationary sources should be estimated in consultation with BAAQMD. When stationary sources will be subject to BAAQMD regulations, the regulation emission limits should be used as emission factors. If BAAQMD emission limits are not applicable, alternative sources of emission factors are: EPA AP-42 emission factors for particular industrial processes, manufacturer specifications for specific equipment, throughput data (e.g., fuel consumption, rate of material feedstock input) and other specifications provided by the project engineer. To the extent possible, BAAQMD recommends that the methodology used to estimate stationary-source emissions be consistent with calculations that would need to be performed to fulfill requirements of the permitting process and provided in the CEQA document.

Sum the estimated emissions for area, mobile, and stationary sources (if any) for each pollutant, and proceed to *Step 3: Comparison of Unmitigated Emissions with Thresholds of Significance.*

Step 3: Comparison of Unmitigated Emissions with Thresholds of Significance

Following quantification of project-generated operational-related emissions in accordance with BAAQMD-recommend methods, compare the total maximum daily and annual emissions of each criteria pollutant and their precursors with the applicable *Thresholds of Significance* (refer to Table 3-2). If daily maximum or annual emissions of operational-related criteria air pollutants or precursors would not exceed any of the *Thresholds of Significance*, the project would result in a less-than-significant impact to air quality. If daily maximum or annual emissions of operational-related criteria air pollutants or precursors would exceed any applicable *Threshold of Significance,* the proposed project would result in a significant impact to air quality and CEQA requires implementation of all feasible mitigation measures. Proceed to *Step 4: Mitigation Measures and Emission Reductions.*

Step 4: Mitigation Measures and Emission Reductions

Where operational-related emissions would exceed applicable *Thresholds of Significance*, refer to Section 3.3 for mitigation measures and associated emission reductions. Only mitigation measures included in the proposed project or recommended as mitigation can be included when quantifying mitigated emission levels.

Step 5: Comparison of Mitigated Emissions with Thresholds of Significance

Following quantification of project-generated operational-related emissions in accordance with BAAQMD-recommended methods, compare the total maximum daily and annual amounts of mitigated criteria air pollutants and precursors with the applicable *Thresholds of Significance* (refer to Table 3-2). If the implementation of mitigation measures, including off-site mitigation, would reduce all operational-related criteria air pollutants and precursors to levels below the applicable *Thresholds of Significance*, the impact to air quality would be reduced to a less-than-significant level. Implementation of mitigation measures means that they are made conditions of project approval and included in a Mitigation Monitoring and Reporting Plan (MMRP). If mitigated levels of any criteria air pollutant or precursor would still exceed the applicable *Threshold of Significance*, the impact to air quality would remain significant and unavoidable.

Table 3-2
Example Operational Criteria Air Pollutant and Precursor Emissions Analysis

Step	Emissions Source	Emissions (lb/day or tpy)*			
		ROG	NO_X	PM_{10}	$PM_{2.5}$
2	Area Sources	A	A	A	A
	Mobile Sources	B	B	B	B
	Stationary Sources	C	C	C	C
	Total Unmitigated Emissions	A + B + C = D	A + B + C = D	A + B + C = D	A + B + C = D
	BAAQMD Threshold	54 lb/day or 10 tpy	54 lb/day or 10 tpy	82 lb/day or 15 tpy	54 lb/day or 10 tpy
3	Unmitigated Emissions Exceed BAAQMD Threshold?	Is D > Threshold? (If Yes, significant. Go to step 4. If No, less than significant)			
4	Mitigated Emissions	E	E	E	E
5	Mitigated Emissions Exceed BAAQMD Threshold?	Is E > Threshold? (If Yes, significant and unavoidable. If No, less than significant with mitigation incorporated)			

* Letters "A", "B", and "C" are used to represent numeric values that would be obtained through modeling for area and mobile sources, and by manual calculations for stationary source-emissions. "D" represents the sum of "A", "B", and "C" (i.e., unmitigated emissions). "E" represents mitigated emissions.
Notes: BAAQMD = Bay Area Air Quality Management District; lb/day = pounds per day; NO_X = oxides of nitrogen; $PM_{2.5}$ = fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less; PM_{10} = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less; ROG = reactive organic gases; tpy = tons per year.
Refer to Appendix C for support documentation.

3.2.2. Greenhouse Gases

Step 1: Comparison of Project Attributes with Screening Criteria

The first step in determining the significance of operational-related GHG emissions is to compare the attributes of the proposed project with the applicable *Screening Criteria* (Refer to Chapter 2). This preliminary screening provides a conservative indication of whether operation of the proposed project would result in the generation of GHGs that exceed the *Threshold of Significance* (Refer to Chapter *2*). If all of the *Screening Criteria* are met, the operation of the proposed project would likely result in a less-than-significant impact to global climate change. If the proposed project does not meet all the *Screening Criteria*, proceed to *Step 2: Emissions Quantification.*

Step 2: Emissions Quantification

Direct Emissions

For proposed projects that do not meet all of the *Screening Criteria*, BAAQMD-recommended methodologies for quantifying GHG emissions include the use of URBEMIS to estimate direct GHG emissions from area and mobile sources. Sources of operational-related GHGs do not include all the categories discussed above in Section 3.2.1 (e.g., Road Dust); however, the same detailed guidance as described above for criteria air pollutants and precursors for quantifying GHG emissions can be followed. URBEMIS gives the modeled emissions output in units of short tons. Convert the URBEMIS output to metric tons by multiplying by 0.91.

Indirect Emissions

Projects should account for indirect GHG emissions from the incremental increase in energy production and water consumption associated with operational-related activities in the project's total GHG emissions. URBEMIS does not model emissions from indirect sources; therefore, modeling outside of URBEMIS is required to quantify off-site GHG emissions associated with energy generation for electricity consumption and water conveyance.

BAAQMD recommends using the California Climate Action Registry (CCAR) General Reporting Protocol (GRP) for quantifying indirect emissions from energy generation. The GRP contains emission factors for carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) for electricity generation. SFBAAB projects should use the emission factors for the subregion designation CAMX, WECC California, for calculating indirect emissions. The current GHG emissions factor equals 0.72724 pounds of CO_2e per kilowatt hour (lb/kwh).

Electricity Generation

The first step in calculating indirect emissions from project operational electricity use is to estimate the electricity consumption for the project build out year. If data are unattainable, the most recent average electricity consumption data from the California Energy Commission (CEC) should be used. Current consumption rates equal:

- For residential uses: 7,000 kwh per year (kwh/yr) per household.
- For commercial uses: 16,750 kwh/yr per thousand square feet.

Once electricity consumption is calculated, multiply the total amount of kwh by the CCAR emissions factor for California; then convert total from pounds to metric tons for total indirect emissions.

[(Estimated electricity usage (kwh/yr) x 0.72724 (lb/kwh)] / 2204.62 (lb/MT) = MT CO_2e/yr

Water Conveyance

Similar to electricity generation, first estimate the water consumption for the project build out year. If data is unattainable, then the average water usage rate per household or commercial space from the project's specific water utility should be identified and used.

Next, calculate energy (kwh) required to convey, treat, and distribute the project's estimated total water usage (million gallons/year). The CEC provides data on the average embedded energy in water conveyance for water usage for Northern California, which is 3,950 kwh/million gallons (kwh/mg).

Once electricity consumption is calculated, multiply sum by the CCAR emissions factor for California; then convert total from pounds to metric tons for total indirect emissions.

[(Estimated water usage (mg/yr) x 3,950 (kwh/mg) x 0.72724 (lb/kwh)] / 2204.62 (lb/MT) = MT CO_2e/yr.

Sum the estimated GHG emissions from area, mobile, and indirect sources and proceed to *Step 3: Comparison of Unmitigated Emissions with Thresholds of Significance.*

Step 3: Comparison of Unmitigated Emissions with Thresholds of Significance

Following quantification of project-generated operational-related emissions in accordance with the above BAAQMD-recommended methods, compare total annual GHG emissions with the applicable *Threshold of Significance* (refer to Table 3-3). If annual emissions of operational-related GHGs would not exceed the *Threshold of Significance*, the project would likely result in a less-than-significant impact to global climate change. If annual emissions would exceed the *Threshold of Significance,* the proposed project would result in a significant impact to global climate change and will require mitigation measures for emissions reductions.

Step 4: Mitigation Measures and Emission Reductions

Where operational-related emissions would exceed applicable *Thresholds of Significance*, refer to Section 3.3 for BAAQMD-recommended mitigation measures and associated emission reductions. Only reduction measures included in the proposed project or recommended as mitigation can be included when quantifying mitigated emission levels.

Step 5: Comparison of Mitigated Emissions with Thresholds of Significance

Following quantification of project-generated operational-related emissions in accordance with the above BAAQMD-recommended methods, compare the total annual amount of mitigated GHGs with the applicable *Threshold of Significance* (refer to Table 3-3 for calculation methodology). If the implementation of BAAQMD-recommended mitigation measures would reduce operational-related GHGs to a level below the applicable *Threshold of Significance*, the impact would likely be reduced to a less-than-significant level. If mitigated levels would still exceed the applicable *Threshold of Significance*, the impact to global climate change would remain significant and unavoidable.

Table 3-3
Example of Operational Greenhouse Gas Emissions Analysis

Step	Emissions Source	Emissions (MT CO_2e/yr)*
2	Area Sources	A
	Mobile Sources	B
	Indirect Sources	C
	Total Unmitigated Emissions	A + B + C = D
	BAAQMD Threshold	1,100
3	Unmitigated Emissions Exceed BAAQMD Threshold?	Is D > 1,100? (If Yes, significant. Go to step 4. If No, less than significant)
4	Mitigated Emissions	E
5	Mitigated Emissions Exceed BAAQMD Threshold?	Is E > 1,100? (If Yes, significant and unavoidable. If No, less than significant with mitigation incorporated)

* Letters "A", "B", and "C" are used to represent numeric values that would be obtained through modeling for area and mobile sources, and by manual calculations for indirect source-emissions. "D" represents the sum of "A", "B", and "C" (i.e., unmitigated emissions). "E" represents mitigated emissions.

Notes: BAAQMD = Bay Area Air Quality Management District; CO_2e = carbon dioxide equivalent; MT = metric tons; yr = year.

Refer to Appendix C for support documentation.

3.3. MITIGATING OPERATIONAL-RELATED IMPACTS

The following mitigation measures would reduce operational-related emissions of criteria air pollutants, precursors, and GHGs from mobile, area, and stationary sources. Additional mitigation measures may be used, including off-site measures, provided their mitigation efficiency is supported by substantial evidence. Where a range of emission reduction potential is given for a measure, the Lead Agency should provide justification for the mitigation reduction efficiency assumed for the project.

"Unscaled" reductions should be scaled by the applicable proportion(s) (i.e., sector, land use type) of project-generated emissions. In other words, if a measure would result in an unscaled 50 percent reduction in residential natural gas consumption, but only 20 percent of a project's emissions are associated with natural gas consumption, and only 10 percent of a project's emissions are from residential land uses, the "scaled" measure performance would be:

50% * 20% * 10% = 1%.

Once unscaled emission reductions are scaled by applicable sector and land use, scaled emission reductions may be treated as additive.

URBEMIS Measures – Operational (Mobile-source) Measures

Measure	Unscaled Reductions	Applicable Pollutants	Sector	Notes	Additional comments
Mix of Uses	-3% to 9%	CAPs, GHGs	Mobile sources	-3 when no housing or employment centers within 1/2 mile	Residential: % reduction is taken from base trips (9.57) and subtracted from ITE trip generation; Nonresidential: % reduction from ITE trip generation
Local serving retail within 1/2 mile of project	2%	CAPs, GHGs	Mobile sources	Uses lower end of reported research to avoid double counting with mix of uses measure	
Transit Service	0% to 15%	CAPs, GHGs	Mobile sources		
Bike & Pedestrian	0%–9%	CAPs, GHGs	Mobile sources	Credit is given based on intersection density, sidewalk completeness, and bike network completeness; No reduction if entire area within 1/2 mile is single use	
Affordable Housing	0%–4%	CAPs, GHGs	Mobile sources		
Transportation Demand Management Parking, Transit Passes					
Daily Parking Charge	0%–25%	CAPs, GHGs	Only resident/ employee trips, no visitor/ shopper trips		
Parking Cash-Out	0%–12.5%	CAPs, GHGs		Shoupe, Donald. 2005. Parking Cash Out. American Planning Association. Chicago, IL.	
Free Transit Passes	25% of Transit Service Reduction	CAPs, GHGs			

URBEMIS Measures – Operational (Mobile-source) Measures

Measure	Unscaled Reductions	Applicable Pollutants	Sector	Notes	Additional comments
Telecommuting					
Employee Telecommuting Program	0%–100%	CAPs, GHGs	Mobile sources, Worker Trips only		
Compressed Work Schedule 3/36	0%–40%	CAPs, GHGs			
Compressed Work Schedule 4/40	0%–20%	CAPs, GHGs			
Compressed Work Schedule 9/80	0%–10%	CAPs, GHGs			
Other Transportation Demand Measures					
Secure Bike Parking (at least 1 space per 20 vehicle spaces)	At least 3 elements: 1% reduction, plus 5% of the reduction for transit and pedestrian/bike friendliness; At least 5 elements: 2% reduction, plus 10% of the reduction for transit and pedestrian/bike friendliness	CAPs, GHGs	Mobile sources, Worker Trips only		
Showers/Changing Facilities Provided					
Guaranteed Ride Home Program Provided					
Car-Sharing Services Provided					
Information Provided on Transportation Alternatives (Bike Schedules, Maps)					
Dedicated Employee Transportation Coordinator					
Carpool Matching Program					
Preferential Carpool/Vanpool Parking					
Parking Supply	0%–50%	CAPs, GHGs	Mobile sources		
On Road Trucks	As input by user in URBEMIS	CAPs, GHGs	Mobile sources		

Area-Source Measures

Measure	Unscaled Reductions	Applicable Pollutants	Sector	Notes
Increase Energy Efficiency Beyond Title 24	Same as % improvement over Title 24	CAPs, GHGs	Natural gas sector in URBEMIS for applicable land use only	User should specify baseline year for the Title 24 standards
Electrically powered landscape equipment and	Same as % of landscape equipment	CAPs, GHGs	Landscape emissions: residential only	

outdoor electrical outlets				
Low VOC architectural coatings	Same as % VOC reduction in applicable coatings (Interior/Exterior)	ROG only	Architectural coating	

Non-URBEMIS Measures – Energy Efficiency Related Measures

Measure	Unscaled Reductions	Applicable Pollutants	Sector	Notes	Additional comments
Plant shade trees within 40 feet of the south side or within 60 feet of the west sides of properties.	30%	GHGs	R,C A/C Electricity	USDA Forest Service, Pacific Northwest Research Station. "California Study Shows Shade Trees Reduce Summertime Electricity Use." Science Daily 7 January 2009. 20 February 2009 <http://www.sciencedaily.com/releases/2009/01/090105150831.htm>.	Electricity-related measures reduce CAPs off-site, but they are not typically quantified as part of a CEQA analysis.
Require cool roof materials (albedo >= 30)	34%	GHGs	C A/C Electricity	U.S. EPA Cool Roof Product Information, Available: <http://www.epa.gov/heatisland/resources/pdf/CoolRoofsCompendium.pdf>	
	69%	GHGs	R A/C Electricity		
Install green roofs	1%	GHGs	R,C A/C Electricity	Reductions are based on the Energy & Atmosphere credits (EA Credit 2) documented in the Leadership in Energy & Environmental Design (LEED), Green Building Rating System for New Constructions and Major Renovations, Version 2.2, October 2005. The reduction assumes that a vegetated roof is installed on a least 50% of the roof area or that a combination high albedo and vegetated roof surface is installed that meets the following standard: (Area of SRI Roof/0.75)+(Area of vegetated roof/0.5) >= Total Roof Area.	
Require smart meters and programmable thermostats	10%	CAPs, GHGs	R, C electricity and natural gas space heating	U. S. Environmental Protection Agency. 2009. Programmable Thermostat. http://www.energystar.gov/ia/new_homes/features/ProgThermostats1-17-01.pdf	

Non-URBEMIS Measures – Energy Efficiency Related Measures

Measure	Unscaled Reductions	Applicable Pollutants	Sector	Notes	Additional comments
Meet GBC standards in all New construction	17%	GHGs	R electricity	California Energy Commission [CEC] 2007. Impact Analysis 2008 Update to the California Energy Efficiency Standards for Residential and Nonresidential Buildings	
	7%	GHGs	C electricity		
	9%	CAPs, GHGs	R natural gas		
	3%	CAPs, GHGs	C natural gas		
Retrofit existing buildings to meet CA GBC standards	38%	GHGs	R electricity	California Energy Commission [CEC] 2003. Impact Analysis 2005 Update to the California Energy Efficiency Standards for Residential and Nonresidential Buildings; California Energy Commission [CEC] 2007. Impact Analysis 2008 Update to the California Energy Efficiency Standards for Residential and Nonresidential Buildings	
	12%	GHGs	C electricity		
	18%	CAPs, GHGs	R natural gas		
	12%	CAPs, GHGs	C natural gas		
Install solar water heaters	70%	CAPs, GHGs	R natural gas water heating	Energy Star. 2009. Solar Water Heater. http://www.energystar.gov/ia/new_homes/features/WaterHtrs_062906.pdf; Department of Energy. California Energy Commission [CEC] 2007. Impact Analysis 2008 Update to the California Energy Efficiency Standards for Residential and Nonresidential Buildings	Cannot take credit for both solar and tank-less water heater measures
	70%	CAPs, GHGs	C natural gas water heating		
Install tank-less water heaters	35%	CAPs, GHGs	R natural gas water heating	Tankless Water Heater. 2008. Available: <http://www.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=12820>	
	35%	CAPs, GHGs	C natural gas water heating		
Install solar panels on residential and commercial buildings	100%	GHGs	R, C electricity		
100% increase in diversity of land use mix	5%	CAPs, GHGs	Mobile sources	Ewing, Reid, et al. 2001. *Travel and the Built Environment: A Synthesis.* Transportation Research Record 1780. Paper No.	

Non-URBEMIS Measures – Energy Efficiency Related Measures

Measure	Unscaled Reductions	Applicable Pollutants	Sector	Notes	Additional comments
				01-3515 as cited in Urban Land Institute. 2008. *Growing Cooler.* ISBN: 978-0-87420-082-2. Washington, DC	
Jobs housing balance	Trip reduction = (1 – (ABS (1.5 * HH – E)/(1.5 * HH + E)) – 0.25) / 0.25 * 0.03; where HH = study area households; E = study area employment	CAPs, GHGs	Mobile sources	*Nelson/Nygaard Consultants. 2005. Crediting Low-Traffic Developments: Adjusting Site-Level Vehicle Trip Generation Using URBEMIS. Pg 12, (adapted from Criterion and Fehr & Peers, 2001)*	
100% increase in design (i.e., presence of design guidelines for transit oriented development, complete streets standards)	3%	CAPs, GHGs	Mobile sources	Ewing, Reid, et al. 2001. *Travel and the Built Environment: A Synthesis.* Transportation Research Record 1780. Paper No. 01-3515 as cited in Urban Land Institute. 2008. *Growing Cooler.* ISBN: 978-0-87420-082-2. Washington, DC	
100% increase in density	5%	CAPs, GHGs	Mobile sources	Ewing, Reid, et al. 2001. *Travel and the Built Environment: A Synthesis.* Transportation Research Record 1780. Paper No. 01-3515 as cited in Urban Land Institute. 2008. *Growing Cooler.* ISBN: 978-0-87420-082-2. Washington, DC	
HVAC duct sealing	30%	GHGs	R,C A/C electricity	Sacramento Metropolitan Utilities District. 2008. Duct Sealing. Available: <http://www.pge.com/myhome/saveenergymoney/rebates/coolheat/duct/index.shtml>.	
Provide necessary infrastructure and treatment to allow use of	SFR: 74%*50% = 37.5% MFR: 58% * 50% = 29%	GHGs	R electricity (water consumption)	Department of Water Resources. 2001. Statewide Indoor/Outdoor Split. Accessed December 2, 2008. Available at:	

Non-URBEMIS Measures – Energy Efficiency Related Measures

Measure	Unscaled Reductions	Applicable Pollutants	Sector	Notes	Additional comments
50% greywater/ recycled water in residential and commercial uses for outdoor irrigation	Commercial: 12% * 50% = 6%		C electricity (water consumption)	<http://www.landwateruse.water.ca.gov/annualdata/urbanwateruse/2001/landuselevels.cfm?use=8>.	
Complete streets (i.e., bike lanes and pedestrian sidewalks on both sides of streets, traffic calming features such as pedestrian bulb-outs, cross-walks, traffic circles, and elimination of physical and psychological barriers (e.g., sound walls and large arterial roadways, respectively).)	1-5%	CAPs, GHGs	Mobile sources	Dierkers, G., E. Silsbe, S. Stott, S. Winkelman, an M. Wubben. 2007. *CCAP Transportation Emissions Guidebook*. Center for Clean Air Policy. Washington, D.C. Available: <http://www.ccap.org/safe/guidebook.php>. as cited in California Air Pollution Control Officers Association (CAPCOA) 2008. *CEQA and Climate Change.*	
Others Measures (No quantifiable reductions at this time)					
Maximize interior day light		GHGs	R, C, M		
Increase roof/ceiling insulation		CAPs, GHGs	R, C, M		
Create program to encourage efficiency improvements in rental units		CAPs, GHGs	R		
Provide composting facilities at residential uses		GHGs	R		
Create food waste and green waste curb-side pickup service		GHGs	R,C,M		
Require the provision of storage areas for recyclables and green		GHGs	R,C,M		

Non-URBEMIS Measures – Energy Efficiency Related Measures

Measure	Unscaled Reductions	Applicable Pollutants	Sector	Notes	Additional comments
waste in new construction					
Install rainwater collection systems in residential and Commercial Buildings		GHGs	R,C,M		
Install low-water use appliances and fixtures		GHGs	R,C,M	California Air Pollution Control Officers Association (CAPCOA) 2008. CEQA and Climate Change.	
Restrict the use of water for cleaning outdoor surfaces/Prohibit systems that apply water to non-vegetated surfaces		GHGs	R,C,M	California Attorney General's Office GHG Reduction Measures	
Implement water-sensitive urban design practices in new construction		GHGs	R,C,M		

Notes: CAPs = Criteria Air Pollutants; GHGs = Greenhouse Gases; ROG = Reactive Organic Gases; R = Residential Development; C = Commercial Development; M = Mixed Use Development; A/C = Air Conditioning; and VOC = Volatile Organic Compounds.
Source: Information compiled by EDAW 2009.

4. ASSESSING AND MITIGATING LOCAL COMMUNITY RISK AND HAZARD IMPACTS

4.1. INTRODUCTION

Under the Clean Air Act, toxic air contaminants (TAC) are airborne pollutants that may be expected to result in an increase in mortality or serious illness or which may pose a present or potential hazard to human health. TACs are also referred to as toxic air pollutants or hazardous air pollutants.

A wide range of sources, from industrial plants to households, emit TACs. Because it is not practical to eliminate all TACs, these compounds are regulated through state and local risk management programs. These programs are designed to eliminate, avoid, or minimize the risk of adverse health effects from exposures to TACs.

A chemical becomes a regulated TAC after it is identified by ARB's California Air Toxics Program or EPA's National-Scale Air Toxics Assessments, assessed for its potential for human exposure, and evaluated for its health effects on humans. ARB has listed approximately 200 toxic substances, which are identified on the California Air Toxics Program's TAC List. Many of these substances have also been identified by EPA as hazardous air pollutants.

TACs can cause long-term health effects such as cancer, birth defects, neurological damage, asthma, bronchitis or genetic damage; or short-term acute affects such as eye watering, respiratory irritation (a cough), running nose, throat pain, and headaches. Regulating TACs is important not only because of the severity of their health effects, but also because these health problems can occur with exposure to even small amounts of TACs. TACs are not classified as criteria air pollutants and no ambient air quality standards have been established for them. The effects of various TACs are very diverse and their health impacts tend to be local rather than regional; therefore, uniform standards for these pollutants have not been established.

TACs can be separated into carcinogens and non-carcinogens based on the nature of the physiological degradation associated with exposure to the pollutant. For regulatory purposes, carcinogens are assumed to have no safe threshold below which health impacts would not occur and cancer risk is expressed as excess cancer cases per one million exposed individuals. Non-carcinogenic substances differ in that there is generally assumed to be a safe level of exposure below which no negative health impact is believed to occur. These levels are determined on a pollutant-by-pollutant basis. Acute and chronic exposure to non-carcinogens is expressed in using a HI, which is the ratio of expected exposure levels to acceptable health-acceptable exposure levels.

EPA's web page, About Air Toxics, provides more detailed information about the health effects of TACs. The specific health effects of each particular TAC as identified by the California Office of Environmental Health Hazard Assessment (OEHHA) and ARB are listed in the Consolidated Table of OEHHA / ARB Approved Risk Assessment Health Values.

The dose to which receptors are exposed to a toxin or TAC is the primary factor used to determine health risk. Dose is a function of the concentration of a substance or substances in the environment and the duration of exposure to the substance(s). Dose is positively correlated with the concentration of a toxic substance, which generally disperses with distance from the emissions source under normal meteorological conditions. Dose is also positively correlated with time, meaning that a longer exposure period would result in a higher exposure level for an

exposed individual. The risks estimated for a receptor are higher if a fixed exposure occurs over a longer period.

The recommendations provided in this chapter apply to assessing and mitigating TAC impacts for individual project operations and construction-related TAC emissions. Refer to Chapter 5 for recommendations for assessing and mitigating local community risk and hazard impacts at the plan-level.

In addition, the cancer risk and HI alone do not indicate all health risks and hazards. Current health risk assessment (HRA) methodologies do not account for all types of health hazards. In some instances, $PM_{2.5}$ may be a better indicator of certain air quality health impacts, even though $PM_{2.5}$ is not itself classified as a TAC. In general, the severity of the health impact associated with PM is inversely related to the size of particle, because smaller particles have greater potential to penetrate deeper into the lungs. Thus, $PM_{2.5}$ can be used as an indicator of potential exposure to health hazards, and BAAQMD recommends characterizing risk from $PM_{2.5}$ outside of the HRA process through use of concentration-based substantial contribution thresholds and approaching the issues with a multifaceted set of *Thresholds of Significance*.

4.2. SIGNIFICANCE DETERMINATION

Exposure of sensitive receptors to substantial concentrations of TACs and other pollutants of localized concern could occur from the following situations:

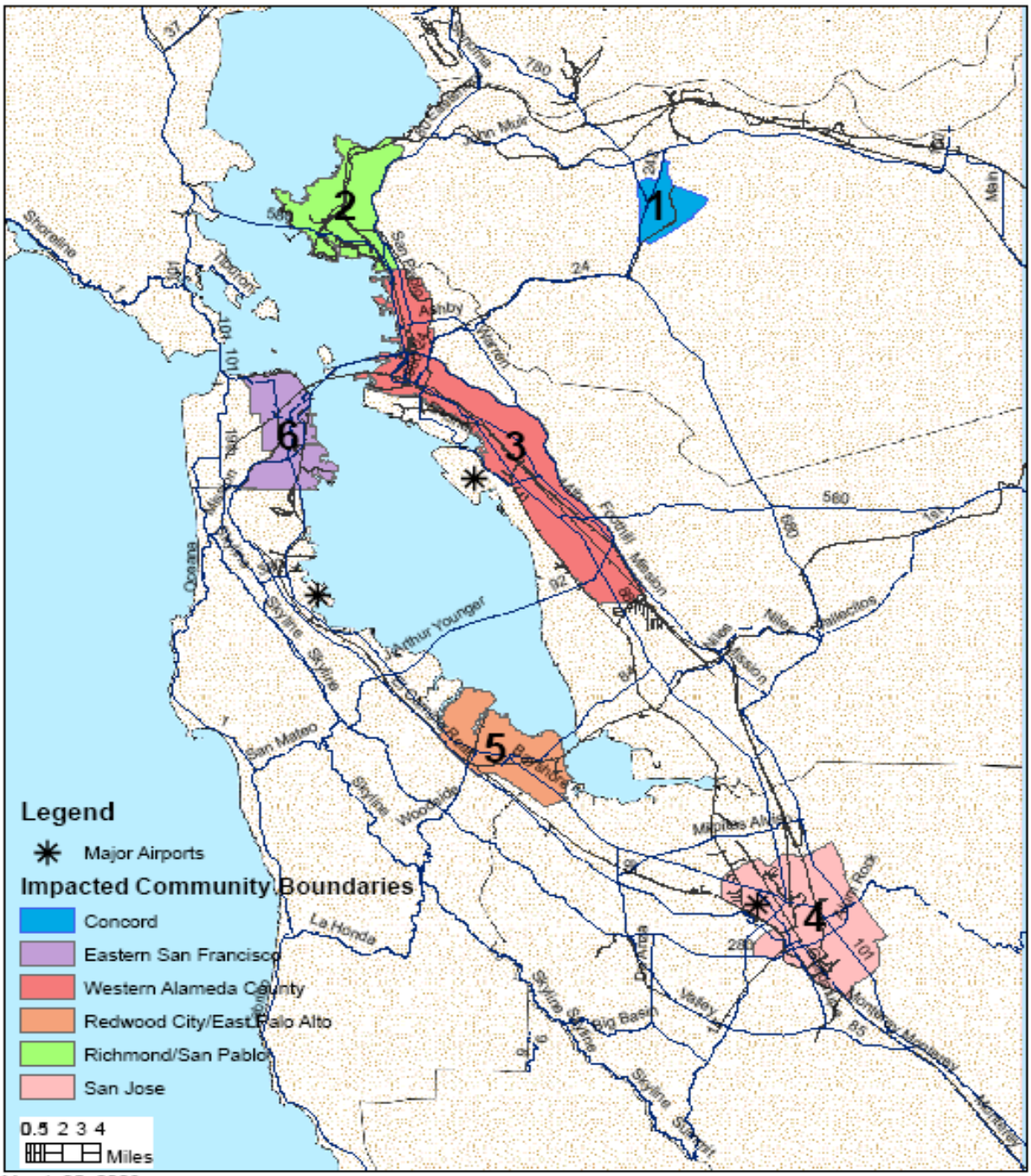
1. Siting a new TAC and/or $PM_{2.5}$ source(e.g., refinery, truck distribution center, freeway) near existing or planned sensitive receptors; and
2. Siting a new receptor near an existing source of TAC or $PM_{2.5}$ emissions.

BAAQMD recommendations for evaluating and making a significance determination for each of these situations are discussed separately below:

4.2.1. Siting a New Source

When evaluating whether a new source of TAC and/or $PM_{2.5}$ emissions would adversely affect existing or future proposed receptors a Lead Agency shall examine the extent to which the new source would increase cancer risk levels at nearby receptors, whether the source would be permitted or non-permitted, whether the affected receptors are located in communities of high concern, and whether the project would implement all T-BACT and/or Toxic Best Practices (TBP), as determined by BAAQMD. To determine whether a new source located in a community of high concern, a Lead Agency should refer to Figure 4-1 (consult District staff if a more precise location is needed). The incremental increase in cancer risk at the affected receptors shall also be assessed. For sources that emit high quantities of TAC emissions, the incremental increase in cancer risk shall be determined by a HRA using the American Meteorological Society (AMS)/EPA Regulatory Model (AERMOD) dispersion model in accordance with the guidance document provided by the California Air Pollution Control Officers Association (CAPCOA) titled *Health Risk Assessments for Proposed Land Use Projects*. A Lead Agency may also consult ARB's *Air Quality and Land Use Handbook: A Community Health Perspective (Land Use Handbook)* for impact analyses relative to the distance between a certain sources and receptor.

Revisions to BAAQMD Regulation 2, Rule 5 (New Source Review of Toxic Air Contaminants) would make the permitting process and the *Thresholds of Significance* consistent with the CEQA analysis. Consequently, new and modified facilities that obtain permits to operate from BAAQMD would be compliant with CEQA.



March 25, 2009 Lau.../Grant communities.mxd

Source: BAAQMD 2009

Communities of High Concern **Figure 4-1**

Some proposed projects would include the operation of non-permitted sources of TAC and/or $PM_{2.5}$ emissions. For instance, projects that would attract high numbers of diesel-powered on-road haul trucks or use off-road diesel equipment on site, such as a distribution center, a quarry, or a manufacturing facility, would potentially expose existing or future planned receptors to substantial risk levels and/or health hazards.

A Lead Agency's analysis shall determine whether operational TAC and/or $PM_{2.5}$ emissions generated as part of a proposed project would expose off-site receptors to risk levels that exceed BAAQMD's applicable *Thresholds of Significance* for siting a new source, restated below for reference:

Impacted Communities

- For impacted communities identified under the BAAQMD's CARE Program, and for projects within 500 feet of a K-12 school, an excess cancer risk level of more than 5 in one million, a chronic HI of more than 0.5 or an acute HI of more than 1.0 would be a cumulatively considerable contribution;
- For impacted communities, an incremental increase of greater than 0.2 $\mu g/m^3$ annual average $PM_{2.5}$ would be a cumulatively considerable contribution.

Other Areas

- For all other areas, an excess cancer risk level of more than 10 in one million, or a chronic or acute HI greater than 1.0 would be a cumulatively considerable contribution;
- For all other areas, an incremental increase of greater than 0.3 $\mu g/m^3$ annual average $PM_{2.5}$ would be a cumulatively considerable contribution.

BAAQMD recommends that all receptors located within a 1,000 foot radius of the project's fence line be assessed for potentially significant impacts from the incremental increase in risks or hazards. For new land uses that would host a high number of non-permitted TAC sources, such as a distribution center, the incremental increase in cancer risk shall be determined by an HRA using the AERMOD dispersion model in accordance with CAPCOA's guidance document titled *Health Risk Assessments for Proposed Land Use Projects*. A Lead Agency may consult HRAs that have previously been conducted for similar land uses to determine whether it assesses the incremental increase in cancer risk qualitatively or by performing an HRA. This analysis shall account for all TAC emissions generated on the project site, as well as any TAC emissions that would occur near the site as a result of the implementation of the project (e.g., diesel trucks queuing outside and entrance, a high volume of trucks using a road to access a quarry or landfill).

It shall also be noted that some proposed projects would include both permitted and non-permitted TAC sources. For instance, a manufacturing facility may include some permitted stationary sources and also attract a high volume of diesel trucks and/or include a rail yard. All sources should be accounted for in the analysis.

4.2.2. Siting a New Receptor

BAAQMD recommends that a Lead Agency identify all TAC and hazard sources located within a 1,000 foot radius of a proposed project site. Permitted TAC sources can be identified using EPA's Toxics Release Inventory Explorer search tool and ARB's Facility Search Engine. To conduct a thorough search, a Lead Agency shall gather all facility data within 1,000 feet of the project site.

Important information is contained in the *Facility Search Results* in the ARB database. The results indicate whether the facility's TAC emissions are above or below BAAQMD's prioritization level and, therefore, whether a quantitative HRA was required for the facility. If BAAQMD's prioritization level was not exceeded by the facility and, therefore, an HRA was not required, then

the Lead Agency shall determine that the facility does not result in a substantial health risk to nearby areas. If BAAQMD's prioritization level is exceeded by the facility (and an HRA was required) then the Lead Agency should request the results of the HRA from BAAQMD. The results of the HRA should be examined to determine whether the facility's TAC emissions result in risk levels anywhere on the proposed project site that exceed BAAQMD's applicable *Thresholds of Significance*. This step is important because some HRAs only estimate the levels of risk at existing discrete off-site receptors and/or at the fence line of receptors, while others evaluate the levels of health risk at all off-site locations surrounding the facility. EPA's Toxics Release Inventory Explorer search tool can also be used to supplement the survey using ARB's Facility Search Engine. Note that EPA's search tool provides information about releases of toxic chemicals discharged to the environment in a variety of forms, including emissions to the air (i.e., TACs), discharges to bodies of water, disposal to the land at the facility, and/or disposal in underground injection wells. In the air quality analysis of a CEQA document, the Lead Agency only needs to address air pollutant emissions in the air quality analysis.

The risk levels estimated for the locations throughout the project site where receptors would be located should be compared to BAAQMD's applicable *Threshold of Significance* for siting a new receptor near existing sources of TAC and/or $PM_{2.5}$ emissions, restated below for reference:

Impacted Communities

- All projects in impacted communities with new receptors must implement the following T-BACT/TBP measures:
  - Site design: locate livable structures and HVAC intake as far from source of risk or hazard as possible; and
  - Plant tiered redwood and/or deodar cedar trees between source of risk or hazard and livable structures.
- After installation of TBACT/TBP, an excess cancer risk level of 10 in one million, or a chronic or acute HI greater than 1.0 from any single source would be a cumulatively considerable contribution.

Other Areas

- For all other areas, an excess cancer risk level of more than 10 in one million, or a chronic or acute HI greater than 1.0 from any single source would be a cumulatively considerable contribution.

4.3. CUMULATIVE LOCAL COMMUNITY RISK AND HAZARD IMPACTS

A Lead Agency shall also examine which TAC and/or $PM_{2.5}$ sources are located within 1,000 feet of a proposed project site. Sources of TACs include land uses such as freeways and high volume roadways, truck distribution centers, ports, rail yards, refineries, chrome plating facilities, dry cleaners using perchloroethylene, and gasoline dispensing facilities. Land uses that contain permitted sources, such as a landfill or manufacturing plant, may also contain non-permitted TAC and/or $PM_{2.5}$ sources, particularly if they host a high volume of diesel truck activity. A Lead Agency should determine what the combined risk levels are from all nearby TAC sources in the vicinity of sensitive receptors.

For some types of TAC sources, a Lead Agency can refer to ARB's *Land Use Handbook* to determine whether the proposed receptor(s) at a project site would be exposed to risk levels that exceed BAAQMD's *Thresholds of Significance*. The *Land Use Handbook* provides guidance based on distance-related findings of health risk for a variety of TAC sources. A Lead Agency

shall note, however, that for proposed project sites that would be affected by multiple TAC sources (e.g., one or more freeway or high volume roadway and a gasoline dispensing facility) the combined health risk from all TAC sources and combined $PM_{2.5}$ concentration shall be analyzed.

If risk levels cannot be determined using guidance in the *Land Use Handbook* then a Lead Agency shall conduct a HRA. A HRA should also be conducted if the proposed project would not attain the screening distances recommended by the *Land Use Handbook* and a more detailed analysis that accounts for local meteorology and other conditions would more accurately disclose the level of risk to the public. All HRAs should be conducted in accordance with CAPCOA's guidance document titled *Health Risk Assessments for Proposed Land Use Projects*. The risk levels estimated for the locations where receptors would be located should be compared to BAAQMD's applicable *Threshold of Significance* for siting a new receptor near existing sources of TAC emissions.

Cumulative Local Community Risk and Hazard Threshold

If the aggregate total of all past, present, and foreseeable future sources within a 1,000 foot radius from the fence line of a source, or from the location of a receptor, plus the contribution from the project, exceeds cancer risk level of more than 10 in one million or HI greater than 1.0 for TACs, or 2 $\mu g/m^3$ annual average $PM_{2.5}$, would be a significant cumulative impact.

Following assessment of project-generated TAC emissions and $PM_{2.5}$ concentrations in accordance with the above BAAQMD-recommend methods, a Lead Agency should compare the analysis results with the applicable *Threshold of Significance*. For TACs, BAAQMD has separate *Thresholds of Significance* for projects that would site new permitted or non-permitted sources in close proximity to receptors and for projects that would site new sensitive receptors in close proximity to permitted or non-permitted sources of TAC emissions. If a proposed project would not exceed BAAQMD's applicable *Threshold of Significance* for TACs or $PM_{2.5}$, then the project would result in a less-than-significant air quality impact. If a project would exceed the applicable *Threshold of Significance,* the proposed project would result in a significant air quality impact and the Lead Agency should implement all feasible mitigation to reduce the impact (Refer to Section 4.3).

If implementation of BAAQMD-recommended mitigation measures for reducing TAC and $PM_{2.5}$ emissions and resultant exposure to health risks would reduce all TAC impacts to levels below the applicable *Threshold of Significance*, TAC impacts would be reduced to a less-than-significant level. If resultant health risk exposure would still exceed the applicable *Threshold of Significance*, the impacts would remain significant and unavoidable.

4.4. MITIGATING LOCAL COMMUNITY RISK AND HAZARD IMPACTS

For stationary sources, please refer to BAAQMD's permit handbook and BACT/T-BACT workbook.

BAAQMD-recommended mitigation measures for reducing the exposure of sensitive receptors to TACs and hazards include the following:

1. Increase project distance from freeways and/or major roadways.
2. Redesign the site layout to locate sensitive receptors as far as possible from any freeways, major roadways, or other non-permitted TAC sources (e.g., loading docks, parking lots).

3. In some cases, BAAQMD may recommend site redesign. BAAQMD will work closely with the local jurisdiction and project consultant in developing a design that is more appropriate for the site.

4. Projects that propose sensitive receptors adjacent to sources of diesel PM (e.g., freeways, major roadways, rail lines, and rail yards) shall consider tiered plantings of redwood and/or deodar cedar trees to reduce TAC exposure. This recommendation is based on a laboratory study that measured the removal rates of PM passing through leaves and needles of vegetation. Particles were generated in a wind tunnel and a static chamber and passed through vegetative layers at low wind velocities. Redwood, deodar cedar, live oak, and oleander were tested. The results indicate that all forms of vegetation were able to remove 65–85 percent of very fine particles at wind velocities below 1.5 meters per second (approximately 3 miles per hour [mph]) with redwood and deodar cedar being the most effective. Even greater removal rates were predicted for ultra-fine PM (i.e., aerodynamic resistance diameter of 0.1 micrometer or less). While this study clearly supports the effectiveness of the planting of finely needled trees along sources of TACs, further studies that reflect actual roadway conditions are needed (SMAQMD 2009).

5. Install indoor air filtering systems and consider the location/orientation on the site with regard to locations of TAC sources.

6. Where appropriate, install passive (drop-in) electrostatic filtering systems, especially those with low air velocities (i.e., 1 mph).

7. Locate air intakes and design windows to reduce PM exposure (e.g., windows nearest to the freeway do not open).

8. Install and maintain indoor air quality filters in public buildings such as schools.

9. Install indoor air quality monitoring units in buildings.

10. Require rerouting of nearby heavy-duty truck routes.

11. Enforce illegal parking and/or idling of heavy-duty trucks in vicinity.

5. ASSESSING AND MITIGATING PLAN-LEVEL IMPACTS

5.1. Introduction

Long range plans (e.g., general plan, redevelopment plans, specific plans, area plans, community plans, transportation plans, congestion management plans, etc.) present unique challenges for assessing impacts. These plans often contain development strategies for 20-year, or longer, time horizons. They can also provide for a wide range of potential land uses and densities that accommodate all types of development. General plan updates and large specific plans nearly always require the Lead Agency to prepare an Environmental Impact Report (EIR). Due to the SFBAAB's nonattainment status for ozone and PM, and the cumulative impacts of growth on air quality, these plans almost always have significant, unavoidable adverse air quality impacts. CEQA requires the Lead Agency to evaluate individual as well as cumulative impacts of general plans, and all feasible mitigation measures must be incorporated within the proposed plan to reduce significant air quality impacts.

This chapter provides guidance on methods to evaluate air quality and climate change impacts of general and area plans prepared within the SFBAAB pursuant to CEQA. The term *general and area plan* refers broadly to discretionary planning activities which may include, but are not limited to the following: general plans, redevelopment plans, specific plans, area plans, community plans, transportation plans, congestion management plans, and annexations of lands and service areas. General and area plans are often subject to program-level analysis under CEQA, as opposed to project-level analysis. As a general principle, the guidance offered within this chapter should be applied to discretionary, program-level planning activities; whereas the project-level guidance offered in other chapters should be applied to individual project-specific approvals, such as a proposed development project.

Air quality impacts from future development pursuant to general or area plans can be divided into construction-related impacts and operational-related impacts. Construction-related impacts are associated with construction activities likely to occur in conjunction with future development allocated by the plan. Operational-related impacts are associated with continued and future operation of developed land uses, including increased vehicle trips and energy use.

Refer to Table 2-4 for a summary of applicable *Thresholds of Significance* for long range plans.

5.2. OPERATIONAL-RELATED IMPACTS

Long-term operational impacts to air quality result from the build-out of long range plans and are generally determined by continued operation of land uses allowed in the general or area plan and the vehicle travel behavior associated with these uses.

5.2.1. Criteria Air Pollutants

The *Threshold of Significance* for operational-related criteria air pollutant and precursor impacts for plans is consistency with the most recently adopted AQP. All of the following criteria must be satisfied for a proposed plan to be consistent with the AQP, and to result in a less-than-significant impact.

Proposed plans must show over the planning period of the plan that:

- The plan incorporates current AQP control measures as appropriate to the plan area;

- The rate of increase in VMT or vehicle trips (VT) within the plan area is equal to or lower than the rate of increase in population within the proposed plan.

Control measures should be derived from the most recently adopted AQP. Population estimates should be derived from the most recent issue of the Association of Bay Area Governments *Projections* publication.

5.2.2. Greenhouse Gases

California's legislative mandate (AB 32) is to reduce total projected 2020 GHG emissions to 1990 levels, a reduction of approximately 30 percent. To achieve this target, future development must be planned and implemented in the most GHG-efficient manner possible. GHG-efficient development reduces vehicle miles traveled by supporting compact, dense, mixed-use, pedestrian- and bicycle-friendly, transit oriented development. Local agencies are strongly encouraged to address GHG emissions when updating and/or adopting general and area plans. The general plan is perhaps the best venue for addressing GHG emissions in making meaningful progress toward attaining AB 32 goals while addressing CEQA requirements.

If a general or area plan is adopted pursuant to a certified EIR that considers GHG emissions, and if the plan and its EIR incorporate development policies, performance standards, and mitigation measures achieving GHG emission reductions, this could alleviate the need to evaluate and mitigate GHG emissions at the project-level for projects that are found to be consistent with the general or area plan.

As opposed to the identification of a bright-line mass emissions threshold (1,100 MT CO_2e/yr), as is applied to individual projects, BAAQMD recommends the use of an efficiency-based metric to evaluate general and area plans, combined with reliance on local action plans designed to reduce GHG emissions. Such an analysis enables comparison of general plans of different sizes and in different jurisdictions to a uniform GHG efficiency threshold, and allows comparison of general plans throughout the SFBAAB to one another. It will also provide guidance for decision-makers regarding whether the general plan would substantially help or hinder the State's ability to attain GHG emission reduction goals identified in AB 32.

Step 1 – Climate Action Plan

A general or area plan would be assumed to have a less than significant impact from GHG emissions if the Lead Agency has prepared and adopted a Climate Action Plan, or the plan contains goals, objectives and policies that meet criteria established in Chapter 2, and has been evaluated pursuant to CEQA and has a certified or approved environmental document.

For reference, the criteria established in Chapter 2 are as follows:

The Climate Action Plan (or the area's long range plan) must:

1. Address the entirety of the general or area plan project area;
2. Include a base year GHG emissions inventory and GHG emissions projections for 2020 for community-wide and municipal emissions;
3. Identify a GHG reduction target that meets or exceeds AB 32 and/or Executive Order S-3-05 reduction targets;
4. Specify a range of binding and enforceable GHG emission reduction measures, and demonstrate by way of substantial evidence that these measures, if implemented on a project-by-project basis, would achieve the specified GHG reduction target; and
5. Establish a mechanism to monitor the plan's progress toward achieving the GHG reduction target and require amendment if the plan does not meet the specified level.

If the Lead Agency has not prepared and adopted a Climate Action Plan meeting established criteria, refer to Step 2.

Step 2 – Prepare a Greenhouse Gas Emissions Inventory
BAAQMD recommends quantifying community-wide GHG emissions from a general or area plan through development of a GHG emissions inventory and projections report. The emissions inventory should be conducted for a base year that includes existing conditions; and should follow published ARB protocols for municipal and community-wide inventories. A range of tools are available to assist the Lead Agency to complete the inventory, including the Intergovernmental Panel on Climate Change (IPCC) Emissions Inventory Guidelines, CCAR GRP, URBEMIS, and ICLEI's Clean Air and Climate Protection (CACP) model. The base year inventory should be expressed in terms of metric tons CO_2e emissions and account for municipal and community-wide emission sectors applicable in the jurisdiction such as, transportation, commercial, residential, electricity, water use and treatment, solid waste, and agriculture.

Step 3 – Prepare Greenhouse Gas Emissions Projections
BAAQMD recommends preparing a community-wide GHG emission projections to identify the expected levels of GHG emissions for: 1) 2020 (i.e., the AB 32 benchmark year), and 2) the projected year of general plan build out. Two projections should be prepared:

1) A projection reflecting existing conditions (e.g., business-as-usual), and

2) A projection that accounts for proposed policies, programs, and plans included within the long range plan that would reduce GHG emissions from build-out of the plan.

The first projection should be used as the basis for evaluation of the no project alternative in the General Plan EIR. The second projection should be used as the basis for evaluation of the proposed project. Additional projections corresponding to plan alternatives considered within the EIR should also be prepared and included within the EIR's alternatives analysis. Examples of policies, performance standards and implementation measures are included in Section 5.6.

Where possible, emission projections should account for inherent improvements in energy and fuel efficiency, population and employment growth rates published by ABAG, VMT growth rates available from MTC, energy consumption growth rates available from California Energy Commission (CEC) and the Department of Energy (DOE), planned expansions of municipal infrastructure or services, and anticipated Statewide legislative requirements or mandates (e.g., Renewable Energy Portfolio, Green Building Code Standards, on-road mobile-source emission regulations).

A range of GIS-based planning models are available that can assist the Lead Agency to complete projections, including Index, PLACE3S, UPlan, and the Sustainable Systems Integration Model (SSIM). The projection should be expressed in metric tons CO_2e emissions, and include the expected municipal and community-wide emissions across all sectors evaluated in the base year inventory.

BAAQMD encourages the Lead Agency to prepare similar projections for 2050 (the EO S-03-05 benchmark year). As we approach the 2020 timeframe, BAAQMD will reevaluate this significance threshold to better represent progress toward 2050 goals. The Lead Agency should use the projected build-out emissions profile of the general or area plan as a benchmark to ensure that adoption of the plan would not preclude attainment of 2050 goals.

Step 4 – Determine Planned Population and Employment Levels and Service Population
State law requires that general plans identify the planned density and intensity of land uses for all lands within the planning area established by the Lead Agency. These measures of density

(typically dwelling units/acre) and intensity (typically floor-area ratios) are often translated into expected population and employment levels for estimating traffic impacts associated with the proposed plan. Most demand-based transportation models use population and employment to determine trip generation. Measures of population and employment are typically available for general and area plans. In evaluating GHG impacts, estimates of the number of residents and jobs anticipated in the general or area plan are required for 2020, the build-out year of the proposed plan, the no project alternative, and additional alternatives the Lead Agency is evaluating in the environmental review.

SP is an efficiency-based measure used by BAAQMD to estimate the development potential of a general or area plan. SP is determined by adding the number of residents to the number of jobs estimated for a given point in time. For purposes of evaluating GHG impacts, SP estimates are required for 2020 and for the build-out year of the proposed plan.

Step 5 – Compare Service Population to 2020 GHG Projections and Thresholds of Significance

The Lead Agency should divide the 2020 GHG emissions inventory by 2020 SP estimates to determine the per-SP emissions associated with the proposed general or area plan, the no project alternative, and additional alternatives the Lead Agency is evaluating. The Lead Agency should then compare these per-SP emissions to the significance thresholds identified in Chapter 2 (refer to Table 5-1).

If the estimated per-SP emissions exceed identified thresholds, the general or area plan would be considered to have a significant impact with respect to GHG emissions, and mitigation would be required.

Table 5-1
Example Plan-level Greenhouse Gas Emissions Analysis

Step	Emissions Source	Year	Emissions (MT CO2e/yr)*
2	GHG Emissions Inventory (Community-wide and municipal)	Base year (e.g., 2007)	A
3	GHG Emissions Projections	2020	B
		GP Buildout (e.g., 2030)	C
4	Projected Service Population (population + employment)	SP	
	Projected Population (residents)	P	
	GHG/SP (2020) for mixed-use plans	B/SP (MT CO_2e/SP/yr)	
	GHG/capita (2020) for residential plans	B/P (MT CO_2e/capita/yr)	
5	BAAQMD GHG/SP Threshold	4.59 (MT CO_2e/SP/yr)	
	BAAQMD GHG/Capita Threshold	6.70 (MT CO_2e/capita/yr)	
	Is B/SP > 4.6, or is B/P > 6.7? (If Yes, Significant. Proceed to Step 6. If No, less than significant).		

*Letters "A", "B", and "C" are used to represent numeric values that would be obtained through conducting a community-wide emissions inventory and projections.

Notes: BAAQMD = Bay Area Air Quality Management District; CO_2e = carbon dioxide equivalent; MT = metric tons; yr = year, P = population, SP = service population.
Refer to Appendix C for support documentation.

Step 6 – Mitigation Measures

General or area plans found to have a significant impact should implement all feasible mitigation measures to reduce impacts. Refer to Section 5.6 for examples of appropriate mitigation measures for operational impacts relative to GHG emissions. Mitigation measures identified through the environmental review process must be made into binding and enforceable policies and implementation programs within the long range plan.

5.3. LOCAL COMMUNITY RISK AND HAZARD IMPACTS

For general and area plans to have a less-than-significant impact with respect to potential TACs, special overlay zones need to be established around existing and proposed land uses that emit TACs. Special overlay zones should be included in proposed plan policies, land use maps, and implementing ordinances.

The *Thresholds of Significance* for plans with regard to community risk and hazard impacts are:

3. The land use diagram must identify:
    a. Special overlay zones around existing and planned sources of TACs;
    b. Special overlay zones of at least 500 feet on each side of all freeways and high-volume roadways.
4. The plan must also identify goals, policies, and objectives to minimize potential impacts and create overlay zones for sources of TACs and receptors.

ARB's Land Use Handbook offers advisory recommendations for locating sensitive receptors near uses associated with TACs, such as freeways and high-traffic roads, commercial distribution centers, rail yards, ports, refineries, chrome platers, dry cleaners, gasoline stations, and other industrial facilities, to reduce exposure of sensitive populations. The Lead Agency should refer to this handbook when evaluating whether the proposed general or area plan includes adequate buffer distances between TAC sources and sensitive receptors.

5.4. CONSTRUCTION-RELATED IMPACTS

Construction-related emissions are generally short-term or temporary in duration. Construction-related activities most often result in emissions of criteria air pollutants and ozone precursors from site preparation such as excavation, grading, and clearing; exhaust from off-road equipment, material delivery trucks, and worker commute vehicles; vehicle travel on paved and unpaved roads; and other miscellaneous activities such as building construction, asphalt paving, application of architectural coatings, and trenching for utility installation.

5.4.1. Criteria Air Pollutants and Precursors

The *Threshold of Significance* for construction-related criteria air pollutant and precursor impacts is the presence of Best Management Practices (BMPs). If the plan does not include the most recent BAAQMD-recommended BMPs in goals, policies, and objectives, as appropriate, construction-related criteria pollutant emissions would result in a significant impact to air quality.

The *Threshold of Significance* for construction-related criteria pollutant emissions is the presence of the following performance-based best management practices:

1. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.
2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered.

3. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.
4. All vehicle speeds on unpaved roads shall be limited to 15 mph.
5. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.
6. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.
7. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.
8. Post a publicly visible sign with the telephone number and person to contact at the Lead Agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The phone number of the BAAQMD shall also be visible to ensure compliance with applicable regulations.

These best management practices may change over time. Contact District staff to ensure the most recent BMPs are used.

5.4.2. Greenhouse Gases

The *Threshold of Significance* for construction-related GHG emissions is the presence of Best Management Practices (BMPs). If the plan does not include the most recent BAAQMD-recommended BMPs in goals, policies, and objectives, as appropriate, construction-related GHG emissions would result in a significant impact to air quality.

The *Threshold of Significance* for construction-related GHG emissions is the presence of the following performance-based best management practices:

1. Alternative-fueled (e.g., biodiesel, electric) construction vehicles/equipment of at least 15 percent of the fleet;
2. Local building materials of at least 10 percent; and
3. Recycle at least 50 percent of construction waste or demolition materials.

These best management practices may change over time. Contact District staff to ensure you are using the most recent BMPs.

5.5. ODOR IMPACTS

For general and area plans to have a less-than-significant impact, special overlay zones need to be established around existing and proposed land uses that emit odors. Special overlay zones should be included proposed plan policies, land use map, and implementing ordinances. As identified in Chapter 8, BAAQMD has established screening levels for project-level evaluation for sensitive receptors proposed to be located near several types of utilities and industrial facilities. The Lead Agency should employ this guidance when evaluating whether the proposed general or

area plan includes adequate special overlay zone distances between odor sources and sensitive receptors.

The *Thresholds of Significance* for plans with regard to odor impacts are:

1. The land use diagram must identify special overlay zones around existing and planned sources of odors;
2. The plan must identify goals, policies, and objectives to minimize potential impacts and create overlay zones for sources of odors and receptors.

5.6. MITIGATING PLAN-LEVEL IMPACTS

Plans often have significant, unavoidable adverse air quality impacts due to the SFBAAB's nonattainment status and the cumulative impacts of growth on air quality. In addition, plans generally have long-term planning horizons of twenty years or more. For these reasons, it is essential for plans to incorporate all feasible strategies and measures to reduce air quality impacts. Mitigation measures for plans are often broad in scope due to the long timeframe and comprehensive nature of general and area plan policies and programs.

This section contains mitigation measures recommended for plans prepared within the SFBAAB. Measures are identified by state-required general plan element, planning issue, development phase, and type of air quality impact. Proposed plans should incorporate mitigation measures applicable to their elements and planning issues.

Plans are the appropriate place to establish community-wide air quality policies that reinforce regional air quality plans. Plans present opportunities to establish requirements for new construction, future development, and redevelopment projects within a community that will ensure new of revised plans do not inhibit attainment of state and national air quality standards and actually assist in improving local and regional air quality. Binding, enforceable mitigation measures identified through the environmental review process should be incorporated as policies and implementation programs within the plan to the greatest extent feasible. Ideally, air quality related goals, policies, performance measures and standards should be incorporated within the context of the proposed project itself, rather than introduced as corrective actions within the proposed project's EIR. The list below is not intended to serve as an exhaustive list.

5.6.1. Climate Action Plan

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Develop and adopt a comprehensive Climate Action Plan that includes: baseline inventory of greenhouse gas emissions from all sources, greenhouse gas emissions reduction targets that are consistent with the goals of AB 32, and enforceable GHG emission reduction strategies and performance measures.		X				X		
Climate Action Plan to include enforcement and monitoring tools to ensure regular review of progress toward the emission reduction targets, report progress to the public and responsible agencies, and revise the plan as appropriate.		X				X		

5.6.2. Land Use Element

Urban Form

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Create and enhance landscaped greenway, trail, and sidewalk connections between neighborhoods, commercial areas, activity centers, and parks.					X	X		
Adopt policies supporting infill development in communities with established growth boundaries.					X	X		
Ensure that proposed land uses are supported by a multi-modal transportation system and that the land uses themselves support the development of the transportation system.					X	X		
Designate a central city core for high-density and mixed-use development.					X	X		
Discourage high intensity office and commercial uses from locating outside of designated centers or downtowns, or far from residential areas and transit stations.					X	X		
Provide financial incentives and density bonuses to entice development within the designated central city.					X	X		
Provide public education about benefits of well-designed, higher-density housing and relationships between land use and transportation.					X	X		

Compact Development

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Achieve a jobs/housing balance or improve the jobs/housing ratio within the plan area.					X	X		
Create incentives to attract mixed-use projects to older commercial and industrial areas.					X	X		
Adopt incentives for the concurrent development of retail, office, and residential land uses within mixed-use projects or areas. Require mixed-use development to include ground-floor retail.					X	X		
Provide adaptive re-use alternatives to demolition of historic buildings. Provide incentives to prevent demolition of historic buildings.	X	X			X	X		
Facilitate lot consolidation that promotes integrated development with improved pedestrian and vehicular access.					X	X		
Reinvest in existing neighborhoods and promote infill development as a preference over new, greenfield development.					X	X		
Ensure that new development finances the full cost of expanding public infrastructure and services to provide an economic incentive for incremental expansion.					X	X		
Require new developments to extend sewer and water lines from existing systems or to be in conformance with a master sewer and water plan.	X	X			X	X		

Transit-oriented Design

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Require all development projects proposed within 2,000 feet of an existing or planned light rail transit, commuter rail, express bus, or transit corridor stop, to incorporate site design measures that enhance the efficiency of the transit system.					X	X		
Develop transit/pedestrian-oriented design guidelines. Identify and designate appropriate sites during general plan updates and amendments.					X	X		
Plan areas within ¼-mile of locations identified as transit hubs and commercial centers for higher density development.					X	X		

Sustainable Development

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Ensure new construction complies with California Green Building Code Standards and local green building ordinances.					X	X		
Promote re-use of previously developed property, construction materials, and/or vacant sites within a built-up area.					X	X		
Avoid development of isolated residential areas near hillsides or other areas where such development would require significant infrastructure investment or adversely impact biological resources.						X		
Require orientation of buildings to maximize passive solar heating during cool seasons, avoid solar heat gain during hot periods, enhance natural ventilation, and promote effective use of daylight. Orientation should optimize opportunities for on-site solar generation.					X	X		
Provide land area zoned for commercial and industrial uses to support a mix of retail, office, professional, service, and manufacturing businesses.					X	X		
Provide permitting incentives for energy efficient building projects.					X	X		
Develop a joint powers agreement or other legal instrument that provides incentive for counties to discourage urban commercial development in unincorporated areas and promote urban infill and redevelopment projects.					X	X		

Activity Centers

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Provide pedestrian amenities, traffic-calming features, plazas and public areas, attractive streetscapes, shade trees, lighting, and retail stores at activity centers.					X	X		
Provide for a mix of complementary retail uses to be located together to create activity centers and commercial districts serving adjacent neighborhoods.					X	X		
Permit upper-story residential and office uses in neighborhood shopping areas.					X	X		
Provide pedestrian links between commercial districts and neighborhoods.					X	X		
Provide benches, streetlights, public art, and other amenities in activity centers to attract pedestrians.					X	X		

Green Economy and Businesses

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Work with businesses to encourage employee transit subsidies and shuttles from transit stations.					X	X		
Encourage businesses to participate in local green business programs.					X	X		
Offer incentives to attract businesses to city core and infill areas.					X	X		
Work to attract green businesses and promote local green job training programs.					X	X		
Support regional collaboration to strengthen the green economy.					X	X		
Provide outreach and education to local businesses on energy, waste, and water conservation benefits and cost savings.					X	X		
Support innovative energy technology companies.					X	X		

5.6.3. Circulation Element

Local Circulation

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Create or reinforce a grid street pattern with small block sizes and maintain high connectivity within the roadway network.					X	X		
Implement circulation improvements that reduce vehicle idling, such as signal timing systems and controlled intersections.					X	X	X	
Consider alternatives such as increasing public transit or improving bicycle or pedestrian travel routes before funding transportation improvements that increase VMT.					X	X		
Require payment of transportation impact fees and/or roadway and transit improvements as a condition upon new development.					X	X		
Minimize use of cul-de-sacs and incomplete roadway segments.					X	X		
Actively promote walking as a safe mode of local travel, particularly for children attending local schools.					X	X		
Consult with school districts, private schools, and other operators to coordinate local bussing, to expand ride-sharing programs, and to replace older diesel buses with low or zero emission vehicles.					X	X	X	
Evaluate all bussing options as a preferential strategy to roadway improvements in the vicinity of schools to ease congestion.					X	X		
Establish public/private partnerships to develop satellite and neighborhood work centers for telecommuting.					X	X		
Employ traffic calming methods such as median landscaping and provision of bike or transit lanes to slow traffic, improve roadway capacity, and address safety issues.					X	X		
Support the use of electric vehicles where appropriate. Provide electric recharge facilities.					X	X		

Regional Transportation

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Ensure that submittals of transportation improvement projects to be included in regional transportation plans (RTP, RTIP, CMP, etc.) are consistent with the air quality goals and policies of the general plan.					X	X		
Consult with adjacent jurisdictions to address the impacts of regional development patterns on the circulation system.					X	X		
Adopt a (or implement the existing) Transportation Demand Management Ordinance.					X	X		
Create financing programs for the purchase or lease of vehicles used in employer ride sharing programs.					X	X		
Consult with adjacent jurisdictions to maintain adequate service levels at shared intersections and to provide adequate capacity on regional routes for through traffic.					X	X		
Work to provide a strong paratransit system that promotes the mobility of all residents and educate residents about local mobility choices.					X	X		
Designate sites for park-and-ride lots. Consider funding of the park and ride lots as mitigation during CEQA review of residential development projects.					X	X		
Consult with appropriate transportation agencies and major employers to establish express buses and vanpools to increase the patronage of park and ride lots.					X	X		
Allow developers to reach agreements with auto-oriented shopping center owners to use commercial parking lots as park-and-ride lots and multimodal transfer sites.					X	X		

Parking

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Reduce parking for private vehicles while increasing options for alternative transportation.					X	X		
Eliminate minimum parking requirements for new development.					X	X		
Establish commercial district parking fees.					X	X		
Require that parking is paid for separately and is not included in rent for residential or commercial space.					X	X		
Encourage parking sharing between different land uses.					X	X		
Encourage businesses to offer parking cash-outs to employees.					X	X		
Encourage parking assessment districts.								
Encourage car-share and bike-share programs in new development.								

Bicycles and Pedestrians

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Provide safe and convenient pedestrian and bicycle connections to and from activity centers, commercial districts, offices, neighborhoods, schools, other major activity centers.					X	X		
Ensure that non-motorized transportation systems are connected and not interrupted by impassable barriers, such as freeways.					X	X		
Provide pedestrian pathways that are well-shaded and pleasantly landscaped to encourage use.					X	X		
Consult with transit providers to increase the number of bicycles that can be accommodated on buses.					X	X		
Provide crosswalks and sidewalks along streets that are accessible for people with disabilities and people who are physically challenged.					X	X		
Prohibit on-street parking to reduce bicycle/automobile conflicts in appropriate target areas.					X	X		
Prohibit projects that impede bicycle and walking access.					X	X		
Retrofit abandoned rail corridors as segments of a bikeway and pedestrian trail system.					X	X		
Require commercial developments and business centers to include bicycle amenities in building such as bicycle racks, showers, and lockers.					X	X		

Regional Rail Transit

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Support regional rail service and consult with rail operators to expand services.					X	X		
Create activity centers and transit-oriented development projects near transit stations.					X	X		

Local and Regional Bus Transit

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Give funding preference to investment in public transit over investment in infrastructure for private automobile traffic.					X	X		
Establish a local shuttle service to connect neighborhoods, commercial centers, and public facilities to rail transit.					X	X		
Empower seniors and those with physical disabilities who desire maximum personal freedom and independence of lifestyle with unimpeded access to public transportation.					X	X		
Provide transit shelters that are comfortable, attractive, and accommodate transit riders. Ensure that shelters provide shade, route information, benches and lighting.					X	X		
Design all arterial and collector streets planned as transit routes to allow for the efficient operation of public transit.					X	X		
Require transit providers to coordinate intermodal time schedules					X	X		

5.6.4. Conservation Element

Municipal Operations

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Replace existing City vehicles with ultra-low or zero emission vehicles and purchase new low emission vehicles.					X	X		
Require that all new government buildings, and all major renovations and additions, meet identified green building standards.					X	X		
Install cost-effective renewable energy systems on all city buildings and purchase remaining electricity from renewable sources.					X	X		
Support the use of teleconferencing in lieu of city/county employee travel to conferences and meetings when feasible.					X	X		
Require city/county departments to set up telecommuting programs as part of their trip reduction strategies.					X	X		
Require environmentally responsible government purchasing. Require or give preference to products that reduce or eliminate indirect GHG emissions.						X		
Investigate the feasibility of using solar (photovoltaic) street lights instead of conventional street lights that are powered by electricity in an effort to conserve energy.					X	X		
Support investment in cost-effective land use and transportation modeling and geographic information system technology.					X	X	X	X
Install LED lighting for all traffic light systems.						X		
Implement a timed traffic light system to reduce idling.					X	X		

Air Quality – Sensitive Receptors

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Require residential development projects and projects categorized as sensitive receptors to be located an adequate distance from existing and potential sources of TACs and odors.			X	X			X	X
Require new air pollution point sources such as, but not limited to, industrial, manufacturing, and processing facilities to be located an adequate distance from residential areas and other sensitive receptors.	X		X	X	X		X	X
Consult with BAAQMD to identify TAC sources and determine the need for and requirements of a health risk assessment for proposed developments.			X	X			X	X
Consult with project proponents during the pre-application review process to avoid inappropriate uses at affected sites and during the environmental review process for general plan amendments and general plan updates.					X		X	X
Require project proponents to prepare health risk assessments in accordance with BAAQMD-recommended procedures as part of environmental review when the proposed project has associated air-toxic emissions.			X				X	
Designate adequate industrial land in areas downwind and well-separated from sensitive uses.							X	X
Designate non-sensitive land uses for areas surrounding industrial sites.					X		X	X
Protect vacant industrial sites from encroachment by residential or other sensitive uses through appropriate zoning.					X		X	X
Require indoor air quality equipment, such as enhanced air filters, to be installed at schools, residences, and other sensitive receptor uses located near pollution sources.							X	X
Quantify the existing and added health risks to new sensitive receptors or for new sources.							X	
Utilize pollution absorbing trees and vegetation in buffer areas.					X	X	X	

Air Quality – PM_{10} and Dust Control

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Include PM_{10} control measures as conditions of approval for subdivision maps, site plans, and grading permits.	X				X			
Minimize vegetation removal required for fire prevention.	X				X			
Require alternatives to discing, such as mowing, to the extent feasible. Where vegetation removal is required for aesthetic or property maintenance purposes, encourage or require alternatives to discing.	X	X			X	X		
Require subdivision designs and site planning to minimize grading and use landform grading in hillside areas.	X							
Condition grading permits to require that graded areas be stabilized from the completion of grading to commencement of construction.	X							
Require all access roads, driveways, and parking areas serving new commercial and industrial development to be constructed with materials that minimize particulate emissions and are appropriate to the scale and intensity of use.	X							
Develop a street cleaning program aimed at removing heavy silt loadings from roadways that result from sources such as storm water runoff and construction sites.	X				X			
Pave shoulders and pave or landscape medians. Curb and gutter installation may provide additional benefits where paving is contiguous to the curb.	X	X			X	X		

Water Conservation

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Require residential remodels and renovations to improve plumbing fixture and fixture-fitting water efficiency by an established amount above the California Building Standards Code water efficiency standards.		X						
Provide water use audits to identify conservation opportunities and financial incentives for adopting identified efficiency measures.		X						
Require use of native and drought-tolerant plants, proper soil preparation, and efficient irrigation systems for landscaping.		X				X		
Maximize use of native, low-water plants for landscaping of areas adjacent to sidewalks or other impermeable surfaces.		X				X		
Increase use of recycled and reclaimed water for landscaping projects.		X				X		
Adopt a water-efficient landscaping ordinance and implement the Bay-Friendly Landscaping Guidelines established by StopWaste.org.						X		
Provide public water conservation education.						X		
Reduce pollutant runoff from new development through use of Best Management Practices.	X	X	X		X	X	X	
Minimize impervious surfaces and associated urban runoff pollutants in new development and reuse projects.	X	X	X		X	X	X	
Utilize permeable surfaces and green roof technologies where appropriate.					X	X	X	

Energy Conservation

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Conduct energy efficiency audits of existing buildings by checking, repairing, and readjusting heating, ventilation, air conditioning, and lighting, water heating equipment, insulation and weatherization. Offer financial incentives for adoption of identified efficiency measures.		X				X		
Require implementation of energy-efficient design features in new development, including appropriate site orientation, use of light color roofing and building materials, and use of evergreen and wind-break trees to reduce heating and cooling fuel consumption.		X				X		
Adopt residential and commercial energy efficiency retrofit ordinances that require upgrades as a condition of issuing permits for renovations or additions, and on the sale of residences and buildings.		X				X		
Facilitate cooperation between neighboring development projects to use on-site renewable energy supplies or combined heat and power co-generation facilities.		X				X		
Develop a comprehensive renewable energy financing and informational program for residential and commercial uses.		X				X		
Partner with community services agencies to fund energy efficiency projects for low income residents.		X				X		
Encourage the installation of energy efficient fireplaces in lieu of normal open-hearth fireplaces. Prohibit installation of wood burning devices.	X	X			X	X		
Provide natural gas lines or electrical outlets to backyards to encourage the use of natural gas or electric barbecues, and electric gardening equipment.	X				X			
Implement Community Choice Aggregation (CCA) for renewable electricity generation.		X				X		

Solid Waste

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Achieve established local and regional waste-reduction and diversion goals. Adopt more stringent waste reduction goals.		X				X		
Establish programs that enable residents to donate or recycle surplus furniture, old electronics, clothing, and other household items.		X				X		
Establish methane recovery in local landfills and wastewater treatment plants to generate electricity.		X				X		
Participate or initiate a composting program for restaurants and residences.						X		
Implement recycling programs for businesses and construction waste.	X	X			X	X		
Prohibit styrofoam containers and plastic bags by businesses.					X	X		

5.6.5. Open Space Element

Community Forestry

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Require inclusion of street trees and landscaping for all development projects.		X				X		
Require that trees larger than a specified diameter that are removed to accommodate development must be replaced at a set ratio.		X				X		
Provide adequate funding to manage and maintain the existing community forest, including sufficient funds for tree planting, pest control, scheduled pruning, and removal and replacement of dead trees.		X				X		
Provide public education regarding the benefits of street trees and the community forest.		X				X		

Sustainable Agriculture

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Require agricultural practices be conducted in a manner that minimizes harmful effects on soils, air and water quality, and marsh and wildlife habitat. Sustainable agricultural practices should be addressed in the Climate Action Plan to address climate change effects.	X	X			X	X		
Preserve forested areas, agricultural lands, wildlife habitat and corridors, wetlands, watersheds, groundwater recharge areas and other open spaces that provide carbon sequestration benefits.	X	X			X	X		
Establish a mitigation program for establishing conservation areas. Impose mitigation fees on development of such lands and use funds generated to protect existing, or create replacement, conservation areas.	X	X			X	X		
Require no-till farming, crop rotation, cover cropping, and residue farming.	X	X			X	X		
Require the use of appropriate vegetation within urban-agricultural buffer areas.		X				X		
Protect grasslands from conversion to non-agricultural uses.	X	X			X	X		
Support energy production activities that are compatible with agriculture, including biogas, wind and solar.		X				X		
Allow alternative energy projects in areas zoned for agriculture or open space where consistent with primary uses.		X				X		
Provide spaces within the community suitable for farmers markets.						X		
Promote local produce and garden programs at schools.						X		

Parks and Recreation

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Expand and improve community recreation amenities including parks, pedestrian trails and connections to regional trail facilities.						X		
Require payment of park fees and/or dedication and provision of parkland, recreation facilities and/or multi-use trails as a condition upon new development.		X				X		
Encourage development of pocket parks in neighborhoods. Improve equal accessibility to park space across communities.		X				X		
Encourage joint use of parks with schools and community centers and facilities.		X				X		

5.6.6. Housing Element

Affordable Housing

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Ensure a portion of future residential development is affordable to low and very low income households.		X				X		
Target local funds, including redevelopment and Community Development or Energy Efficiency Block Grant resources, to assist affordable housing developers in incorporating energy efficient designs and features.						X		
Adopt minimum residential densities in areas designated for transit-oriented, mixed use development to ensure higher density in these areas.					X	X		
Consult with the Housing Authority, transit providers, and developers to facilitate construction of low-income housing developments that employ transit-oriented and pedestrian-oriented design principles.					X	X		
Offer density-bonus incentives for projects that provide for infill, mixed use, and higher density residential development.					X	X		

5.6.7. Safety Element

Traffic Safety

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Facilitate traffic safety for motorists and pedestrians through proper street design and traffic monitoring.					X	X		
Require traffic control devices, crosswalks, and pedestrian-oriented lighting within design of streets, sidewalks, trails, and school routes.					X	X		

6. ASSESSING AND MITIGATING CONSTRUCTION-RELATED IMPACTS

6.1. INTRODUCTION

Construction-related activities are typically short-term or temporary in duration; however, project-generated emissions could represent a significant impact with respect to air quality and/or global climate change. Construction-related activities will result in the generation of criteria air pollutants including CO, sulfur dioxide (SO_2), respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less (PM_{10}), and $PM_{2.5}$, precursors such as, reactive organic gases (ROG) and oxides of nitrogen [NO_X]), and GHGs from exhaust, fugitive, and off-gas emissions. Sources of exhaust emissions could include on-road haul trucks, delivery trucks, worker commute motor vehicles, and off-road heavy-duty equipment. Sources of fugitive emissions (e.g., PM dust) could include construction-related activities such as soil disturbance, grading, and material hauling. Sources of off-gas emissions could include asphalt paving and the application of architectural coatings.

The recommendations provided in this chapter only apply to assessing and mitigating construction-related impacts for individual projects. Construction-related assumptions and project-specific information assumed in CEQA analyses should accompany the quantitative analysis described below. Refer to Chapter 5 for recommendations for assessing and mitigating construction-related impacts at the plan-level.

6.2. CRITERIA AIR POLLUTANTS AND PRECURSORS

Step 1: Comparison of Project Attributes with Screening Criteria
The first step in determining the significance of construction-related criteria air pollutants and precursors is to compare the attributes of the proposed project with the applicable S*creening Criteria* listed in Chapter 2.

This preliminary screening provides a conservative indication of whether construction of the proposed project would result in the generation of criteria air pollutants and/or precursors that exceed the *Thresholds of Significance*. If all of the *Screening Criteria* are met, construction of the proposed project would result in a less-than-significant impact to air quality. If the proposed project does not meet all the *Screening Criteria*, proceed to *Step 2: Emissions Quantification*.

Step 2: Emissions Quantification
BAAQMD-recommended methodologies include using URBEMIS for proposed land use development projects and the Roadway Construction Emissions Model (RoadMod) for proposed projects that are linear in nature (e.g., new roadway, roadway widening, or pipeline installation).

Land Use Development Projects
For proposed land use development projects, BAAQMD recommends using the most current version of URBEMIS to quantify construction-related criteria air pollutants and precursors. URBEMIS includes a module (*Enter Construction Data*) that quantifies emissions from the following construction-related activity phases: demolition, mass and fine grading ("grading"), trenching, asphalt paving, building construction, and the application of architectural coatings.

Input Parameters

BAAQMD-recommended input parameters and data requirements along with general URBEMIS user information for each construction-related activity phase are described below. Refer to the URBEMIS User's Manual for more detailed information.

Construction data needs that can be provided by URBEMIS default assumptions are identified below; however, the use of project-specific information results in a more accurate quantification of emissions. Appendix A contains a *Construction Data Needs Form* template that can be used to assist with requesting and gathering project-specific information.

Land Use Type and Size

Choose each individual land use type (e.g., single family housing, apartment high rise, regional shopping center, or office park) that is most applicable to the proposed development project in the *Enter Land Use Data* module and enter the size of the project (e.g., acres, thousand square feet [ksf], students, dwelling units [du], rooms, pumps, rooms, or employees). For several of the land use types, various size units are available (e.g., ksf and acres); ensure that the unit type for the project-specific data is consistent with the unit type selected in URBEMIS.

Schedule

The project schedule typically provides the number of months or days required for the completion of each construction-related activity phase (e.g., grading, building construction, asphalt paving), as well as the total duration of project construction. Where project-specific information is available, modify URBEMIS default assumptions in *Click to Add, Delete, or Modify Phases* under the *Enter Construction Data* module. In this module, add or delete construction activities, add multiple similar construction activities (e.g., three grading phases), as well as overlap any construction activities as necessary. The URBEMIS default assumption for the number of work days per week is five, which inherently assumes that construction-related activities would only occur during weekdays, not on weekends. This can be altered if project-specific data is available in *Click to Add, Delete, or Modify Phases* under the construction phase setting *Work Days/Week.* For projects with specific phasing information (i.e., duration of each construction phase), but no definite construction commencement date, the earliest feasible start date should be used to be conservative. In addition, when project-specific information is not known, assume some overlap of construction phases (e.g., overlap of grading and asphalt paving activities or asphalt paving and building construction activities) to also be conservative. Please note that URBEMIS quantifies annual emissions on a calendar year basis (i.e., January to December) rather than the year-long period (running yearly average from the start date of construction) with the maximum amount of emissions.

Demolition

URBEMIS quantifies exhaust and fugitive PM dust emissions from demolition activities in the *Demolition Phase* within the *Enter Construction Data* module. Information to quantify emissions from this activity phase includes:

1. Duration of demolition (work days/week, phase start and end dates);
2. Total volume of building to be demolished (width, length, and height);
3. Maximum daily volume of building to be demolished (width, length, and height);
4. Haul truck capacity (cubic yards [yd^3]);
5. Haul truck trip length to disposal site (round trip miles); and
6. Off-road equipment requirements (number and type of equipment).

URBEMIS contains default assumptions for haul truck capacity (yd^3 per truck) and round trip distance (miles), if project-specific information is not available. URBEMIS also contains default

assumptions for off-road equipment requirements. URBEMIS bases these on the size(s) of the proposed land use type(s) in the *Enter Land Use Data* module to estimate the off-road equipment requirements. In other words, URBEMIS assumes the size of the land use to be demolished is equal to the land use that would be developed. If the size(s) and/or type(s) of the land use(s) to be demolished are different from the land use(s) to be developed, create a separate URBEMIS run to quantify demolition emissions. Input the size and type of land use(s) for the different demolition building space versus the proposed building space in the *Enter Land Use Data* module for the separate URBEMIS run and only include the *Demolition* phase within the *Enter Construction Data* module.

Site Grading (Mass and Fine)

URBEMIS quantifies exhaust and fugitive PM dust emissions from grading activities in the *Site Grading* phase within the *Enter Construction Data* module. Information to quantify emissions from this activity phase includes, where applicable:

1. Duration of grading (work days/week, phase start and end dates);
2. Total acreage to be graded (acres);
3. Maximum daily acreage disturbed (acres per day);
4. Type and amount of cut/fill activities (yd^3 per day on- or off-site);
5. Description of soil hauling (amount of soil import/export [yd^3], haul truck capacity [yd^3 per truck], round trips per day, round trip distance [miles]); and
6. Off-road grading equipment requirements (number and type of equipment).

URBEMIS default assumptions for the total acreage to be graded and the maximum daily acreage disturbed are shown in the *Daily Acreage* tab within the *Site Grading* phase. Under the default settings, URBEMIS assumes that the maximum daily acreage disturbed is equivalent to 25 percent of the total acreage to be graded. Override this default assumption if more specific project information is available. The *Site Grading* phase consists of separate tabs for *Daily Acreage*, as mentioned above, *Fugitive Dust*, *Soil Hauling*, and *Site Grading Equipment*. Due to the differences in methodology and level of information required, each is discussed separately below.

Fugitive Dust

URBEMIS quantifies fugitive PM dust emissions in the *Site Grading* phase under the *Fugitive Dust* tab. URBEMIS provides four different levels of detail from which to select (i.e., default, low, medium, and high), described below.

Default: This method involves the use of the *Default Emission Rate* quantification methodology in the *Fugitive Dust* tab for which fugitive PM dust emissions are based on an emission rate (pound per disturbed acre per day [lb/acre-day]). This method should only be used when no project-specific information is known, or when no cut/fill activities would occur. BAAQMD recommends the selection of the worst-case emission rate (i.e., 38.2 lb/acre-day) for extensive site preparation activities (e.g., cut/fill) where the exact type and amount (e.g., yd^3 per day on- or off-site) are not known, and selection of the average emission rate (i.e., 10 lb/acre-day) otherwise. The average emission rate would be used for projects that involve typical site grading activities, but no cut/fill or earthmoving activities.

Low: The *Low Level of Detail* quantification method should be used when cut/fill activities would occur and the amount of on-site and off-site cut/fill is known. Input the type and amount of cut/fill activities (yd^3 per day on- or off-site). On-site cut/fill activities involve soil movement within the boundaries of the project site via scrapers or graders, while off-site cut/fill activities involve soil

movement outside of the boundaries of the project site via haul trucks. Projects that require off-site cut/fill should also enter the appropriate amount of soil import/export in the *Soil Hauling* tab, as discussed in more detail below.

Medium: The *Medium Level of Detail* quantification method should be used when cut/fill activities would occur and the required number of activity hours per day for on-site scrapers and off-site haul trucks is known. Input the number of hours per day for on-site scraper and off-site haul trucks conducting cut/fill activities. Input the total number of scraper-hours and/or haul truck-hours that are anticipated to occur per day. For example, if two scrapers would operate for eight hours per day each and three haul trucks would operate for four hours per day each, enter 16 for the *Onsite Scraper* parameter (i.e., 2 scrapers × 8 hours) and 12 for the *Offsite Haul* parameter (i.e., 3 haul trucks × 4 hours). Similar to the *Low Level of Detail* quantification method, on-site cut/fill activities involve soil movement within the boundaries of the project site via scrapers or graders, while off-site cut/fill activities involve soil movement outside of the boundaries of the project site via haul trucks. Projects that require off-site cut/fill should also enter the appropriate amount of soil import/export in the *Soil Hauling* tab, as discussed in more detail below.

High: The *High Level of Detail* quantification method should be used when cut/fill activities would occur and details about soil haulage is known. Input data on the amount of on- and off-site haulage (ton-miles per day) based on the total volume of cut/fill (yd^3), duration of the cut/fill activities (work days), density of soil being moved (tons per yd^3), and the scraper or haul truck round-trip distance (miles). A *High Level Haulage Input* worksheet that can be used to assist with determining the amount of on- and off-site haulage (ton-miles per day) required for this method is contained in Appendix A.

Soil Hauling

URBEMIS quantifies entrained PM road dust and exhaust emissions from soil hauling in the *Soil Hauling* tab within the *Site Grading* phase. Information requirements include the amount of soil import/export (yd^3), round trips per day, round trip distance (miles), and haul truck capacity (yd^3 per truck). For round trip distance and haul truck capacity, URBEMIS provides default assumptions of 20 yd^3 per truck and 20 miles, respectively. Override the default assumptions if the project specific values are known.

Grading Equipment

URBEMIS quantifies exhaust emissions from on-site heavy-duty equipment in the *Site Grading Equipment* tab within the *Site Grading* phase. Information requirements include the type of equipment and quantity or amount, along with horsepower, load factor, and hours of operation per work day. URBEMIS provides default assumptions for all of these, primarily based on the amount of maximum daily acreage disturbed shown in the *Daily Acreage* tab. If project-specific grading equipment is known, click on the *All Checks Off* button and input the number for each type of equipment to be used for the project. Note that although the *All Checks Off* button will allow the user to override the URBEMIS default equipment assumptions in the *Amount Model Uses* column, make sure to delete the previous URBEMIS default equipment selections prior to entering the project-specific equipment information.

Asphalt Paving

URBEMIS quantifies off-gas and exhaust emissions from asphalt paving activities in the *Paving* tab within the *Enter Construction Data* module. Information to quantify emissions from this activity phase includes the duration of asphalt paving (work days/week, phase start and end dates), total acreage to be paved, and off-road equipment requirements. URBEMIS includes default assumptions for the amount of asphalt to be paved based on the size of the proposed land use type(s) in the *Enter Land Use Data* module. Account for the size of project features (e.g., parking structure, roadways, and large hardtop fields) that would require asphalt paving in excess of

default assumptions (i.e., standard site access and parking spaces) within the *Total Acreage to be Paved with Asphalt* parameter.

Architectural Coating
URBEMIS quantifies off-gas emissions from the application of architectural coatings in the *Arch Coating* tab within the *Enter Construction Data* module. Information to quantify emissions from this phase include the duration of activities (i.e., work days/week, phase start and end dates). URBEMIS includes default parameters for the volatile organic compound content per liter of coating based on BAAQMD's Regulation 8, Rule 3: Architectural Coating.

Linear Projects
For proposed projects that are linear in nature (e.g., road or levee construction, pipeline installation, transmission lines), BAAQMD recommends using the most current version of Sacramento Metropolitan Air Quality Management District's (SMAQMD) Road Construction Emissions Model (RoadMod) to quantify construction-related criteria air pollutants and precursors. Similar to URBEMIS, RoadMod quantifies fugitive PM dust, exhaust, and off-gas emissions from the following construction-related activity phases: grubbing/land clearing, grading/excavation, drainage/utilities/sub-grade, and paving. BAAQMD recommends using RoadMod in accordance with the user instructions and default assumptions unless project-specific information is available. The default assumptions contained therein are applicable to projects located within the SFBAAB. Also, URBEMIS inherently accounts for the on-site construction of roadways and the installation of project infrastructure. If the proposed project involves off-site improvements that are linear in nature (e.g., roadway widening), use RoadMod in addition to URBEMIS to determine total emissions.

Step 3: Comparison of Unmitigated Emissions with Thresholds of Significance
Following quantification of project-generated construction-related emissions in accordance with BAAQMD-recommended methods, compare the total maximum daily emissions of each criteria pollutant and precursor with the applicable *Threshold of Significance* (Refer to Table 6-1). For instance, with respect PM_{10} and $PM_{2.5}$, compare the total amount of emissions from both exhaust and fugitive sources with the applicable *Threshold of Significance*. If construction-related emissions have been quantified using multiple models or model runs, sum the criteria air pollutants and precursor levels from each where said activities would overlap. In cases where the exact timing of construction activities is not known, sum any phases that could overlap to be conservative.

If daily maximum emissions of construction-related criteria air pollutants or precursors would not exceed any of the *Thresholds of Significance*, the project would result in a less-than-significant impact to air quality. If daily maximum emissions of construction-related criteria air pollutants or precursors would exceed any applicable *Threshold of Significance,* the proposed project would result in a significant impact to air quality and would require mitigation measures for emission reductions.

Step 4: Mitigation and Emission Reductions
For all proposed projects, BAAQMD recommends the implementation of all *Basic Construction Mitigation Measures* (listed in Section 6.3) whether or not construction-related emissions exceed applicable *Thresholds of Significance*, as such measures represent Best Management Practices. In addition, all projects must implement any applicable air toxics control measures (ATCM). For example, projects that have the potential to disturb asbestos (from soil or building material) must comply with all the requirements of ARB's ATCM for Construction, Grading, Quarrying, and Surface Mining Operations. The following section describes BAAQMD-recommended methodologies for quantifying emission reductions associated with the implementation of the *Basic* and *Additional Construction Mitigation Measures* (Refer to Section 6.3) where construction-

related emissions would exceed applicable *Thresholds* of Significance. Only reduction measures included in the proposed project's description or recommended as mitigation in a CEQA-compliant environmental document can be included when quantifying mitigated emission levels.

Basic Construction Mitigation Measures

As mentioned above, BAAQMD recommends that all proposed projects implement the *Basic Construction Mitigation Measures* regardless of the significance determination. The methodology for quantifying criteria air pollutant and precursor emission reductions from both fugitive PM dust and exhaust emissions by implementing the *Basic Construction Mitigation Measures* are discussed separately below.

Fugitive Particulate Matter Dust Emissions

For quantification of fugitive PM dust-related *Basic Construction Mitigation Measures* in URBEMIS, BAAQMD first recommends selecting the *Mitigation* option in the *Enter Construction Data* module for the *Site Grading* phase. For *Site Grading Soil Disturbance Mitigation*, select (turn on) the soil stabilizing measure titled *Water exposed surfaces* along with the two times daily option without altering the default percent reduction. For *Unpaved Roads Mitigation*, select the measure titled *Reduce speed on unpaved roads to less than 15 mph* without altering the default percent reduction. BAAQMD considers this as a surrogate for the implementation of the *Basic Construction Mitigation Measures* listed in Section 6.3. RoadMod assumes an inherent 50 percent reduction in fugitive PM dust emissions when water trucks are selected. BAAQMD recommends selecting water trucks to account for the implementation of the *Basic Construction Mitigation Measures*.

Exhaust Emissions

For quantification of the exhaust-related *Basic Construction Mitigation Measures* in URBEMIS, select the *Mitigation* option in the *Enter Construction Data* module for the *Site Grading*, *Building Construction,* and *Asphalt Paving* phases, as applicable to the proposed project. BAAQMD then recommends that for the *Off-Road Equipment Mitigation*, select (turn on) the measure titled *Use aqueous diesel fuel* and alter the default percent reduction for each to match those recommended by BAAQMD in Section 6.3. BAAQMD considers this as a surrogate for the implementation of the *Basic Construction Mitigation Measures* listed in Section 6.3.

RoadMod does not calculate emission reductions associated with the implementation of the exhaust-related *Basic Construction Mitigation Measures*. To quantify the exhaust-related emission reductions associated with the implementation of the *Basic Construction Mitigation Measures*, rely on the information and data contained in the *Data Entry* and *Emission Estimates* tabs in RoadMod. Reductions in exhaust emissions should be quantified separately for each phase (i.e., Grubbing/Land Clearing, Grading/Excavation, Drainage/Utilities/ Sub-Grade, and Paving). First isolate the exhaust emissions from off-road (e.g., heavy-duty) equipment for each phase. Table 6-2 below provides a cell reference for the *Data Entry* tab of RoadMod to assist with the identification and isolation of such emissions.

Once isolated, apply the specified percent reductions listed in Section 6.3 to each compound emission to determine the resultant amount of mitigated emissions from construction of the proposed project for each phase.

Emission reductions should be estimated by multiplying the total emissions for each compound by the anticipated emission reduction applicable for that compound to estimate the mitigated amount of emissions reductions. The formulas for NO_X, PM_{10}, and $PM_{2.5}$ are shown as an example below.

Table 6-1
Example Construction Criteria Air Pollutant and Precursor Emissions Analysis

Step	Emissions Source	Emissions (lb/day or tpy)			
		ROG	NO_X	PM_{10}	$PM_{2.5}$
2	Fugitive Dust Emissions	-	-	A	A
	Mobile Sources	B	B	B	B
	Off-gassing	C	-	-	-
3	Total Unmitigated Emissions	B + C = D	B = D	A + B = D	A + B = D
4	Total Basic Mitigated Emissions	E	E	E	E
	BAAQMD Threshold	54 lb/day	54 lb/day	82 lb/day*	54 lb/day*
5	Basic Mitigated Emissions Exceed BAAQMD Threshold?	Is E > 54 lb/day? (If Yes, significant. Go to step 6. If No, less than significant)	Is E > 54 lb/day? (If Yes, significant. Go to step 6. If No, less than significant)	Is B* > 82 lb/day? (If Yes, significant. Go to step 6. If No, less than significant)	Is B* > 54 lb/day? (If Yes, significant. Go to step 6. If No, less than significant)
6	Total Additional Mitigated Emissions	F	F	F	F
7	Additional Mitigated Emissions Exceed BAAQMD Threshold?	Is F > 54 lb/day? (If Yes, significant and unavoidable. If No, less than significant with mitigation incorporated)	Is F > 54 lb/day? (If Yes, significant and unavoidable. If No, less than significant with mitigation incorporated)	Is F* > 82 lb/day? (If Yes, significant and unavoidable. If No, less than significant with mitigation incorporated)	Is F* > 54 lb/day? (If Yes, significant and unavoidable. If No, less than significant with mitigation incorporated)

* Applies to construction equipment exhaust only.

Notes: BAAQMD = Bay Area Air Quality Management District; lb/day = pounds per day; NO_X = oxides of nitrogen; $PM_{2.5}$ = fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less; PM_{10} = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less; ROG = reactive organic gases; tpy = tons per year.

Refer to Appendix C for support documentation.

Table 6-2
Roadway Construction Emissions Model
Cell Reference for Unmitigated Off-Road Equipment Emissions

Linear Construction Phase	NO_X	PM_{10}	$PM_{2.5}$
Grubbing/Land Clearing	G155	H155	I155
Grading/Excavation	G195	H195	I195
Drainage/Utilities/Sub-Grade	G235	H235	I235
Paving	G275	H275	I275

Notes: NO_X = oxides of nitrogen; $PM_{2.5}$ = fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less; PM_{10} = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less.
Cell references refer to the *Data Entry* tab from the SMAQMD Road Construction Emissions Model.
Source: SMAQMD 2009.

NO_X Emission Reduction
Emissions of NO_X (lb/day) × (1 – [NO_X percent reduction])

PM_{10} Emission Reduction
Emissions of PM_{10} (lb/day) × (1 – [PM_{10} percent reduction])

$PM_{2.5}$ Emission Reduction
Emissions of $PM_{2.5}$ (lb/day) × ([1 – [$PM_{2.5}$ percent reduction])

The user should use the *Emission Estimates* tab to calculate the total mitigated amount of emissions for each phase of construction. The total NO_X, PM_{10}, and $PM_{2.5}$ exhaust emissions for each phase are contained in cells E6 to E9, H6 to H9, and K6 to K9, respectively. To calculate the total amount of mitigated emissions, first subtract the unmitigated off-road equipment exhaust emissions (Please refer to Table 6-2) from the total exhaust emissions to calculate total emissions without inclusion of off-road equipment exhaust emissions. Then, add the mitigated off-road exhaust emissions (calculated with the method described above) to the remaining emissions to calculate the total emissions with mitigated off-road construction equipment exhaust emissions. For PM_{10} and $PM_{2.5}$, add the mitigated exhaust emissions with the mitigated fugitive PM dust emissions (calculated by RoadMod) to calculate the total amount of mitigated PM_{10} and $PM_{2.5}$ emissions.

Step 5: Comparison of Mitigated (Basic Mitigation) Emissions with Thresholds of Significance

Following quantification of project-generated construction-related emissions in accordance with the above BAAQMD-recommended methods, compare the total maximum daily amount of mitigated (with implementation of *Basic Construction Mitigation Measures)* criteria air pollutants and precursors with the applicable *Thresholds of Significance* (Refer to Table 6-1). If the implementation of BAAQMD-recommended *Basic Construction Mitigation Measures* would reduce all construction-related criteria air pollutants and precursors to levels below the applicable *Thresholds of Significance*, the impact to air quality would be less than significant. If emissions of any criteria air pollutant or precursor would exceed the applicable *Threshold of Significance*, the impact to air quality would be significant. Proceed to *Step 6: Implement Additional Construction Mitigation Measures*.

Step 6: Implement Additional Construction Mitigation Measures

As mentioned above, BAAQMD recommends that all proposed projects, where construction-related emissions would exceed the applicable *Thresholds of Significance*, implement the *Additional Construction Mitigation Measures*. The methodology for quantifying reductions of fugitive PM dust, exhaust, and off gas emissions associated with the implementation of these mitigation measures are discussed separately below. Keep all of the changes recommended above with regards to the *Basic Construction Mitigation Measures*, as the emission reductions associated with these *Additional Construction Mitigation Measures* are considered additive. Please note that in RoadMod all of these associated reductions should be taken outside of the model, which is described in further detail below.

Fugitive Particulate Matter Dust

BAAQMD recommends that for *Site Grading Soil Disturbance Mitigation* select (turn on) the soil stabilizing measure titled *Equipment loading/unloading* and alter the default percent reduction to match those recommended by BAAQMD in Section 6.3. BAAQMD considers this as a surrogate for the implementation of the *Additional Construction Mitigation Measures* listed in Section 6.3.

To quantify emission reductions associated with the implementation of the fugitive PM dust-related *Additional Construction Mitigation Measures* in RoadMod, rely on the *Emission Estimates* tab. RoadMod assumes a 50 percent reduction in fugitive PM dust emissions. Therefore, take the additional reduction listed in Section 6.3 to the maximum daily fugitive PM dust emissions in the *Emission Estimates* tab (i.e., cell I10 for PM_{10} and cell K10 for $PM_{2.5}$) to account for the implementation of fugitive PM dust-related *Additional Construction Mitigation Measures*. The resultant amount of fugitive PM dust emissions should be added to the maximum daily mitigated exhaust PM emissions (methodology described below) to calculate the total amount of mitigated PM_{10} and $PM_{2.5}$ emissions.

Exhaust Emissions

BAAQMD recommends that for the *Off-Road Equipment Mitigation* select (turn on) the measure titled *Diesel particulate filter* and alter the default percent reduction for each to match those recommended by BAAQMD in Section 6.3. BAAQMD considers this as a surrogate for the implementation of the *Additional Construction Mitigation Measures* listed in Section 6.3.

RoadMod does not calculate emission reductions associated with the implementation of the exhaust-related *Additional Construction Mitigation Measures*. To quantify the exhaust-related emission reductions associated with the implementation of the *Additional Construction Mitigation Measures*, follow the same methodology described above for applying the reductions associated with the implementation of the *Basic Construction Mitigation Measures*. BAAQMD-recommended percent reductions for NO_X, PM_{10}, and $PM_{2.5}$ associated with the implementation of the exhaust-related *Additional Construction Mitigation Measures* are contained in Section 6.3.

Off-Gas Emissions

For quantification of off-gas-related *Additional Construction Mitigation Measures*, first select the *Mitigation* option in the *Enter Construction Data* module for the *Architectural Coating* phase. Then select (turn on) the measures applicable to the proposed project and alter the default percent reduction for each to match those recommended by BAAQMD in Section 6.3. BAAQMD considers this as a surrogate for the implementation of the *Additional Construction Mitigation Measures* listed in Section 6.3.

Step 7: Comparison of Mitigated Emissions with Thresholds of Significance

Following quantification of project-generated construction-related emissions in accordance with the above BAAQMD-recommended methods, compare the total maximum daily amount of mitigated (with *Additional Construction Mitigation Measures* implemented) criteria air pollutants

and precursors with the applicable *Thresholds of Significance*. If the implementation of BAAQMD-recommended *Additional Construction Mitigation Measures* would reduce all construction-related criteria air pollutants and precursors to levels below the applicable *Thresholds of Significance*, the impact to air quality would be reduced to a less-than-significant level. If mitigated levels of any criteria air pollutant or precursor would still exceed the applicable *Threshold of Significance*, the impact to air quality would remain significant and unavoidable.

6.3. MITIGATING CONSTRUCTION-RELATED IMPACTS

This section identifies the *Basic Construction Mitigation Measures* and *Additional Construction Mitigation Measures*, and the emission reductions associated with the implementation thereof by pollutant type.

6.3.1. Criteria Air Pollutants and Precursors

Basic Construction Mitigation Measures

As described in *Chapter 6 Assessing and Mitigating Construction-Related Impacts*, for all proposed projects, BAAQMD recommends the implementation of all *Basic Construction Mitigation Measures* whether or not construction-related emissions exceed applicable *Thresholds of Significance*, as such measures represent best management practices. The information herein should be used in accordance with BAAQMD-recommendations in *Chapter 6 (Step 4: Mitigation Measures and Emission Reductions)*. The list of *Basic Construction Mitigation Measures* is provided below along with emission reductions by source type (i.e., fugitive and exhaust) for quantification in URBEMIS and RoadMod.

1. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.
2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
3. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.
4. All vehicle speeds on unpaved roads shall be limited to 15 mph.
5. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.
6. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.
7. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.
8. Post a publicly visible sign with the telephone number and person to contact at the Lead Agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The phone number of the BAAQMD shall also be visible to ensure compliance with applicable regulations.

Fugitive Particulate Matter Dust Emissions

Mitigation measures 1 through 5 above relate to fugitive PM dust emissions (i.e., PM_{10} and $PM_{2.5}$).

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As described in *Chapter 6 (Step 4: Mitigation Measures and Emission Reductions*), do not change the URBEMIS default percent reduction values for the fugitive PM dust-related measures, as BAAQMD considers this as a surrogate for the implementation of the *Basic Construction Mitigation Measures*. For the soil stabilizing measure titled *Water exposed surfaces* (with the "two times daily" option selected) and the measure *Reduce speed on unpaved roads to less than 15 mph*, URBEMIS assumes default percent reduction values of 55 percent and 21 percent, respectively. URBEMIS assumes that fugitive PM dust emissions from soil disturbance activities and travel on unpaved roads account for approximately 79 percent and 21 percent of total the fugitive PM dust emissions, respectively. Therefore, following the guidance in *Chapter 6* (*Step 4: Mitigation Measures and Emission Reductions*), URBEMIS will apply an approximate 53 percent reduction to total fugitive PM dust emissions as a result of implementation of the *Basic Construction Mitigation Measures* 1 through 5.

RoadMod

As discussed in *Chapter 6 (Step 4: Mitigation Measures and Emission Reductions*), RoadMod assumes an inherent 50 percent reduction in fugitive PM dust emissions when water trucks are selected. BAAQMD recommends selecting water trucks to account for the implementation of the *Basic Construction Mitigation Measures*.

Exhaust Emissions

Mitigation measures 6 and 7 above relate to exhaust emissions of criteria air pollutants and precursors.

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As discussed in *Chapter 6 (Step 4: Mitigation Measures and Emission Reductions*), for quantification of the exhaust-related *Basic Construction Mitigation Measures*, select the *Mitigation* option in the *Enter Construction Data* module for the *Site Grading*, *Building Construction,* and *Asphalt Paving* phases, as applicable. BAAQMD then recommends that for the *Off-Road Equipment Mitigation*, select (turn on) the measure titled *Use aqueous diesel fuel* and alter the default percent reduction values to 5 percent for NO_X, PM_{10}, and $PM_{2.5}$ to serve as a surrogate for the implementation of the *Basic Construction Mitigation Measures* 6 and 7.

RoadMod

For RoadMod, apply a 5 percent reduction for NO_X, PM_{10}, and $PM_{2.5}$ to account for implementation of the *Basic Construction Mitigation Measures* 6 and 7. Please refer to *Chapter 6 (Step 4: Mitigation Measures and Emission Reductions*) for detailed guidance on quantifying emission reductions.

Additional Construction Mitigation Measures

As described in *Chapter 6 Assessing and Mitigating Construction-Related Impacts*, BAAQMD recommends that all proposed projects, where construction-related emissions would exceed the applicable *Thresholds of Significance*, implement the *Additional Construction Mitigation Measures*. The information herein should be used in accordance with BAAQMD-recommendations in *Chapter 6* (*Step 4: Mitigation Measures and Emission Reductions*). The list of *Additional Construction Mitigation Measures* is provided below along more detailed guidance on emission reductions by source type (i.e., fugitive and exhaust) for quantification in URBEMIS and RoadMod.

1. All exposed surfaces shall be watered at a frequency adequate to maintain minimum soil moisture of 12 percent. Moisture content can be verified by lab samples or moisture probe.
2. All excavation, grading, and/or demolition activities shall be suspended when average wind speeds exceed 20 mph.

3. Wind breaks (e.g., trees, fences) shall be installed on the windward side(s) of actively disturbed areas of construction. Wind breaks should have at maximum 50 percent air porosity.
4. Vegetative ground cover (e.g., fast-germinating native grass seed) shall be planted in disturbed areas as soon as possible and watered appropriately until vegetation is established.
5. The simultaneous occurrence of excavation, grading, and ground-disturbing construction activities on the same area at any one time shall be limited. Activities shall be phased to reduce the amount of disturbed surfaces at any one time
6. All trucks and equipment, including their tires, shall be washed off prior to leaving the site.
7. Site accesses to a distance of 100 feet from the paved road shall be treated with a 6 to 12 inch compacted layer of wood chips, mulch, or gravel.
8. Sandbags or other erosion control measures shall be installed to prevent silt runoff to public roadways from sites with a slope greater than one percent.
9. The project shall develop a plan demonstrating that the off-road equipment (more than 50 horsepower) to be used in the construction project (i.e., owned, leased, and subcontractor vehicles) would achieve a project wide fleet-average 20 percent NO_X reduction and 45 percent PM reduction compared to the most recent ARB fleet average. Acceptable options for reducing emissions include the use of late model engines, low-emission diesel products, alternative fuels, engine retrofit technology, after-treatment products, and/or other options as such become available.
10. Use low VOC (i.e., ROG) coatings beyond the local requirements (i.e., Regulation 8, Rule 3: Architectural Coatings).

Fugitive Particulate Matter Dust Emissions

Mitigation measures 1 through 8 above relate to fugitive PM dust emissions (i.e., PM_{10} and $PM_{2.5}$).

URBEMIS

As discussed in *Chapter 6 (Step 4: Mitigation Measures and Emission Reductions*), BAAQMD recommends that for *Site Grading Soil Disturbance Mitigation*, select (turn on) the soil stabilizing measure titled *Equipment loading/unloading.* To account for the implementation of the *Additional Construction Mitigation Measures* 1 through 8, alter the default percent reduction to 63 percent, which would result in a total reduction of 75 percent in fugitive PM dust emissions.

RoadMod

Apply an additional 50 percent reduction to the fugitive PM dust emissions contained in the *Emission Estimates* tab of RoadMod to account for the implementation of the *Additional Construction Mitigation Measures* 1 through 8. The resulting total percent reduction from fugitive PM dust emissions would be 75 percent (i.e., $1 – (0.5 \times 0.5)$).

Exhaust Emissions

Mitigation measure 9 above relates to exhaust emissions.

URBEMIS

As discussed in *Chapter 6* (*Step 4: Mitigation Measures and Emission Reductions*), for quantification of the exhaust-related *Additional Construction Mitigation Measures*, select the *Mitigation* option in the *Enter Construction Data* module for the *Site Grading*, *Building Construction,* and *Asphalt Paving* phases, as applicable. BAAQMD then recommends that for the *Off-Road Equipment Mitigation*, select (turn on) the measure titled *Use aqueous diesel fuel* and

alter the default percent reduction values to 20 percent for NO_X and 45 percent for PM_{10}, and $PM_{2.5}$ to serve as a surrogate for the implementation of the Additional *Construction Mitigation Measures* 9.

RoadMod

For RoadMod, apply a 20 percent reduction for NO_X and a 45 percent reduction for PM_{10} and $PM_{2.5}$ to account for implementation of the *Additional Construction Mitigation Measure* 9. Please refer to *Chapter 6* (*Step 4: Mitigation Measures and Emission Reductions*) for detailed guidance on quantifying emission reductions.

Off-Gas Emissions

Mitigation measure 10 above relates to off-gas emissions. For quantification of the off-gas-related *Additional Construction Mitigation Measure*, first select the *Mitigation* option in the *Enter Construction Data* module for the *Architectural Coating* phase. Then, select (turn on) the measures applicable to the proposed project. Do not change the default URBEMIS percent reduction.

Refer to Table 6-3 below for a summary of BAAQMD's overall guidance principles for assessing construction-related impacts.

Table 6-3
Overall Guidance Principles for Construction-Related Impacts

Construction Input Parameter	Guidance Principle
Land Use Type and Size	• Select most applicable land use type. • Use the appropriate land use units.
Construction Schedule	• Use the earliest possible commencement date(s) if project-specific information is unknown. • Overlap phases that will or have the potential to occur simultaneously. • Check the selected number of work days per week to ensure an accurate number of construction work days for each phase.
Demolition Phase	• Use a separate demolition URBEMIS run if the land use size to be developed differs from the land use size to be demolished. • Demolition fugitive dust is based on maximum daily volume of building to be demolished. • Demolition construction equipment is based on acres of land use to be demolished (in *Enter Land Use Data* module).
Site Grading Phase	• Site grading construction equipment is based on maximum daily acres disturbed. • Enter project-specific maximum daily acres disturbed if known, otherwise URBEMIS assumes the maximum daily amount of acres disturbed is 25 percent of total acres disturbed.
Site Grading Fugitive Dust	• Select the appropriate fugitive dust quantification methodology based on the amount and type of project-specific information available. • The more specific grading information available will result in more accurate quantification of PM emissions.
Asphalt Paving Phase	• Acres to be asphalt paved are based on land use type and size (in *Enter Land Use Data* module). • Asphalt paving construction equipment is based on total acres to be paved. • URBEMIS assumes asphalt paving occurs at equal rate throughout phase. • Account for excess asphalt paving requirements of project beyond default assumptions by adjusting the acres to be paved.

Table 6-3
Overall Guidance Principles for Construction-Related Impacts

Construction Input Parameter	Guidance Principle
Architectural Coatings	• URBEMIS assumes architectural coating operations occur at equal rate throughout phase.
Basic Construction Mitigation Measures	• All projects must implement Basic Construction Mitigation Measures, including those below the construction screening levels. • Use surrogate URBEMIS mitigation to account for Basic Construction Mitigation Measures' emission reductions.
Additional Construction Mitigation Measures	• Projects that generate construction emissions that exceed the thresholds of significance are required to implement Additional Construction Mitigation Measures. • Use surrogate URBEMIS mitigation to account for Additional Construction Mitigation Measures' emission reductions.
Other	• For all construction phases, the more specific information available will result in more accurate emissions quantification. • When a specific construction schedule is unknown, all phases that could potentially overlap should be added to calculate maximum daily emissions.

Notes: The Overall Guidance Principles listed above are a summary of BAAQMD's construction guidance. Refer to the *Chapter 6 Assessing and Mitigating Construction-Related Impacts* for detailed guidance on evaluation.

6.4. GREENHOUSE GASES

Step 1: Comparison of Project Attributes with Screening Criteria
The first step in determining the significance of construction-related GHGs is to compare the attributes of the proposed project with the applicable qualitative threshold/screening criteria listed in Chapter 2, and restated below.

The *Threshold of Significance* for construction-related GHG emissions is the presence of the following performance-based best management practices, as applicable:

1. Alternative-fueled (e.g., biodiesel, electric) construction vehicles/equipment of at least 15 percent of the fleet ;

2. Local building materials (within 100 miles) of at least 10 percent; and

3. Recycle at least 50 percent of construction waste or demolition materials.

If the project would not implement BAAQMD-recommended BMPs, construction-related GHGs would result in a significant impact to global climate change.

Step 2: (Optional) Emissions Quantification
For proposed projects that wish to disclose GHG emissions from construction, BAAQMD recommends using URBEMIS for proposed land use development projects and RoadMod for proposed projects that are linear in nature. Sources of construction-related GHGs only include exhaust, for which the same detailed guidance as described for criteria air pollutants and precursors should be followed.

6.4.1. Mitigating Greenhouse Gases

For all proposed projects, BAAQMD recommends implementation of the following performance-based best management practices, as applicable.

1. Alternative-fueled (e.g., biodiesel, electric) construction vehicles/equipment of at least 15 percent of the fleet;

2. Local building materials of at least 10 percent; and

3. Recycle at least 50 percent of construction waste or demolition materials.

If the proposed project would implement the above-mentioned BMPs, the project would be considered to have a less-than-significant impact with mitigation incorporated.

6.5. TOXIC AIR CONTAMINANTS

Diesel Particulate Matter

Construction-related activities could result in the generation of TACs, specifically diesel PM, from on-road haul trucks and off-road equipment exhaust emissions. According to the specific health effects of each particular TAC, as identified by OEHHA and ARB in the Consolidated Table of OEHHA / ARB Approved Risk Assessment Health Values, the potential cancer risk from the inhalation of diesel PM outweighs the potential noncancer health impacts. Due to the variable nature of construction activity, the generation of TAC emissions in most cases would be temporary, especially considering the short amount of time such equipment is typically within an influential distance (Concentrations of mobile-source diesel PM emissions are typically reduced by 70 percent at a distance of approximately 500 feet [ARB 2005]) that would result in the exposure of sensitive receptors to substantial concentrations. In addition, current models and methodologies for conducting health risk assessments are associated with longer-term exposure periods of 9, 40, and 70 years, which do not correlate well with the temporary and highly variable nature of construction activities resulting in difficulties with producing accurate estimates of health risk. Additionally, the implementation of the *Basic Construction Mitigation Measures*, which is recommended for all proposed projects, would also reduce diesel PM exhaust emissions. However, these variability issues associated with construction do not necessarily minimize the significance of possible impacts. BAAQMD recommends that the same *Threshold of Significance* for project operations be applied to construction (*see* Section 2.4). However, BAAQMD suggests associated impacts should be addressed on a case-by-case basis, taking into consideration the specific construction-related characteristics of each project and proximity to off-site receptors, as applicable.

The analysis shall disclose the following about construction-related activities:

1. Types of off-site receptors and their proximity to construction activity;
2. Duration of construction period;
3. Quantity and types of diesel-powered equipment;
4. Number of hours equipment would be operated each day;
5. Location(s) of equipment use, distance to nearest off-site sensitive receptors, and orientation with respect to the predominant wind direction;
6. Location of equipment staging area; and

7. Amount of on-site diesel-generated $PM_{2.5}$ exhaust (assuming that all on-site diesel $PM_{2.5}$ exhaust is diesel PM) if mass emission levels from construction activity are estimated.

In cases, where construction-generated emissions of diesel PM is anticipated to occur in close proximity to sensitive receptors for extended periods of time, lead agencies are encouraged to consult with BAAQMD.

Demolition and Renovation of Asbestos-Containing Materials

Demolition of existing buildings and structures would be subject to BAAQMD Regulation 11, Rule 2 (Asbestos Demolition, Renovation, and Manufacturing). BAAQMD Regulation 11, Rule 2 is intended to limit asbestos emissions from demolition or renovation of structures and the associated disturbance of asbestos-containing waste material generated or handled during these activities. The rule addresses the national emissions standards for asbestos along with some additional requirements. The rule requires the Lead Agency and its contractors to notify BAAQMD of any regulated renovation or demolition activity. This notification includes a description of structures and methods utilized to determine whether asbestos-containing materials are potentially present. All asbestos-containing material found on the site must be removed prior to demolition or renovation activity in accordance with BAAQMD Regulation 11, Rule 2, including specific requirements for surveying, notification, removal, and disposal of material containing asbestos. Therefore, projects that comply with Regulation 11, Rule 2 would ensure that asbestos-containing materials would be disposed of appropriately and safely. By complying with BAAQMD Regulation 11, Rule 2, thereby minimizing the release of airborne asbestos emissions, demolition activity would not result in a significant impact to air quality.

Because BAAQMD Regulation 11, Rule 2 is in place, no further analysis about the demolition of asbestos-containing materials is needed in a CEQA document. BAAQMD does recommend that CEQA documents acknowledge and discuss BAAQMD Regulation 11, Rule 2 to support the public's understanding of this issue.

Naturally Occurring Asbestos

Naturally occurring asbestos (NOA) was identified as a TAC in 1986 by ARB. NOA is located in many parts of California and is commonly associated with ultramafic rocks, according the California Department of Geology's special publication titled Guidelines for Geologic Investigations of Naturally Occurring Asbestos in California. Asbestos is the common name for a group of naturally occurring fibrous silicate minerals that can separate into thin but strong and durable fibers. Ultramafic rocks form in high-temperature environments well below the surface of the earth. By the time they are exposed at the surface by geologic uplift and erosion, ultramafic rocks may be partially to completely altered into a type of metamorphic rock called serpentinite. Sometimes the metamorphic conditions are right for the formation of chrysotile asbestos or tremolite-actinolite asbestos in the bodies of these rocks, along their boundaries, or in the soil.

For individuals living in areas of NOA, there are many potential pathways for airborne exposure. Exposures to soil dust containing asbestos can occur under a variety of scenarios, including children playing in the dirt; dust raised from unpaved roads and driveways covered with crushed serpentine; grading and earth disturbance associated with construction activity; quarrying; gardening; and other human activities. For homes built on asbestos outcroppings, asbestos can be tracked into the home and can also enter as fibers suspended in the air. Once such fibers are indoors, they can be entrained into the air by normal household activities, such as vacuuming (as many respirable fibers will simply pass through vacuum cleaner bags).

People exposed to low levels of asbestos may be at elevated risk (e.g., above background rates) of lung cancer and mesothelioma. The risk is proportional to the cumulative inhaled dose (quantity of fibers), and also increases with the time since first exposure. Although there are a

number of factors that influence the disease-causing potency of any given asbestos (such as fiber length and width, fiber type, and fiber chemistry), all forms are carcinogens.

BAAQMD enforces the ATCM which regulates NOA emissions from grading, quarrying, and surface mining operations at sites which contain ultramafic rock. The provisions that cover these operations are found specifically in the California Code of Regulations, Section 93105. The ATCM for Construction, Grading, Quarrying and Surface Mining Operations was signed into State law on July 22, 2002, and became effective in the SFBAAB on November 19, 2002. The purpose of this regulation is to reduce public exposure to NOA from construction and mining activities that emit or re-suspend dust which may contain NOA. The ATCM requires regulated operations engaged in road construction and maintenance activities, construction and grading operations, and quarrying and surface mining operations in areas where NOA is likely to be found, to employ the best available dust mitigation measures to reduce and control dust emissions.

BAAQMD's NOA program requires that the applicable notification forms listed below be submitted by qualifying operations in accordance with the procedures detailed in the ATCM Inspection Guidelines Policies and Procedures. The Lead Agency shall reference BAAQMD's ATCM Policies and Procedures to determine which NOA Notification Form is applicable to the proposed project (NOA Notification Forms).

Using the geologic map of the SFBAAB (Geologic Map), the Lead Agency shall discuss whether a proposed project would be located in "areas moderately likely to contain NOA." If a project would not involve earth-disturbing construction activity in one of these areas or would not locate receptors in one of these areas then it can be assumed that the project would not have the potential to expose people to airborne asbestos particles. If a project would be located in an area moderately likely to contain NOA, then the impact would be considered significant.

7. ASSESSING AND MITIGATING LOCAL CARBON MONOXIDE IMPACTS

7.1. INTRODUCTION

Emissions and ambient concentrations of CO have decreased dramatically in the SFBAAB with the introduction of the catalytic converter in 1975. No exceedances of the CAAQS or NAAQS for CO have been recorded at nearby monitoring stations since 1991. SFBAAB is currently designated as an attainment area for the CAAQS and NAAQS for CO; however, elevated localized concentrations of CO still warrant consideration in the environmental review process. Occurrences of localized CO concentrations, known as hotspots, are often associated with heavy traffic congestion, which most frequently occur at signalized intersections of high-volume roadways.

CO impact assessments should be conducted for any project or plan that produces significant congestion including construction phases, project operations, and plan development.

7.2. SIGNIFICANCE DETERMINATION

7.2.1. Step 1: Comparison of Project Attributes with Screening Criteria

The first step in determining the significance of CO emissions is to compare the attributes of the proposed project to the applicable S*creening Criteria* (Refer to Chapter 2).

This preliminary screening procedure provides a conservative indication of whether the proposed project would result in the generation of CO concentrations that would substantially contribute to an exceedance of the *Thresholds of Significance* (Refer to Chapter 2). If all of the *Screening Criteria* are met, the proposed project would likely result in a less-than-significant impact to air quality with respect to concentrations of local CO. If the proposed project does not meet all the screening criteria, then CO emissions should be quantified.

7.2.2. Step 2: Emissions Quantification

This section describes recommended methodologies for quantifying concentrations of local CO for proposed projects that do not meet all of the *Screening Criteria*. Recommended methodologies include using the On-Road Mobile-Source Emission Factors (EMFAC) and the California Line Source Dispersion Model (CALINE4) models in accordance with the methodology recommended in the University of California (UC) Davis Transportation Project-Level Carbon Monoxide Protocol (*CO Protocol*) (Garza, et al. 1997).

Air Quality Models

BAAQMD recommends using the most current version of the EMFAC model to obtain mobile-source emission factors for CO associated with operating conditions that would be representative of the roadway or facility subject to analysis.

Users should input the emission factors and other input parameters into the CALINE4 model to quantify CO concentrations near roadways or facilities.

The *CO Protocol* contains detailed methodology for modeling CO impacts.

Input Parameters

The CALINE4 model contains five screens for input data. CALINE4 input parameters are summarized below. For more detailed descriptions see the CALINE4 Users Guide.

Job Parameters

File Name – Name the file (e.g., data file extension) to create the CALINE4 Input file.

Job Title – Provide a name for the modeling scenario (e.g., existing no project, existing plus project).

Run Type – Select the worst-case wind angle.

Aerodynamic Roughness Coefficient – Choose the characteristic (i.e., rural, suburban, central business district, other) that is most representative of the project site.

Model Information – Indicate the unit of measurement (i.e., meters or feet) and inputs the vertical dimension of the project (i.e., altitude above sea level).

Run – Once data input is completed, return to this screen to run the model. Upon running the model, the output will appear as a text file called C4$.out. Save the output file under an appropriate filename for future reference.

Link Geometry

On this screen, input the dimensions (i.e., coordinates) for the roadway intersection that is the subject of the analysis.

Link Name – Input names for each roadway segment

Link Type – Indicate the character of the roadway segment (i.e., at-grade, depressed, fill, bridge, parking lot).

Endpoint Coordinates (X_1, X_2, Y_1, Y_2) – Input the dimensions (i.e., coordinates) of the roadway segments as though the intersection were oriented at point of origin X = 0, Y = 0 on a Cartesian coordinate system. Roadway segments approaching the intersection from the west side of the screen (if north is treated as “up”, or the top of the screen) would have negative X coordinate endpoints. Similarly, roadway segments approaching the intersection from the south would have negative Y coordinate endpoints.

Link Height – Indicate the vertical dimension of the roadway segment. If the roadway segment is at-grade, should set this parameter to zero. If the roadway segment is depressed, enter a negative value for this parameter.

Mixing Zone Width – The Mixing Zone is defined as the width of the roadway, plus three meters on either side. The minimum allowable value is 10 meters, or 32.81 feet.

Canyon/Bluff (Mix Left/Right) – Set these features to zero.

Link Activity

Traffic Volume – Input hourly traffic volumes applicable to each roadway segment.

Emission Factor – Input the CO emission factor (in units of grams/mile) obtained from EMFAC for the applicable vehicle speed class reflecting operating conditions for the affected intersection.

Run Conditions
Wind Speed – Input 0.5 meters per second to represent worst-case conditions.

Wind Direction – Set parameter to zero. Select "Worst-Case Wind Angle" as the "Run Type" on the "Job Parameters" screen, so this field will be overridden by the model.

Wind Direction Standard Deviation – Use a wind direction standard deviation of 5 degrees to represent worst-case conditions.

Atmospheric Stability Class – Use Stability Class 4 (i.e., class D) to represent average conditions in the SFBAAB.

Mixing Height – Indicate the vertical dimension over which vertical mixing may occur. In most situations, input 300 meters, approximately the height of the atmospheric boundary layer. If the roadway subject to analysis is a bridge underpass, tunnel, or other situation where vertical mixing would be limited, indicates the height of the structure that would hamper vertical mixing (in units of meters).

Ambient Temperature – Indicate the average temperature of the project site during the time of day at which maximum daily traffic volume would occur (in degrees Celsius). A temperature of 7.2 degrees Celsius is recommended.

Ambient Pollutant Concentration – Enter 0 in this field to determine the contribution of CO from the roadway subject to analysis. Add the roadway-related CO concentration to ambient CO levels outside of the CALINE4 model, as discussed later in this section.

Receptor Positions
Receptor Name – Input names for each receptor.

Receptor Coordinates (X, Y, Z) – Input receptor coordinates in a manner similar to the "Link Coordinates" on the "Link Geometry" screen. Locate receptors at three and seven meters from the intersection in all directions from the intersection, in accordance with the recommendations of the *CO Protocol*. The Receptor Coordinates are oriented in the same Cartesian coordinate system as the roadway segment "Link Coordinates". Receptors located to the southwest of the intersection would have negative X and Y coordinates. The Z dimension should be assigned the coordinate of 1.8 meters (5.9 feet); the approximate breathing height of a receptor located adjacent to the roadway.

This screen also contains a window that shows a map of the link and receptor coordinates in the X, Y plane.

Model Output
CALINE4 output includes estimated 1-hour CO concentrations in units of ppm at the receptor locations input into the model. Note the highest concentrations at each of the three meter and seven meter receptor distances from the roadway.

Background Concentrations
Ambient 1-hour CO concentrations can be obtained from ARB air quality monitoring station data and 8-hour concentrations from EPA. Users should obtain the CO monitoring data recorded at the monitoring station nearest the project site. According to the *CO Protocol*, select the second highest concentration recorded during the last two years to represent the ambient CO concentration in the project area.

Estimated Localized CO Concentrations

Users should sum the highest modeled 1-hour CO concentration in units of ppm obtained from CALINE4 to ambient (background) 1-hour CO concentrations in ppm obtained from ARB. This represents the modeled worst-case 1-hour CO concentration near the affected roadway.

Persistence Factor – multiply the highest 1-hour CO concentration estimated by CALINE4 by a persistence factor of 0.7, as recommended in the CO Protocol, to obtain the estimated 8-hour CO concentration.

Add the estimated 8-hour CO concentration (ppm) obtained in the previous step to the ambient 8-hour CO concentration obtained from EPA (ppm). This represents the modeled worst-case 8-hour CO concentration near the affected roadway.

7.2.3. Step 3: Comparison of Unmitigated Emissions with Thresholds of Significance

Following quantification of local CO emissions in accordance with the recommended methods, compare the total modeled worst-case 1-hour and 8-hour CO concentrations with the applicable *Threshold of Significance*. If the modeled concentrations do not exceed any of the *Thresholds of Significance*, the project would result in a less-than-significant impact to air quality. If modeled concentrations do exceed any applicable *Threshold of Significance,* the proposed project would result in a significant impact to air quality with respect to local CO impacts.

7.2.4. Step 4: Mitigation Measures and Emission Reductions

Where local CO emissions exceed applicable *Thresholds of Significance*, refer to Section 7.3 for recommended mitigation measures and associated emission reductions. Only reduction measures included in the proposed project or recommended as mitigation in a CEQA-compliant document can be included when quantifying mitigated emission levels.

7.2.5. Step 5: Comparison of Mitigated Emissions with Thresholds of Significance

Following quantification of local CO emissions in accordance with the above recommended methods, compare the total modeled worst-case 1-hour and 8-hour CO concentrations with the applicable *Thresholds of Significance*. If the implementation of recommended mitigation measures reduces all local CO emissions to levels below the applicable *Thresholds of Significance*, the impact to air quality would be reduced to a less-than-significant level. If mitigated levels of local CO emissions still exceed the applicable *Threshold of Significance*, the impact to air quality would remain significant and unavoidable.

7.3. MITIGATING LOCAL CARBON MONOXIDE IMPACTS

The following section describes recommended mitigation measures for reducing local CO impacts to air quality. Consider implementation of the following measures, as feasible, for reducing project-generated traffic volumes and associated CO emissions at affected intersections. Actual emission reductions should be quantified through project-specific transportation modeling.

1. Synchronize traffic signals to improve traffic flow and minimize traffic congestion.
2. Consider additional traffic signals, such as light metering, to relocate congested areas further away from receptors.
3. Improve public transit service to reduce vehicle traffic and increase public transit mode share during peak traffic congestion periods.

4. Improve bicycle and pedestrian infrastructure to reduce vehicle traffic and increase bicycle and pedestrian mode share during peak traffic congestion periods. Improvements may include installing class I or II bike lanes, sidewalks, and traffic calming features.

5. Adjust pedestrian crosswalk signal timing to minimize waiting time for vehicles turning right or otherwise sharing green time with pedestrians. Give pedestrians a head start before traffic signal changes to green.

6. Where pedestrian traffic is high, implement pedestrian crosswalks with multi-directional crossings allowing pedestrians to cross intersections diagonally.

7. Limit heavy-duty truck traffic during peak hours. Designate truck routes that divert truck traffic away from congested intersections.

8. Limit left turns or other maneuvers during peak hours that add to congestion.

9. Limit on-street parking during peak hours to allow for added vehicle capacity.

10. Implement traffic congestion-alleviating mitigation measures as identified by a traffic engineer.

8. ASSESSING AND MITIGATING ODOR IMPACTS

8.1. INTRODUCTION

Odor impacts could result from siting a new odor source near existing sensitive receptors or siting a new sensitive receptor near an existing odor source. Examples of land uses that have the potential to generate considerable odors include, but are not limited to:

1. Wastewater treatment plants;
2. Landfills;
3. Confined animal facilities;
4. Composting stations;
5. Food manufacturing plants;
6. Refineries; and
7. Chemical plants.

Odors are generally regarded as an annoyance rather than a health hazard. Manifestations of a person's reaction to odors can range from psychological (e.g., irritation, anger, or anxiety) to physiological (e.g., circulatory and respiratory effects, nausea, vomiting, and headache).

The ability to detect odors varies considerably among the population and overall is quite subjective. 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., coffee roaster). An unfamiliar odor is more easily detected and is more likely to cause complaints than a familiar one. Known as odor fatigue, a person can become desensitized to almost any odor and recognition only occurs with an alteration in the intensity.

Quality and intensity are two properties present in any odor. The quality of an odor indicates the nature of the smell experience. For instance, if a person describes an odor as flowery or sweet, then the person is describing the quality of the odor. Intensity refers to the strength of the odor. For example, a person may use the word strong to describe the intensity of an odor. Odor intensity depends on the concentration in the air. When an odor sample is progressively diluted, the odor concentration decreases. As this occurs, the odor intensity weakens and eventually becomes so low that the detection or recognition of the odor is quite difficult. At some point during dilution, the concentration of the odor reaches a level that is no longer detectable.

The presence of an odor impact is dependent on a number of variables including:

1. Nature of the odor source (e.g., wastewater treatment plant, food processing plant);
2. Frequency of odor generation (e.g., daily, seasonal, activity-specific);
3. Intensity of odor (e.g., concentration);
4. Distance of odor source to sensitive receptors (e.g., miles);
5. Wind direction (e.g., upwind or downwind); and
6. Sensitivity of the receptor.

The recommendations provided in this chapter only apply to assessing and mitigating odor impacts for individual projects. Please refer to Chapter 5 for recommendations for assessing and mitigating odor impacts at the plan-level.

8.2. SIGNIFICANCE DETERMINATION

Odor impacts could occur from two different situations:

1. Siting a new odor source (e.g., the project includes a proposed odor source near existing sensitive receptors), or
2. Siting a new receptor (e.g., the project includes proposed sensitive receptors near an existing odor source).

Regardless of the situation, BAAQMD recommends completing the following steps to comprehensively analyze the potential for an odor impact.

8.2.1. Step 1: Disclosure of Odor Parameters

The first step in assessing potential odor impacts is to gather and disclose applicable information regarding the characteristics of the buffer zone between the sensitive receptor(s) and the odor source(s), local meteorological conditions, and the nature of the odor source. Consideration of such parameters assists in evaluating the potential for odor impacts as a result of the proposed project. Projects should clearly state the following information in odor analyses, which provide the minimum amount of information required to address potential odor impacts:

1. Type of odor source(s) the project is exposed to or the type of odor source(s) produced by the project (e.g., wastewater treatment plant, landfill, food manufacturing plant);
2. Frequency of odor events generated by odor source(s) (e.g., operating hours, seasonal);
3. Distance and landscape between the odor source(s) and the sensitive receptor(s) (e.g., topography, land features); and
4. Predominant wind direction and speed and whether the sensitive receptor(s) in question are upwind or downwind from the odor source(s).

8.2.2. Step 2: Odor Screening Distances

BAAQMD has developed a list of recommended odor screening distances for specific odor-generating facilities shown in Table 2-8. Projects that would locate sensitive receptor(s) to odor source(s) closer than the screening distances would be considered to result in a potential significant impact. If the proposed project would include the operation of an odor source, the screening distances should also be used to evaluate the potential impact to existing sensitive receptors. Projects that would locate sensitive receptor(s) near odor source(s) farther than the screening distances, or vice versa, would be considered to have a sufficient buffer. The odor screening distances in Table 2-8 should not be used as absolute thresholds, rather an indicator to how much further analysis is required. The Lead Agency should also consider the other parameters listed above in Step 1 and information from Step 3 below to comprehensively evaluate potential odor impacts.

8.2.3. Step 3: Odor Complaint History

The impact of an existing odor source on surrounding sensitive receptors could also be evaluated by identifying the number of confirmed and unconfirmed complaints received for that specific odor source.

If the proposed project would be located near an existing odor source, contact BAAQMD to obtain the odor complaints over the past 3 years for the source in question. Then calculate the annual average confirmed and unconfirmed odor complaints filed for the source. BAAQMD considers a source to have a substantial number of odor complaints if the complaint history includes one confirmed complaint per year averaged over a 3-year period or three unconfirmed complaints per

year averaged over a 3-year period. Also, disclose the distance at which receptors were affected by the existing odor source. As discussed in Step 1, describe the topography and landscape between the receptors and the odor source. These distances and landscaping should then be compared with the distance and landscape that would separate the proposed project and the odor source.

If the proposed project would locate an odor source, first identify the location of potential sensitive receptors (i.e., distance, upwind/downwind) with respect to the project site. Then contact BAAQMD about existing odor complaints in the past 3 years near the project site. Similar to the methods described above, calculate the annual average confirmed and unconfirmed odor complaints from existing odor sources, which provides a baseline condition. To evaluate how implementation of the proposed project would affect identified sensitive receptors contact BAAQMD to obtain odor complaints in the region for facilities similar in size and type of odor produced in the past 3 years. These surrogate odor complaints should be evaluated for their distance from source to receptor, and then compared with the distance from the proposed project to receptors. Odor complaints from the surrogate odor source are considered substantial if the complaint history includes one confirmed complaint per year averaged over a 3-year period or three unconfirmed complaints per year averaged over a 3-year period.

BAAQMD considers a substantial number of odor complaints, specifically, 1 confirmed complaint averaged over the past 3 years or 3 unconfirmed complaints averaged over the past 3 years as the indication of an odor impact. As discussed above, the Lead Agency should compare the odor parameters (i.e., distance and wind direction) associated with the odor complaints that have been filed with those of the proposed project. Similar to the odor screening distances, odor complaints should not be used as an absolute threshold, but evidence to support a significance determination.

8.2.4. Step 4: Significance Determination

BAAQMD recognizes that there is not one piece of information that can solely be used to determine the significance of an odor impact. The factors (i.e., Step 1 through 3) discussed above could enhance the potential for a significant odor impact or help prevent the potential for a significant odor impact. For example, a project that would be located near an existing odor source may not discover any odor complaints for the existing odor source. It is possible that factors such as a small number of existing nearby receptors, predominate wind direction blowing away from the existing receptors, and/or seasonality of the odor source has prevented any odor complaints from being filed about the existing odor source. The results of each of the steps above should be clearly disclosed in the CEQA document. Projects should use the collective information from Steps 1 through 3 to qualitatively evaluate the potential for a significant odor impact. The Lead Agency should clearly state the reasoning for the significance determination using information from Steps 1 through 3 to support the determination. Section 8.3 includes BAAQMD-recommendations for odor-related mitigation measures.

8.3. MITIGATING ODOR IMPACTS

BAAQMD considers appropriate land use planning the primary method to mitigate odor impacts. Providing a sufficient buffer zone between sensitive receptors and odor sources should be considered prior to analyzing implementation of odor mitigation technology. Projects that would include potential sensitive receptors should consider the odor parameters (i.e., Step 1) discussed in *Chapter 8 Assessing and Mitigating Odor Impacts* during the planning process to avoid siting receptors near odor sources. Similarly, projects that would include an odor source should consider the location of nearby existing sensitive receptors that could be affected by the project.

This section contains source-specific mitigation measures. This should not be considered an exhaustive list and due to the subjective nature of odor impacts, there is no formulaic method to assess if odor mitigation is sufficient. In determining whether the implementation of mitigation would reduce the potential odor impact to a less-than-significant level, rely on the information contained in *Chapter 8 Assessing and Mitigating Odor Impacts.*

The source types for which mitigation has been provided below have been selected based on the nature of the odors produced as a result of their operational activities. These land use types are those most likely to result in odor impacts if sensitive receptors are located in close proximity.

8.3.1. Wastewater Treatment Plant

Odor issues associated with wastewater treatment plants typically occur within the containment and ventilation system for the headworks building and primary clarifiers. The aeration basin influent channel also tends to produce hydrogen sulfide (H_2S) as a result of anaerobic conditions. The following list provides current and feasible odor mitigation measures for wastewater treatment plants.

1. Activated Carbon Filter/Carbon adsorption
2. Biofiltration/Bio Trickling Filters
3. Fine Bubble Aerator
4. Hooded Enclosures
5. Wet and Dry Scrubbers
6. Caustic and Hypochlorite Chemical Scrubbers
7. Ammonia Scrubber
8. Energy Efficient Blower System
9. Thermal Oxidizer
10. Capping/Covering Storage Basins and Anaerobic Ponds
11. Mixed Flow Exhaust
12. Wastewater circulation technology
13. Exhaust stack and vent location with respect to receptors

8.3.2. Landfill/Recycling/Composting Facilities

Odors generated from landfills and composting facilities are typically associated with methane production from the anaerobic decomposition of waste. The following mitigation measures could also reduce and treat the methane generated from landfills. Landfill projects should also implement best management practices to avoid and minimize the creation of anaerobic conditions.

1. Passive Gas Collection
2. Active Gas Collection
3. Flaring or energy production/utilization
4. Vegetation Growth on Landfill Cover
5. Cover/Cap Landfill
6. Odor Neutralizing Spray
7. Negative aeration for compost facilities

8. Turning and mixing of compost piles

8.3.3. Petroleum Refinery

Odors generated from materials and processes associated with petroleum refineries include, but are not limited to, H_2S, SO_2, mercaptan, ammonia (NH_3), and petroleum coke. The following list provides current and feasible odor mitigation measures for petroleum refineries.

1. Water Injections to Hydrocracking Process
2. Vapor recovery system
3. Injection of masking odorants into process streams
4. Flare meters and controls
5. Wastewater circulation technology for Aerated Ponds
6. Exhaust stack and vent location with respect to receptors
7. Thermal oxidizers
8. Carbon absorption
9. Biofiltration/Bio Trickling Filters

8.3.4. Chemical Plant

Chemical plants can generate a variety of different odors (e.g., acrylates, phenols, and styrene) as a result of process emissions. The range of odor mitigation measures required for chemical plants may vary substantially depending on the type of odors produced. Nevertheless, the following odor mitigation measures are general measures that can be applied to chemical plants.

1. Wet scrubbers (50–90 percent efficiency)
2. Catalytic oxidation (99 percent efficiency)
3. Thermal oxidation (90–99 percent efficiency)
4. Carbon adsorption (95 percent efficiency)
5. Exhaust stack and vent location with respect to receptors

8.3.5. Food Services

Restaurants, especially fast food restaurants, can generate substantial sources of odors as a result of cooking processes and waste disposal. Char broilers, deep-fryers, and ovens tend to produce food odors that can be considered offensive to some people. The food waste produced by restaurants can putrefy if not properly managed, which can also produce objectionable odors. The follow mitigation measures are management practices and odor technology that can be used to reduce the amount odors generated by food services.

1. Integral grease filtration system or grease removal system
2. Baffle filters
3. Electrostatic precipitator
4. Water cooling/cleaning unit
5. Disposable pleated or bag filters
6. Activated carbon filters
7. Oxidizing pellet beds
8. Incineration

9. Catalytic conversion
10. Proper packaging and frequency of food waste disposal
11. Exhaust stack and vent location with respect to receptors

A. CONSTRUCTION ASSESSMENT TOOLS

High Level Haulage Input Worksheet
High Level of Detail Fugitive Dust Quantification Method

Instructions: When using the *High Level of Detail* quantificaiton method to calculate fugitive dust emissions from cut/fill activities, BAAQMD recommends using this worksheet to calculate the on- and off-site haulage inputs for URBEMIS. If a project would involve both on-site and off-site cut/fill operations, the user should create two separate High Level Haulage Input Worksheets (i.e., one worksheet calculation for on-site and one for off-site).

User inputs	
Input to use in URBEMIS	
Calculation (do not change)	

Project Name:

Grading Activity/Phase:

Cut/Fill Operations

Description	Amount	Units	Notes
Total Cut/Fill Volume	1,800	cubic yards	Enter information
Months of Activity	2	months	Enter information
Days of Activity	44	days	
Daily Cut/Fill Volume	40.91	cubic yards/day	

Soil Density by Soil Type and Condition

Soil Type	Bulk Density (grams/cubic centimeter)	Density (pounds/cubic yard)	Density (tons/cubic yard)
Sandy	1.69	2,849	1.42
Loamy Coarse-Loamy	1.63	2,747	1.37
Loamy Fine-Loamy	1.60	2,697	1.35
Loamy Coarse-Silty	1.60	2,697	1.35
Loamy Fine-Silty	1.54	2,596	1.30
Clayey 25-25% clay	1.49	2,511	1.26
Clayey >45% clay	1.39	2,343	1.17

Source: U.S. Department of Agriculture, Natural Resources Conservation Service, 2007. National Soil Survey Handbook, title 430-VI. [Online] Available at <http://soils.usda.gov/technical/handbook/>.

URBEMIS 2007 Ton-Mile Calculation

Description	Amount	Units	Notes
Soil Type	Loamy Coarse-Loamy		Use drop-down menu to select soil type. Assume Sandy unless project-specific soil type is known.
Soil Density	1.37	tons/cubic yard	Enter project specific soil density if known
Haul Distance (Round Trip On-Site)	0.04	miles	Enter distance
Ton-Mile per Day	2.25	ton-miles/day	

Notes:
On-site ton-mile assumes cut/fill volume is moved by scrapers.
Off-site ton-mile assumes cut/fill volume is moved by haul trucks.

URBEMIS Construction Modeling Data Needs/Request

1) Construction Schedule
- Land use type and size to be developed
- Commencement and buildout date
- Duration and start date for each construction phase (e.g., demolition, grading, building construction)
- Identify any potential or planned overlap in phases

Note: If project will be built out in multiple phases, provide information above for each phase.

2) Demolition
- Commencement date and duration of activities
- Total volume to be demolished
- Maximum daily volume to be demolished
- Haul truck capacity and distance to disposal site (URBEMIS defaults provided)
- Demolition equipment required (URBEMIS defaults provided)

Note: URBEMIS estimates demolition construction equipment based on the land use being developed.

3) Grading (Mass and Fine)
- Commencement date and duration of activities
- Maximum daily acres disturbed (URBEMIS defaults provided)
- Volume of material to be cut and/or filled (cubic yards)
- Volume of material to be exported and/or exported (cubic yards)
- Construction equipment required

Note: URBEMIS estimates grading construction equipment based on maximum daily acres disturbed.

4) Fugitive Dust

A) Method 1 (Default)
- Maximum daily acres disturbed (URBEMIS defaults provided)

B) Method 2 (Low Level of Detail)
- Duration of cut/fill operations
- Volume of material to be cut and/or filled (cubic yards)
- Origin of soil material (i.e., on-site or off-site)

C) Method 3 (Medium Level of Detail)
- Duration of cut/fill operations
- Number of scrapers or haul trucks operating per day
- Hours of operation for each scraper or haul truck (scraper hours and haul truck hours)

C) Method 4 (High Level of Detail)
- Duration of cut/fill operations
- Volume of material to be cut and/or filled (cubic yards)
- Bulk density of material (i.e., tons per cubic yard)
- Round trip distance required to move materials on-site (on-site miles only)

5) Asphalt Paving
- Commencement date and duration of activities
- Total acres to be paved
- Construction equipment required

Note: URBEMIS estimates asphalt paving construction equipment based on total acres to be paved.

6) Architectural Coatings
- Commencement date and duration of activities

B. SAMPLE AIR QUALITY SETTING

B.1. EXISTING AIR QUALITY

The Bay Area Air Quality Management District (BAAQMD) is the regional air quality agency for the San Francisco Bay Area Air Basin (SFBAAB), which comprises all of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, and Santa Clara counties, the southern portion of Sonoma, and the southwestern portion of Solano County. Air quality in this area is determined by such natural factors as topography, meteorology, and climate, in addition to the presence of existing air pollution sources and ambient conditions. These factors along with applicable regulations are discussed below.

B.1.1. Climate, Topography, Air Pollution Potential

The SFBAAB is characterized by complex terrain, consisting of coastal mountain ranges, inland valleys, and bays, which distort normal wind flow patterns. The Coast Range splits resulting in a western coast gap, Golden Gate, and an eastern coast gap, Carquinez Strait, which allow air to flow in and out of the SFBAAB and the Central Valley.

The climate is dominated by the strength and location of a semi-permanent, subtropical high-pressure cell. During the summer, the Pacific high pressure cell is centered over the northeastern Pacific Ocean resulting in stable meteorological conditions and a steady northwesterly wind flow. Upwelling of cold ocean water from below to the surface because of the northwesterly flow produces a band of cold water off the California coast. The cool and moisture-laden air approaching the coast from the Pacific Ocean is further cooled by the presence of the cold water band resulting in condensation and the presence of fog and stratus clouds along the Northern California coast.

In the winter, the Pacific high-pressure cell weakens and shifts southward resulting in wind flow offshore, the absence of upwelling, and the occurrence of storms. Weak inversions coupled with moderate winds result in a low air pollution potential.

High Pressure Cell

During the summer, the large-scale meteorological condition that dominates the West Coast is a semipermanent high pressure cell centered over the northeastern Pacific Ocean. This high pressure cell keeps storms from affecting the California coast. Hence, the SFBAAB experiences little precipitation in the summer months. Winds tend to blow on shore out of the north/northwest.

The steady northwesterly flow induces upwelling of cold water from below. This upwelling produces a band of cold water off the California coast. When air approaches the California coast, already cool and moisture-laden from its long journey over the Pacific, it is further cooled as it crosses this bank of cold water. This cooling often produces condensation resulting in a high incidence of fog and stratus clouds along the Northern California coast in the summer.

Generally in the winter, the Pacific high weakens and shifts southward, winds tend to flow offshore, upwelling ceases and storms occur. During the winter rainy periods, inversions (layers of warmer air over colder air; see below) are weak or nonexistent, winds are usually moderate and air pollution potential is low. The Pacific high does periodically become dominant, bringing strong inversions, light winds and high pollution potential.

Topography

The topography of the SFBAAB is characterized by complex terrain, consisting of coastal mountain ranges, inland valleys and bays. This complex terrain, especially the higher elevations,

distorts the normal wind flow patterns in the SFBAAB. The greatest distortion occur when low-level inversions are present and the air beneath the inversion flows independently of air above the inversion, a condition that is common in the summer time.

The only major break in California's Coast Range occurs in the SFBAAB. Here the Coast Range splits into western and eastern ranges. Between the two ranges lies San Francisco Bay. The gap in the western coast range is known as the Golden Gate, and the gap in the eastern coast range is the Carquinez Strait. These gaps allow air to pass into and out of the SFBAAB and the Central Valley.

Wind Patterns

During the summer, winds flowing from the northwest are drawn inland through the Golden Gate and over the lower portions of the San Francisco Peninsula. Immediately south of Mount Tamalpais, the northwesterly winds accelerate considerably and come more directly from the west as they stream through the Golden Gate. This channeling of wind through the Golden Gate produces a jet that sweeps eastward and splits off to the northwest toward Richmond and to the southwest toward San Jose when it meets the East Bay hills.

Wind speeds may be strong locally in areas where air is channeled through a narrow opening, such as the Carquinez Strait, the Golden Gate or the San Bruno gap. For example, the average wind speed at San Francisco International Airport in July is about 17 knots (from 3 p.m. to 4 p.m.), compared with only 7 knots at San Jose and less than 6 knots at the Farallon Islands.

The air flowing in from the coast to the Central Valley, called the sea breeze, begins developing at or near ground level along the coast in late morning or early afternoon. As the day progresses, the sea breeze layer deepens and increases in velocity while spreading inland. The depth of the sea breeze depends in large part upon the height and strength of the inversion. If the inversion is low and strong, and hence stable, the flow of the sea breeze will be inhibited and stagnant conditions are likely to result.

In the winter, the SFBAAB frequently experiences stormy conditions with moderate to strong winds, as well as periods of stagnation with very light winds. Winter stagnation episodes are characterized by nighttime drainage flows in coastal valleys. Drainage is a reversal of the usual daytime air-flow patterns; air moves from the Central Valley toward the coast and back down toward the Bay from the smaller valleys within the SFBAAB.

Temperature

Summertime temperatures in the SFBAAB are determined in large part by the effect of differential heating between land and water surfaces. Because land tends to heat up and cool off more quickly than water, a large-scale gradient (differential) in temperature is often created between the coast and the Central Valley, and small-scale local gradients are often produced along the shorelines of the ocean and bays. The temperature gradient near the ocean is also exaggerated, especially in summer, because of the upwelling of cold ocean bottom water along the coast. On summer afternoons the temperatures at the coast can be 35ºF cooler than temperatures 15 to 20 miles inland. At night this contrast usually decreases to less than 10º.

In the winter, the relationship of minimum and maximum temperatures is reversed. During the daytime the temperature contrast between the coast and inland areas is small, whereas at night the variation in temperature is large.

Precipitation

The SFBAAB is characterized by moderately wet winters and dry summers. Winter rains account for about 75 percent of the average annual rainfall. The amount of annual precipitation can vary greatly from one part of the SFBAAB to another even within short distances. In general, total

annual rainfall can reach 40 inches in the mountains, but it is often less than 16 inches in sheltered valleys.

During rainy periods, ventilation (rapid horizontal movement of air and injection of cleaner air) and vertical mixing are usually high, and thus pollution levels tend to be low. However, frequent dry periods do occur during the winter where mixing and ventilation are low and pollutant levels build up.

Air Pollution Potential

The potential for high pollutant concentrations developing at a given location depends upon the quantity of pollutants emitted into the atmosphere in the surrounding area or upwind, and 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.

Wind Circulation

Low wind speed contributes to the buildup of air pollution because it allows more pollutants to be emitted into the air mass per unit of time. Light winds occur most frequently during periods of low sun (fall and winter, and early morning) and at night. These are also periods when air pollutant emissions from some sources are at their peak, namely, commute traffic (early morning) and wood burning appliances (nighttime). The problem can be compounded in valleys, when weak flows carry the pollutants upvalley during the day, and cold air drainage flows move the air mass downvalley at night. Such restricted movement of trapped air provides little opportunity for ventilation and leads to buildup of pollutants to potentially unhealthful levels.

Wind-roses provide useful information for communities that contain industry, landfills or other potentially odorous or noxious land uses. Each wind-rose diagram provides a general indication of the proportion of time that winds blow from each compass direction. The longer the vector length, the greater the frequency of wind occurring from that direction. Such information may be particularly useful in planning buffer zones. For example, sensitive receptors such as residential developments, schools or hospitals are inappropriate uses immediately downwind from facilities that emit toxic or odorous pollutants, unless adequate separation is provided by a buffer zone. Caution should be taken in using wind-roses in planning and environmental review processes. A site on the opposite side of a hill or tall building, even a short distance from a meteorological monitoring station, may experience a significant difference in wind pattern. Consult BAAQMD meteorologists if more detailed wind circulation information is needed.

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.

There are two types of inversions that occur regularly in the SFBAAB. One is more common in the summer and fall, while the other is most common during the 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 build-up of such

pollutants as carbon monoxide 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 to 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 of these factors contribute

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.

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 and oxides of nitrogen react to 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 insufficient ultraviolet light and warming of the atmosphere to drive the photochemical reactions. Ozone concentrations do not reach significant levels in the SFBAAB during these seasons.

Sheltered Terrain

The hills and mountains in the SFBAAB contribute to the high pollution potential of some areas. During the day, or at night during windy conditions, areas in the lee sides of mountains are sheltered from the prevailing winds, thereby reducing turbulence and downwind transport. At night, when wind speeds are low, the upper atmospheric layers are often decoupled from the surface layers during radiation conditions. If elevated terrain is present, it will tend to block pollutant transport in that direction. Elevated terrain also can create a recirculation pattern by inducing upvalley air flows during the day and reverse downvalley flows during the night, allowing little inflow of fresh air.

The areas having the highest air pollution potential tend to be those that experience the highest temperatures in the summer and the lowest temperatures in the winter. The coastal areas are exposed to the prevailing marine air , creating cooler temperatures in the summer, warmer temperatures in winter, and stratus clouds all year. The inland valleys are sheltered from the marine air and experience hotter summers and colder winters. Thus, the topography of the inland valleys creates conditions conducive to high air pollution potential.

Pollution Potential Related to Emissions

Although air pollution potential is strongly influenced by climate and topography, the air pollution that occurs in a location also depends upon 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, high motor vehicle use and/or industrialization. These 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.

Climatological Subregions

This section discusses the varying climatological and topographic conditions, and the resulting variations in air pollution potential, within inhabited subregions of the SFBAAB. All urbanized areas of the SFBAAB are included in one of 11 climatological subregions. Sparsely inhabited areas are excluded from the subregional designations. Some of the climatological subregions discussed in this appendix overlap county boundaries. The Lead Agencies analyzing projects located close to the boundary between subregions may need to examine the characteristics of the neighboring subregions to adequately evaluate potential air quality impacts.

The information about each subregion includes location, topography and climatological factors relevant to air quality. Where relevant to air quality concerns, more localized subareas within a subregion are discussed. Each subregional section concludes with a discussion of pollution potential resulting from climatological and topographic variables and the major types of air pollutant sources in the subregion.

Carquinez Strait Region

The Carquinez Strait runs from Rodeo to Martinez. It is the only sea-level gap between the Bay and the Central Valley. The subregion includes the lowlands bordering the strait to the north and south, and includes the area adjoining Suisun Bay and the western part of the Sacramento-San Joaquin Delta as far east as Bethel Island. The subregion extends from Rodeo in the southwest and Vallejo in the northwest to Fairfield on the northeast and Brentwood on the southeast.

Prevailing winds are from the west in the Carquinez Strait. During the summer and fall months, high pressure offshore coupled with low pressure in the Central Valley causes marine air to flow eastward through the Carquinez Strait. The wind is strongest in the afternoon. Afternoon wind speeds of 15 to 20 mph are common throughout the strait region. Annual average wind speeds are 8 mph in Martinez, and 9 to 10 mph further east. Sometimes atmospheric conditions cause air to flow from the east. East winds usually contain more pollutants than the cleaner marine air from the west. In the summer and fall months, this can cause elevated pollutant levels to move into the central SFBAAB through the strait. These high pressure periods are usually accompanied by low wind speeds, shallow mixing depths, higher temperatures and little or no rainfall.

Summer mean maximum temperatures reach about 90º F. in the subregion. Mean minimum temperatures in the winter are in the high 30's. Temperature extremes are especially pronounced in sheltered areas farther from the moderating effects of the strait itself, e.g. at Fairfield.

Many industrial facilities with significant air pollutant emissions — e.g., chemical plants and refineries — are located within the Carquinez Strait Region. The pollution potential of this area is often moderated by high wind speeds. However, upsets at industrial facilities can lead to short-term pollution episodes, and emissions of unpleasant odors may occur at anytime. Receptors downwind of these facilities could suffer more long-term exposure to air contaminants than individuals elsewhere., It is important that local governments and other Lead Agencies maintain buffers zones around sources of air pollution sufficient to avoid adverse health and nuisance impacts on nearby receptors. Areas of the subregion that are traversed by major roadways, e.g. Interstate 80, may also be subject to higher local concentrations of carbon monoxide and particulate matter, as well as certain toxic air contaminants such as benzene.

Cotati and Petaluma Valleys

The subregion that stretches from Santa Rosa to the San Pablo Bay is often considered as two different valleys: the Cotati Valley in the north and the Petaluma Valley in the south. To the east, the valley is bordered by the Sonoma Mountains, while to the west is a series of low hills, followed by the Estero Lowlands, which open to the Pacific Ocean. The region from the Estero

Lowlands to the San Pablo Bay is known as the Petaluma Gap. This low-terrain area allows marine air to travel into the SFBAAB.

Wind patterns in the Petaluma and Cotati Valleys are strongly influenced by the Petaluma Gap, with winds flowing predominantly from the west. As marine air travels through the Petaluma Gap, it splits into northward and southward paths moving into the Cotati and Petaluma valleys. The southward path crosses San Pablo Bay and moves eastward through the Carquinez Strait. The northward path contributes to Santa Rosa's prevailing winds from the south and southeast. Petaluma's prevailing winds are from the northwest.

When the ocean breeze is weak, strong winds from the east can predominate, carrying pollutants from the Central Valley and the Carquinez Strait. During these periods, upvalley flows can carry the polluted air as far north as Santa Rosa.

Winds are usually stronger in the Petaluma Valley than the Cotati Valley because the former is directly in line with the Petaluma Gap. Petaluma's climate is similar to areas closer to the coast even though Petaluma is 28 miles from the ocean. Average annual wind speed at the Petaluma Airport is seven mph. The Cotati Valley, being slightly north of the Petaluma Gap, experiences lower wind speeds. The annual average wind speed in Santa Rosa is five mph.

Air temperatures are very similar in the two valleys. Summer maximum temperatures for this subregion are in the low-to-mid-80's, while winter maximum temperatures are in the high-50's to low-60's. Summer minimum temperatures are around 50 degrees, and winter minimum temperatures are in the high 30's.

Generally, air pollution potential is low in the Petaluma Valley because of its link to the Petaluma Gap and because of its low population density. There are two scenarios that could produce elevated pollutant levels: 1) stagnant conditions in the morning hours created when a weak ocean breeze meets a weak bay breeze, and 2) an eastern or southeastern wind pattern in the afternoon brings in pollution from the Carquinez Strait Region and the Central Valley.

The Cotati Valley has a higher pollution potential than does the Petaluma Valley. The Cotati Valley lacks a gap to the sea, contains a larger population and has natural barriers at its northern and eastern ends. There are also industrial facilities in and around Santa Rosa. Both valleys of this subregion are also threatened by increased motor vehicle traffic and the associated air contaminants. Population and motor vehicle use are increasing significantly, and housing costs and the suburbanization of employment are leading to more and longer commutes traversing the subregion.

Diablo and San Ramon Valleys

East of the Coast Range lay the Diablo and San Ramon Valleys. The valleys have a northwest to southeast orientation, with the northern portion known as Diablo Valley and the southern portion as San Ramon Valley. The Diablo Valley is bordered in the north by the Carquinez Strait and in the south by the San Ramon Valley. The San Ramon Valley is long and narrow and extends south from Walnut Creek to Dublin. At its southern end it opens onto the Amador Valley.

The mountains on the west side of these valleys block much of the marine air from reaching the valleys. During the daytime, there are two predominant flow patterns: an upvalley flow from the north and a westerly flow (wind from the west) across the lower elevations of the Coast Range. On clear nights, surface inversions separate the flow of air into two layers: the surface flow and the upper layer flow. When this happens, there are often drainage surface winds which flow downvalley toward the Carquinez Strait.

Wind speeds in these valleys generally are low. Monitoring stations in Concord and Danville report annual average wind speeds of 5 mph. Winds can increase in the afternoon near San Ramon because it is located at the eastern edge of the Crow Canyon gap. Through this gap, polluted air from cities near the Bay travels to the valley in the summer months.

Air temperatures in these valleys are cooler in the winter and warmer in the summer than are temperatures further west, as these valleys are far from the moderating effect of the Bay and ocean. Mean summer maximum temperatures are in the low- to mid-80's. Mean winter minimum temperatures are in the high-30's to low-40's.

Pollution potential is relatively high in these valleys. On winter evenings, light winds combined with surface-based inversions and terrain that restricts air flow can cause pollutant levels to build up. San Ramon Valley can experience high pollution concentrations due to motor vehicle emissions and emissions from fireplaces and wood stoves. In the summer months, ozone and ozone precursors are often transported into the valleys from both the central SFBAAB and the Central Valley.

Livermore Valley

The Livermore Valley is a sheltered inland valley near the eastern border of SFBAAB. The western side of the valley is bordered by 1,000 to 1,500 foot hills with two gaps connecting the valley to the central SFBAAB, the Hayward Pass and Niles Canyon. The eastern side of the valley also is bordered by 1,000 to 1,500 foot hills with one major passage to the San Joaquin Valley called the Altamont Pass and several secondary passages. To the north lie the Black Hills and Mount Diablo. A northwest to southeast channel connects the Diablo Valley to the Livermore Valley. The south side of the Livermore Valley is bordered by mountains approximately 3,000 to 3,500 feet high.

During the summer months, when there is a strong inversion with a low ceiling, air movement is weak and pollutants become trapped and concentrated. Maximum summer temperatures in the Livermore Valley range from the high-80's to the low-90's, with extremes in the 100's. At other times in the summer, a strong Pacific high pressure cell from the west, coupled with hot inland temperatures causes a strong onshore pressure gradient which produces a strong, afternoon wind. With a weak temperature inversion, air moves over the hills with ease, dispersing pollutants.

In the winter, with the exception of an occasional storm moving through the area, air movement is often dictated by local conditions. At night and early morning, especially under clear, calm and cold conditions, gravity drives cold air downward. The cold air drains off the hills and moves into the gaps and passes. On the eastern side of the valley the prevailing winds blow from north, northeast and east out of the Altamont Pass. Winds are light during the late night and early morning hours. Winter daytime winds sometimes flow from the south through the Altamont Pass to the San Joaquin Valley. Average winter maximum temperatures range from the high-50's to the low-60's, while minimum temperatures are from the mid-to-high-30's, with extremes in the high teens and low-20's.

Air pollution potential is high in the Livermore Valley, especially for photochemical pollutants in the summer and fall. High temperatures increase the potential for ozone to build up. The valley not only traps locally generated pollutants but can be the receptor of ozone and ozone precursors from San Francisco, Alameda, Contra Costa and Santa Clara counties. On northeasterly wind flow days, most common in the early fall, ozone may be carried west from the San Joaquin Valley to the Livermore Valley.

During the winter, the sheltering effect of the valley, its distance from moderating water bodies, and the presence of a strong high pressure system contribute to the development of strong,

surface-based temperature inversions. Pollutants such as carbon monoxide and particulate matter, generated by motor vehicles, fireplaces and agricultural burning, can become concentrated. Air pollution problems could intensify because of population growth and increased commuting to and through the subregion.

Marin County Basins

Marin County is bounded on the west by the Pacific Ocean, on the east by San Pablo Bay, on the south by the Golden Gate and on the north by the Petaluma Gap. Most of Marin's population lives in the eastern part of the county, in small, sheltered valleys. These valleys act like a series of miniature air basins.

Although there are a few mountains above 1500 feet, most of the terrain is only 800 to 1000 feet high, which usually is not high enough to block the marine layer. Because of the wedge shape of the county, northeast Marin County is further from the ocean than is the southeastern section. This extra distance from the ocean allows the marine air to be moderated by bayside conditions as it travels to northeastern Marin County. In southern Marin the distance from the ocean is short and elevations are lower, resulting in higher incidence of maritime air in that area.

Wind speeds are highest along the west coast of Marin, averaging about 8 to 10 miles per hour. The complex terrain in central Marin creates sufficient friction to slow the air flow. At Hamilton Air Force Base, in Novato, the annual average wind speeds are only 5 mph. The prevailing wind directions throughout Marin County are generally from the northwest.

In the summer months, areas along the coast are usually subject to onshore movement of cool marine air. In the winter, proximity to the ocean keeps the coastal regions relatively warm, with temperatures varying little throughout the year. Coastal temperatures are usually in the high-50's in the winter and the low-60's in the summer. The warmest months are September and October.

The eastern side of Marin County has warmer weather than the western side because of its distance from the ocean and because the hills that separate eastern Marin from western Marin occasionally block the flow of the marine air. The temperatures of cities next to the Bay are moderated by the cooling effect of the Bay in the summer and the warming effect of the Bay in the winter. For example, San Rafael experiences average maximum summer temperatures in the low-80's and average minimum winter temperatures in the low-40’s. Inland towns such as Kentfield experience average maximum temperatures that are two degrees cooler in the winter and two degrees warmer in the summer.

Air pollution potential is highest in eastern Marin County, where most of population is located in semi-sheltered valleys. In the southeast, the influence of marine air keeps pollution levels low. As development moves further north, there is greater potential for air pollution to build up because the valleys are more sheltered from the sea breeze. While Marin County does not have many polluting industries, the air quality on its eastern side — especially along the U.S. 101 corridor — may be affected by emissions from increasing motor vehicle use within and through the county.

Napa Valley

The Napa Valley is bordered by relatively high mountains. With an average ridge line height of about 2000 feet, with some peaks approaching 3000 to 4000 feet, these mountains are effective barriers to the prevailing northwesterly winds. The Napa Valley is widest at its southern end and narrows in the north.

During the day, the prevailing winds flow upvalley from the south about half of the time. A strong upvalley wind frequently develops during warm summer afternoons, drawing air in from the San Pablo Bay. Daytime winds sometimes flow downvalley from the north. During the evening, especially in the winter, downvalley drainage often occurs. Wind speeds are generally low, with

almost 50 percent of the winds less than 4 mph. Only 5 percent of the winds are between 16 and 18 mph, representing strong summertime upvalley winds and winter storms.

Summer average maximum temperatures are in the low 80's at the southern end of the valley and in the low 90's at the northern end. Winter average maximum temperatures are in the high-50's and low-60's, and minimum temperatures are in the high to mid 30's with the slightly cooler temperatures in the northern end.

The air pollution potential in the Napa Valley could be high if there were sufficient sources of air contaminants nearby. Summer and fall prevailing winds can transport ozone precursors northward from the Carquinez Strait Region to the Napa Valley, effectively trapping and concentrating the pollutants when stable conditions are present. The local upslope and downslope flows created by the surrounding mountains may also recirculate pollutants already present, contributing to buildup of air pollution. High ozone concentrations are a potential problem to sensitive crops such as wine grapes, as well as to human health. The high frequency of light winds and stable conditions during the late fall and winter contribute to the buildup of particulate matter from motor vehicles, agriculture and woodburning in fireplaces and stoves.

Northern Alameda and Western Contra Costa Counties

This climatological subregion stretches from Richmond to San Leandro. Its western boundary is defined by the Bay and its eastern boundary by the Oakland-Berkeley Hills. The Oakland-Berkeley Hills have a ridge line height of approximately 1500 feet, a significant barrier to air flow. The most densely populated area of the subregion lies in a strip of land between the Bay and the lower hills.

In this area, marine air traveling through the Golden Gate, as well as across San Francisco and through the San Bruno Gap, is a dominant weather factor. The Oakland-Berkeley Hills cause the westerly flow of air to split off to the north and south of Oakland, which causes diminished wind speeds. The prevailing winds for most of this subregion are from the west. At the northern end, near Richmond, prevailing winds are from the south-southwest.

Temperatures in this subregion have a narrow range due to the proximity of the moderating marine air. Maximum temperatures in summer average in the mid-70's, with minimums in the mid-50's. Winter highs are in the mid- to high-50's, with lows in the low- to mid-40's.

The air pollution potential is lowest for the parts of the subregion that are closest to the bay, due largely to good ventilation and less influx of pollutants from upwind sources. The occurrence of light winds in the evenings and early mornings occasionally causes elevated pollutant levels.

The air pollution potential at the northern (Richmond) and southern (Oakland, San Leandro) parts of this subregion is marginally higher than communities directly east of the Golden Gate, because of the lower frequency of strong winds.

This subregion contains a variety of industrial air pollution sources. Some industries are quite close to residential areas. The subregion is also traversed by frequently congested major freeways. Traffic and congestion, and the motor vehicle emissions they generate, are increasing.

Peninsula

The peninsula region extends from northwest of San Jose to the Golden Gate. The Santa Cruz Mountains run up the center of the peninsula, with elevations exceeding 2000 feet at the southern end, decreasing to 500 feet in South San Francisco. Coastal towns experience a high incidence of cool, foggy weather in the summer. Cities in the southeastern peninsula experience warmer temperatures and fewer foggy days because the marine layer is blocked by the ridgeline to the west. San Francisco lies at the northern end of the peninsula. Because most of San Francisco's

topography is below 200 feet, marine air is able to flow easily across most of the city, making its climate cool and windy.

The blocking effect of the Santa Cruz Mountains results in variations in summertime maximum temperatures in different parts of the peninsula. For example, in coastal areas and San Francisco the mean maximum summer temperatures are in the mid-60's, while in Redwood City the mean maximum summer temperatures are in the low-80's. Mean minimum temperatures during the winter months are in the high-30's to low-40's on the eastern side of the Peninsula and in the low 40's on the coast.

Two important gaps in the Santa Cruz Mountains occur on the peninsula. The larger of the two is the San Bruno Gap, extending from Fort Funston on the ocean to the San Francisco Airport. Because the gap is oriented in the same northwest to southeast direction as the prevailing winds, and because the elevations along the gap are less than 200 feet, marine air is easily able to penetrate into the bay. The other gap is the Crystal Springs Gap, between Half Moon Bay and San Carlos. As the sea breeze strengthens on summer afternoons, the gap permits maritime air to pass across the mountains, and its cooling effect is commonly seen from San Mateo to Redwood City.

Annual average wind speeds range from 5 to 10 mph throughout the peninsula, with higher wind speeds usually found along the coast. Winds on the eastern side of the peninsula are often high in certain areas, such as near the San Bruno Gap and the Crystal Springs Gap.

The prevailing winds along the peninsula's coast are from the west, although individual sites can show significant differences. For example, Fort Funston in western San Francisco shows a southwest wind pattern while Pillar Point in San Mateo County shows a northwest wind pattern. On the east side of the mountains winds are generally from the west, although wind patterns in this area are often influenced greatly by local topographic features.

Air pollution potential is highest along the southeastern portion of the peninsula. This is the area most protected from the high winds and fog of the marine layer. Pollutant transport from upwind sites is common. In the southeastern portion of the peninsula, air pollutant emissions are relatively high due to motor vehicle traffic as well as stationary sources. At the northern end of the peninsula in San Francisco, pollutant emissions are high, especially from motor vehicle congestion. Localized pollutants, such as carbon monoxide, can build up in "urban canyons". Winds are generally fast enough to carry the pollutants away before they can accumulate.

Santa Clara Valley

The Santa Clara Valley is bounded by the 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 fairly mild. At the northern end of the valley, mean maximum temperatures are in the low-80's during the summer and the high-50's during the winter, and mean minimum temperatures range from the high-50's in the summer to the low-40's in the winter. Further inland, where the moderating effect of the Bay is not as strong, temperature extremes are greater. For example, in San Martin, located 27 miles south of the San Jose Airport, temperatures can be more than 10 degrees warmer on summer afternoons and more than 10 degrees cooler on winter nights.

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 the summer the southern end of the valley sometimes becomes a "convergence zone," when air flowing from the Monterey Bay gets

channeled northward into the southern end of the valley and meets with the prevailing north-northwesterly winds.

Wind speeds are greatest in the spring and summer and weakest in the fall and winter. Nighttime and early morning hours frequently have calm winds in all seasons, while summer afternoons and evenings are quite breezy. Strong winds are rare, associated mostly with the occasional winter storm.

The air pollution potential of the Santa Clara Valley is high. High summer temperatures, stable air and mountains surrounding the valley combine to promote ozone formation. In addition to the many local sources of pollution, ozone precursors from San Francisco, San Mateo and Alameda Counties are carried by prevailing winds to the Santa Clara Valley. The valley tends to channel pollutants to the southeast. In addition, on summer days with low level inversions, ozone can be recirculated by southerly drainage flows in the late evening and early morning and by the prevailing northwesterlies in the afternoon. A similar recirculation pattern occurs in the winter, affecting levels of carbon monoxide and particulate matter. This movement of the air up and down the valley increases the impact of the pollutants significantly.

Pollution sources are plentiful and complex in this subregion. The Santa Clara Valley has a high concentration of industry at the northern end, in the Silicon Valley. Some of these industries are sources of air toxics as well as criteria air pollutants. In addition, Santa Clara Valley's large population and many work-site destinations generate the highest mobile source emissions of any subregion in the SFBAAB.

Sonoma Valley

The Sonoma Valley is west of the Napa Valley. It is separated from the Napa Valley and from the Cotati and Petaluma Valleys by mountains. The Sonoma Valley is long and narrow, approximately 5 miles wide at its southern end and less than a mile wide at the northern end.

The climate is similar to that of the Napa Valley, with the same basic wind characteristics. The strongest upvalley winds occur in the afternoon during the summer and the strongest downvalley winds occur during clear, calm winter nights. Prevailing winds follow the axis of the valley, northwest/southeast, while some upslope flow during the day and downslope flow during the night occurs near the base of the mountains. Summer average maximum temperatures are usually in the high-80's, and summer minimums are around 50 degrees. Winter maximums are in the high-50's to the mid-60's, with minimums ranging from the mid-30's to low-40's.

As in the Napa Valley, the air pollution potential of the Sonoma Valley could be high if there were significant sources of pollution nearby. Prevailing winds can transport locally and nonlocally generated pollutants northward into the narrow valley, which often traps and concentrates the pollutants under stable conditions. The local upslope and downslope flows set up by the surrounding mountains may also recirculate pollutants.

However, local sources of air pollution are minor. With the exception of some processing of agricultural goods, such as wine and cheese manufacturing, there is little industry in this valley. Increases in motor vehicle emissions and woodsmoke emissions from stoves and fireplaces may increase pollution as the valley grows in population and as a tourist attraction.

Southwestern Alameda County

This subregion encompasses the southeast side of San Francisco Bay, from Dublin Canyon to north of Milpitas. The subregion is bordered on the east by the East Bay hills and on the west by the bay. Most of the area is flat.

This subregion is indirectly affected by marine air flow. Marine air entering through the Golden Gate is blocked by the East Bay hills, forcing the air to diverge into northerly and southerly paths. The southern flow is directed down the bay, parallel to the hills, where it eventually passes over southwestern Alameda County. These sea breezes are strongest in the afternoon. The further from the ocean the marine air travels, the more the ocean's effect is diminished. Although the climate in this region is affected by sea breezes, it is affected less so than the regions closer to the Golden Gate.

The climate of southwestern Alameda County is also affected by its close proximity to San Francisco Bay. The Bay cools the air with which it comes in contact during warm weather, while during cold weather the Bay warms the air. The normal northwest wind pattern carries this air onshore. Bay breezes push cool air onshore during the daytime and draw air from the land offshore at night.

Winds are predominantly out of the northwest during the summer months. In the winter, winds are equally likely to be from the east. Easterly-southeasterly surface flow into southern Alameda County passes through three major gaps: Hayward/Dublin Canyon, Niles Canyon and Mission Pass. Areas north of the gaps experience winds from the southeast, while areas south of the gaps experience winds from the northeast. Wind speeds are moderate in this subregion, with annual average wind speeds close to the Bay at about 7 mph, while further inland they average 6 mph.

Air temperatures are moderated by the subregion's proximity to the Bay and to the sea breeze. Temperatures are slightly cooler in the winter and slightly warmer in the summer than East Bay cities to the north. During the summer months, average maximum temperatures are in the mid-70's. Average maximum winter temperatures are in the high-50's to low-60's. Average minimum temperatures are in the low 40's in winter and mid-50's in the summer.

Pollution potential is relatively high in this subregion during the summer and fall. When high pressure dominates, low mixing depths and Bay and ocean wind patterns can concentrate and carry pollutants from other cities to this area, adding to the locally emitted pollutant mix. The polluted air is then pushed up against the East Bay hills. In the wintertime, the air pollution potential in southwestern Alameda County is moderate. Air pollution sources include light and heavy industry, and motor vehicles. Increasing motor vehicle traffic and congestion in the subregion may increase Southwest Alameda County pollution as well as that of its neighboring subregions.

B.1.2. Existing Ambient Air Quality: Criteria Air Pollutants

The California Air Resources Board (ARB) and the U.S. Environmental Protection Agency (EPA) currently focus on the following air pollutants as indicators of ambient air quality: ozone, particulate matter (PM), nitrogen dioxide (NO_2), CO, sulfur dioxide (SO_2), and lead. Because these are the most prevalent air pollutants known to be deleterious to human health and extensive health-effects criteria documents are available, they are commonly referred to as "criteria air pollutants." Sources and health effects of the criteria air pollutants are summarized in Table B.1. Current state and federal air quality standards are available at http://www.arb.ca.gov/research/aaqs/aaqs2.pdf and designations are available at http://www.arb.ca.gov/desig/desig.htm.

Table B.1
Common Sources of Health Effects for Criteria Air Pollutants

Pollutants	Sources	Health Effects
Ozone	Atmospheric reaction of organic gases with nitrogen oxides in sunlight	Aggravation of respiratory and cardiovascular diseases; reduced lung function; increased cough and chest discomfort
Fine Particulate Matter (PM_{10} and $PM_{2.5}$)	Stationary combustion of solid fuels; construction activities; industrial processes; atmospheric chemical reactions	Reduced lung function; aggravation of respiratory and cardiovascular diseases; increases in mortality rate; reduced lung function growth in children
Nitrogen Dioxide (NO_2)	Motor vehicle exhaust; high temperature stationary combustion; atmospheric reactions	Aggravation of respiratory illness
Carbon Monoxide (CO)	Incomplete combustion of fuels and other carbon-containing substances, such as motor vehicle exhaust; natural events, such as decomposition of organic matter	Aggravation of some heart diseases; reduced tolerance for exercise; impairment of mental function; birth defects; death at high levels of exposure
Sulfur Dioxide (SO_2)	Combination of sulfur-containing fossil fuels; smelting of sulfur-bearing metal ore; industrial processes	Aggravation of respiratory diseases; reduced lung function
Lead	Contaminated soil	Behavioral and hearing disabilities in children; nervous system impairment

Source: South Coast Air Quality Management District 2005; EPA 2009; EDAW 2009

Ozone, or smog, is not emitted directly into the environment, but is formed in the atmosphere by complex chemical reactions between ROG and NO_X in the presence of sunlight. Ozone formation is greatest on warm, windless, sunny days. The main sources of NO_X and ROG, often referred to as ozone precursors, are combustion processes (including motor vehicle engines) the evaporation of solvents, paints, and fuels, and biogenic sources. Automobiles are the single largest source of ozone precursors in the SFBAAB. Tailpipe emissions of ROG are highest during cold starts, hard acceleration, stop-and-go conditions, and slow speeds. They decline as speeds increase up to about 50 mph, then increase again at high speeds and high engine loads. ROG emissions associated with evaporation of unburned fuel depend on vehicle and ambient temperature cycles. Nitrogen oxide emissions exhibit a different curve; emissions decrease as the vehicle approaches 30 mph and then begin to increase with increasing speeds.

Ozone levels usually build up during the day and peak in the afternoon hours. Short-term exposure can irritate the eyes and cause constriction of the airways. Besides causing shortness of breath, it can aggravate existing respiratory diseases such as asthma, bronchitis and emphysema. Chronic exposure to high ozone levels can permanently damage lung tissue. Ozone can also damage plants and trees, and materials such as rubber and fabrics.

Particulate Matter refers to a wide range of solid or liquid particles in the atmosphere, including smoke, dust, aerosols, and metallic oxides. Respirable particulate matter with an aerodynamic diameter of 10 micrometers or less is referred to as PM_{10}. $PM_{2.5}$ includes a subgroup of finer particles that have an aerodynamic diameter of 2.5 micrometers or less. Some particulate matter,

such as pollen, is naturally occurring. In the SFBAAB most particulate matter is caused by combustion, factories, construction, grading, demolition, agricultural activities, and motor vehicles. Extended exposure to particulate matter can increase the risk of chronic respiratory disease. PM_{10} is of concern because it bypasses the body's natural filtration system more easily than larger particles, and can lodge deep in the lungs. The EPA and the state of California revised their PM standards several years ago to apply only to these fine particles. $PM_{2.5}$ poses an increased health risk because the particles can deposit deep in the lungs and contain substances that are particularly harmful to human health. Motor vehicles are currently responsible for about half of particulates in the SFBAAB. Wood burning in fireplaces and stoves is another large source of fine particulates.

Nitrogen Dioxide (NO_2) is a reddish-brown gas that is a by-product of combustion processes. Automobiles and industrial operations are the main sources of NO_2. Aside from its contribution to ozone formation, nitrogen dioxide can increase the risk of acute and chronic respiratory disease and reduce visibility. NO_2 may be visible as a coloring component of a brown cloud on high pollution days, especially in conjunction with high ozone levels.

Carbon Monoxide (CO) is an odorless, colorless gas. It is formed by the incomplete combustion of fuels. The single largest source of CO in the SFBAAB is motor vehicles. Emissions are highest during cold starts, hard acceleration, stop-and-go driving, and when a vehicle is moving at low speeds. New findings indicate that CO emissions per mile are lowest at about 45 mph for the average light-duty motor vehicle and begin to increase again at higher speeds. When inhaled at high concentrations, CO combines with hemoglobin in the blood and reduces the oxygen-carrying capacity of the blood. This results in reduced oxygen reaching the brain, heart and other body tissues. This condition is especially critical for people with cardiovascular diseases, chronic lung disease or anemia, as well as fetuses. Even healthy people exposed to high CO concentrations can experience headaches, dizziness, fatigue, unconsciousness, and even death.

Sulfur Dioxide (SO_2) is a colorless acid gas with a pungent odor. It has potential to damage materials and it can have health effects at high concentrations. It is produced by the combustion of sulfur-containing fuels, such as oil, coal and diesel. SO_2 can irritate lung tissue and increase the risk of acute and chronic respiratory disease.

Lead is a metal found naturally in the environment as well as in manufactured products. The major sources of lead emissions have historically been mobile and industrial sources. As a result of the phase-out of leaded gasoline, metal processing is currently the primary source of lead emissions. The highest levels of lead in air are generally found near lead smelters. Other stationary sources are waste incinerators, utilities, and lead-acid battery manufacturers.

Twenty years ago, mobile sources were the main contributor to ambient lead concentrations in the air. In the early 1970s, the EPA set national regulations to gradually reduce the lead content in gasoline. In 1975, unleaded gasoline was introduced for motor vehicles equipped with catalytic converters. The EPA banned the use of leaded gasoline in highway vehicles in December 1995. As a result of the EPA's regulatory efforts to remove lead from gasoline, emissions of lead from the transportation sector and levels of lead in the air decreased dramatically.

Monitoring Data

The BAAQMD operates a regional air quality monitoring network that regularly measures the concentrations of the five major criteria air pollutants. Air pollutant monitoring data is available at http://www.arb.ca.gov/adam/welcome.html. Air quality conditions in the SFBAAB have improved significantly since the BAAQMD was created in 1955. Ambient concentrations and the number of days on which the region exceeds standards have declined dramatically. Neither State nor

national ambient air quality standards of these chemicals have been violated in recent decades for nitrogen dioxide, sulfur dioxide, sulfates, lead, hydrogen sulfide, and vinyl chloride.

Emissions Inventory

The BAAQMD estimates emissions of criteria air pollutants from approximately nine hundred source categories. The estimates are based on BAAQMD permit information for stationary sources (e.g., manufacturing industries, refineries, dry-cleaning operations), plus more generalized estimates for area sources (e.g., space heating, landscaping activities, use of consumer products) and mobile sources (e.g., trains, ships and planes, as well as on-road and off-road motor vehicles). BAAQMD emissions inventory data is available at http://www.arb.ca.gov/ei/maps/statemap/dismap.htm.

B.1.3. Existing Ambient Air Quality: Toxic Air Contaminants

In addition to the criteria air pollutants listed above, another group of pollutants, commonly referred to as toxic air contaminants (TACs) or hazardous air pollutants can result in health effects that can be quite severe. Many TACs are confirmed or suspected carcinogens, or are known or suspected to cause birth defects or neurological damage. Secondly, many TACs can be toxic at very low concentrations. For some chemicals, such as carcinogens, there are no thresholds below which exposure can be considered risk-free.

Industrial facilities and mobile sources are significant sources of TACs. The electronics industry, including semiconductor manufacturing, has the potential to contaminate both air and water due to the highly toxic chlorinated solvents commonly used in semiconductor production processes. Sources of TACs go beyond industry. Various common urban facilities also produce TAC emissions, such as gasoline stations (benzene), hospitals (ethylene oxide), and dry cleaners (perchloroethylene). Automobile exhaust also contains TACs such as benzene and 1,3-butadiene. Most recently, diesel particulate matter was identified as a TAC by the ARB. Diesel PM differs from other TACs in that it is not a single substance but rather a complex mixture of hundreds of substances. BAAQMD research indicates that mobile-source emissions of diesel PM, benzene, and 1,3-butadiene represent a substantial portion of the ambient background risk from TACs in the SFBAAB.

B.1.4. Greenhouse Gases and Global Climate Change

Unlike emissions of criteria and toxic air pollutants, which have local or regional impacts, emissions of greenhouse gases (GHGs) that contribute to global warming or global climate change have a broader, global impact. Global warming is a process whereby GHGs accumulating in the atmosphere contribute to an increase in the temperature of the earth's atmosphere. The principal GHGs contributing to global warming are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated compounds. The primary GHGs of concern are summarized in Table C.2. These gases allow visible and ultraviolet light from the sun to pass through the atmosphere, but they prevent heat from escaping back out into space. Among the potential implications of global warming are rising sea levels, and adverse impacts to water supply, water quality, agriculture, forestry, and habitats. In addition, global warming may increase electricity demand for cooling, decrease the availability of hydroelectric power, and affect regional air quality and public health. Like most criteria and toxic air pollutants, much of the GHG production comes from motor vehicles. GHG emissions can be reduced to some degree by improved coordination of land use and transportation planning on the city, county, and subregional level, and other measures to reduce automobile use. Energy conservation measures also can contribute to reductions in GHG emissions.

Table B.2 Examples of Greenhouse Gases	
Gas	Sources
Carbon dioxide (CO_2)	Fossil fuel combustion in stationary and point sources; emission sources includes burning of oil, coal, gas.
Methane (CH_4)	Incomplete combustion in forest fires, landfills, and leaks in natural gas and petroleum systems, agricultural activities, coal mining, wastewater treatment, and certain industrial processes.
Nitrous oxide (N_2O)	Fossil fuel combustion in stationary and point sources; other emission sources include agricultural soil management, animal manure management, sewage treatment, adipic acid production, and nitric acid production.
Chlorofluorocarbon (CFC), and Hydro-chlorofluorocarbon (HCFC)	Agents used in production of foam insulation; other sources include air conditioners, refrigerators, and solvents in cleaners.
Sulfur hexafluoride (SF_6)	Electric insulation in high voltage equipment that transmits and distributes electricity, including circuit breakers, gas-insulated substations, and other switchgear used in the transmission system to manage the high voltages carried between generating stations and customer load centers.
Perfluorocarbons (PFC's)	Primary aluminum production and semiconductor manufacturing.
Source: EPA 2009	

California Greenhouse Gas Emissions Inventory

Emissions of GHGs contributing to global climate change are attributable in large part to human activities associated with the transportation, industrial/manufacturing, utility, residential, commercial and agricultural sectors. In California, the transportation sector is the largest emitter of GHGs, followed by electricity generation. Emissions of CO_2 are byproducts of fossil fuel combustion. CH_4, a highly potent GHG, results from off-gassing (the release of chemicals from nonmetallic substances under ambient or greater pressure conditions) is largely associated with agricultural practices and landfills. N_2O is also largely attributable to agricultural practices and soil management. CO_2 sinks, or reservoirs, include vegetation and the ocean, which absorb CO_2 through sequestration and dissolution, respectively, two of the most common processes of CO_2 sequestration.

California produced 474 million gross metric tons (MMT) of CO_2 equivalent (CO_2e) averaged over the period from 2002-2004. CO_2e is a measurement used to account for the fact that different GHGs have different potential to retain infrared radiation in the atmosphere and contribute to the greenhouse effect. This potential, known as the global warming potential (GWP) of a GHG, is dependent on the lifetime, or persistence, of the gas molecule in the atmosphere. For example, one ton of CH_4 has the same contribution to the greenhouse effect as approximately 23 tons of CO_2. Therefore, CH_4 is a much more potent GHG than CO_2. Expressing emissions in CO_2e takes the contributions of all GHG emissions to the greenhouse effect and converts them to a single unit equivalent to the effect that would occur if only CO_2 were being emitted.

Combustion of fossil fuel in the transportation sector was the single largest source of California's GHG emissions in 2002-2004, accounting for 38 percent of total GHG emissions in the state. This sector was followed by the electric power sector (including both in-state and out-of-state sources) (18 percent) and the industrial sector (21 percent).

California Greenhouse Gas Emissions Projections
The 1990 GHG emissions limit is approximately 430 MMT CO_2e, which must be met in California by 2020 per the requirements of AB 32 (discussed below in the Regulatory Setting). ARB's GHG inventory for all emissions sectors would require an approximate 28 percent reduction in GHG emissions from projected 2020 forecasts to meet the target emissions limit (equivalent to levels in 1990) established in AB 32. The AB 32 Scoping Plan, discussed further below, is ARB's plan for meeting this mandate.

B.1.5. Existing Ambient Air Quality: Odors and Dust

Other air quality issues of concern in the SFBAAB include nuisance impacts of odors and dust. Objectionable odors may be associated with a variety of pollutants. Common sources of odors include wastewater treatment plants, landfills, composting facilities, refineries and chemical plants. Similarly, nuisance dust may be generated by a variety of sources including quarries, agriculture, grading and construction. Odors rarely have direct health impacts, but they can be very unpleasant and can lead to anger and concern over possible health effects among the public. Each year the BAAQMD receives thousands of citizen complaints about objectionable odors. Dust emissions can contribute to increased ambient concentrations of PM_{10}, and can also contribute to reduced visibility and soiling of exposed surfaces.

B.2. REGULATORY SETTING

Air quality with respect to criteria air pollutants and TACs within the SFBAAB is regulated by such agencies as the BAAQMD, ARB, and EPA. Each of these agencies develops rules, regulations, policies, and/or goals to attain the goals or directives imposed through legislation. Although the EPA regulations may not be superseded, both state and local regulations may be more stringent.

B.2.1. Criteria Air Pollutants

Federal Air Quality Regulations

U.S. Environmental Protection Agency
At the federal level, EPA has been charged with implementing national air quality programs. EPA's air quality mandates are drawn primarily from the Federal Clean Air Act (FCAA), which was enacted in 1963. The FCAA was amended in 1970, 1977, and 1990.

The FCAA required EPA to establish primary and secondary NAAQS, which are available at http://www.arb.ca.gov/research/aaqs/aaqs2.pdf. The FCAA also required each state to prepare an air quality control plan referred to as a State Implementation Plan (SIP). The Federal Clean Air Act Amendments of 1990 (FCAAA) added requirements for states with nonattainment areas to revise their SIPs to incorporate additional control measures to reduce air pollution. The SIP is periodically modified to reflect the latest emissions inventories, planning documents, and rules and regulations of the air basins as reported by their jurisdictional agencies. EPA has responsibility to review all state SIPs to determine conformation to the mandates of the FCAAA and determine if implementation will achieve air quality goals. If the EPA determines a SIP to be inadequate, a Federal Implementation Plan (FIP) may be prepared for the nonattainment area that imposes additional control measures. Failure to submit an approvable SIP or to implement the plan within the mandated timeframe may result in sanctions being applied to transportation funding and stationary air pollution sources in the air basin.

State Air Quality Regulations
In 1992 and 1993, the California Air Resources Board (CARB) requested delegation of authority for the implementation and enforcement of specified New Source Performance Standards

(NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAPS) to the following local agencies: Bay Area and South Coast Air Quality Management Districts (AQMDs). EPA's review of the State of California's laws, rules, and regulations showed them to be adequate for the implementation and enforcement of these federal standards, and EPA granted the delegations as requested.

California Air Resources Board

ARB 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), which was adopted in 1988. The CCAA requires that all air districts in the state endeavor to achieve and maintain the CAAQS by the earliest practical date. The act specifies that districts should focus particular attention on reducing the emissions from transportation and area-wide emission sources, and provides districts with the authority to regulate indirect sources.

ARB is primarily responsible for developing and implementing air pollution control plans to achieve and maintain the NAAQS. The ARB is primarily responsibility for statewide pollution sources and produces a major part of the SIP. Local air districts are still relied upon to provide additional strategies for sources under their jurisdiction. The ARB combines this data and submits the completed SIP to EPA.

Other ARB duties include monitoring air quality (in conjunction with air monitoring networks maintained by air pollution control and air quality management districts), establishing CAAQS (which in many cases are more stringent than the NAAQS), determining and updating area designations and maps, and setting emissions standards for new mobile sources, consumer products, small utility engines, and off-road vehicles.

Transport of Pollutants

The California Clean Air Act, Section 39610 (a), directs the ARB to “identify each district in which transported air pollutants from upwind areas outside the district cause or contribute to a violation of the ozone standard and to identify the district of origin of transported pollutants.” The information regarding the transport of air pollutants from one basin to another was to be quantified to assist interrelated basins in the preparation of plans for the attainment of State ambient air quality standards. Numerous studies conducted by the ARB have identified air basins that are impacted by pollutants transported from other air basins (as of 1993). Among the air basins affected by air pollution transport from the SFBAAB are the North Central Coast Air Basin, the Mountain Counties Air Basin, the San Joaquin Valley Air Basin, and the Sacramento Valley Air Basin. The SFBAAB was also identified as an area impacted by the transport of air pollutants from the Sacramento region.

Local Air Quality Regulations

Bay Area Air Quality Management District

The BAAQMD attains and maintains air quality conditions in the SFBAAB through a comprehensive program of planning, regulation, enforcement, technical innovation, and promotion of the understanding of air quality issues. The clean air strategy of the BAAQMD includes the preparation of plans for the attainment of ambient air quality standards, adoption and enforcement of rules and regulations concerning sources of air pollution, and issuance of permits for stationary sources of air pollution. The BAAQMD also inspects stationary sources of air pollution and responds to citizen complaints, monitors ambient air quality and meteorological conditions, and implements programs and regulations required by the FCAA, FCAAA, and the CCAA.

In 2009, the BAAQMD released the update to its CEQA Guidelines. This is an advisory document that provides the Lead Agency, consultants, and project applicants with uniform procedures for

addressing air quality in environmental documents. The handbook contains the following applicable components:

1. Criteria and thresholds for determining whether a project may have a significant adverse air quality impact;
2. Specific procedures and modeling protocols for quantifying and analyzing air quality impacts;
3. Methods available to mitigate air quality impacts;
4. Information for use in air quality assessments and environmental documents that will be updated more frequently such as air quality data, regulatory setting, climate, topography.

Air Quality Plans

As stated above, the BAAQMD prepares plans to attain ambient air quality standards in the SFBAAB. The BAAQMD prepares ozone attainment plans (OAP) for the national ozone standard and clean air plans (CAP) for the California standard both in coordination with the Metropolitan Transportation Commission and the Association of Bay Area Governments (ABAG).

With respect to applicable air quality plans, the BAAQMD prepared the *2009 Ozone Attainment Plan* to address nonattainment of the national 1-hour ozone standard in the SFBAAB. The purpose of the 2009 OAP is to:

1. Update the Bay Area 2005 Ozone Strategy in accordance with the requirements of the California Clean Air Act to implement “all feasible measures” to reduce ozone;
2. Consider the impacts of ozone control measures on particulate matter (PM), air toxics, and greenhouse gases in a single, integrated plan;
3. Review progress in improving air quality in recent years;
4. Establish emission control measures to be adopted or implemented in the 2009-2012 timeframe.

Similarly, the BAAQMD prepared the 2009 Clean Air Plan to address nonattainment of the CAAQS.

B.2.2. Toxic Air Contaminants

TACs, or in federal parlance under the FCAA, HAPs, are pollutants that result in an increase in mortality, a serious illness, or pose a present or potential hazard to human health. Health effects of TACs may include cancer, birth defects, and immune system and neurological damage.

TACs can be separated into carcinogens and noncarcinogens based on the nature of the physiological degradation associated with exposure to the pollutant. For regulatory purposes, carcinogens are assumed to have no safe threshold below which heath impacts will not occur. Noncarcinogenic TACs differ in that there is a safe level in which it is generally assumed that no negative health impacts would occur. These levels are determined on a pollutant-by-pollutant basis.

It is important to understand that TACs are not considered criteria air pollutants and thus are not specifically addressed through the setting of ambient air quality standards. Instead, the EPA and ARB regulate HAPs and TACs, respectively, through statutes and regulations that generally require the use of the maximum or best available control technology (MACT and BACT) to limit emissions. These in conjunction with additional rules set forth by the BAAQMD establish the regulatory framework for TACs.

Federal Hazardous Air Pollutant Program

Title III of the FCAAA requires the EPA to promulgate national emissions standards for hazardous air pollutants (NESHAPs). The NESHAP may differ for major sources than for area sources of HAPs. (Major sources are defined as stationary sources with potential to emit more than 10 tons per year [TPY] of any HAP or more than 25 TPY of any combination of HAPs; all other sources are considered area sources.) The emissions standards are to be promulgated in two phases. In the first phase (1992–2000), the EPA developed technology-based emission standards designed to produce the maximum emission reduction achievable. These standards are generally referred to as requiring MACT. These federal rules are also commonly referred to as MACT standards, because they reflect the Maximum Achievable Control Technology. For area sources, the standards may be different, based on generally available control technology. In the second phase (2001–2008), the EPA is required to promulgate health risk–based emissions standards where deemed necessary to address risks remaining after implementation of the technology-based NESHAP standards.The FCAAA required the EPA to promulgate vehicle or fuel standards containing reasonable requirements that control toxic emissions, at a minimum to benzene and formaldehyde. Performance criteria were established to limit mobile-source emissions of toxics, including benzene, formaldehyde, and 1,3-butadiene. In addition, §219 required the use of reformulated gasoline in selected U.S. cities (those with the most severe ozone nonattainment conditions) to further reduce mobile-source emissions.

State Toxic Air Contaminant Programs

California regulates TACs primarily through the Tanner Air Toxics Act (AB 1807) and the Air Toxics Hot Spots Information and Assessment Act of 1987 (AB 2588). The Tanner Act sets forth a formal procedure for ARB to designate substances as TACs. This includes research, public participation, and scientific peer review before ARB can designate a substance as a TAC. To date, ARB has identified over 21 TACs, and adopted the EPA's list of HAPs as TACs. Most recently, diesel exhaust particulate was added to the ARB list of TACs.Once a TAC is identified, ARB's then adopts an Airborne Toxics Control Measure for sources that emit that particular TAC. If there is a safe threshold for a substance at which there is no toxic effect, the control measure must reduce exposure below that threshold. If there is no safe threshold, the measure must incorporate TBACT to minimize emissions. None of the TACs identified by ARB have a safe threshold.

The Hot Spots Act requires that existing facilities that emit toxic substances above specified level:

1. Prepare a toxic emission inventory;
2. Prepare a risk assessment if emissions are significant;
3. Notify the public of significant risk levels;
4. Prepare and implement risk reduction measure.

Local Air Quality Regulations

Bay Area Air Quality Management District

The BAAQMD has regulated TACs since the 1980s. At the local level, air pollution control or management districts may adopt and enforce ARB's control measures. Under BAAQMD Regulation 2-1 (General Permit Requirements), Regulation 2-2 (New Source Review), and Regulation 2-5 (New Source Review), all nonexempt sources that possess the potential to emit TACs are required to obtain permits from BAAQMD. Permits may be granted to these operations if they are constructed and operated in accordance with applicable regulations, including new source review standards and air toxics control measures. The BAAQMD limits emissions and public exposure to TACs through a number of programs. The BAAQMD prioritizes TAC-emitting stationary sources based on the quantity and toxicity of the TAC emissions and the proximity of

the facilities to sensitive receptors. In addition, the BAAQMD has adopted Regulation 11 Rules 2 and 14, which address asbestos demolition renovation, manufacturing, and standards for asbestos containing serpentine.

B.2.3. Greenhouse Gases and Global Climate Change

Federal Greenhouse Gas Regulations

Supreme Court Ruling

The U.S. Environmental Protection Agency (EPA) is the Federal agency responsible for implementing the Clean Air Act (CAA). The U.S. Supreme Court ruled in its decision in *Massachusetts et al. v. Environmental Protection Agency* et al. ([2007] 549 U.S. 05-1120), issued on April 2, 2007, that carbon dioxide (CO_2) is an air pollutant as defined under the CAA, and that EPA has the authority to regulate emissions of GHGs.

EPA Proposed Regulations

In response to the mounting issue of climate change, EPA has taken actions to regulate, monitor, and potentially reduce GHG emissions. Although both actions discussed below are still in the proposal stage, they would have large implications on the regulation, monitoring, and reduction of GHG emissions from stationary and mobile sources.

Proposed Mandatory Greenhouse Gas Reporting Rule

On April 10, 2009, EPA published their Proposed Mandatory Greenhouse Gas Reporting Rule (proposed reporting rule) in the Federal Register. The proposed reporting rule is a response to the FY 2008 Consolidate Appropriations Act (H.R. 2764; Public Law 110-161), which required EPA to develop "… mandatory reporting of greenhouse gases above appropriate thresholds in all sectors of the economy…." The proposed reporting rule would apply to fossil fuel and industrial GHG suppliers, vehicle and engine manufacturers, and all facilities that would emit 25,000 metric tons of carbon dioxide equivalent (CO_2e) or more per year. Facility owners would be required to submit an annual GHG emissions report with detailed calculations of facility GHG emissions. The proposed reporting rule would also mandate record keeping and administrative requirements in order for EPA to verify annual GHG emissions reports. Owners of existing facilities that commenced operation prior to January 1, 2010 would be required to submit an annual report for calendar year 2010. Owners of new facilities commencing operation after January 1, 2010 would be required to submit an annual report from the facility's commencement date to December 31, 2010. For all subsequent operating years, facility owners would be required to report GHG emissions for the whole calendar year (January 1 to December 31). The comment period on the proposed reporting rule ended on June 6, 2009.

Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases under the Clean Air Act

On April 23, 2009, EPA published their Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases under the CCA (Endangerment Finding) in the Federal Register. The Endangerment Finding is based on Section 202(a) of the CAA, which states that the Administrator (of EPA) should regulate and develop standards for "emission[s] of air pollution from any class of classes of new motor vehicles or new motor vehicle engines, which in [its] judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." The proposed rule addresses Section 202(a) in two distinct findings. The first addresses whether or not the concentrations of the six key GHGs (i.e., carbon dioxide [CO_2], methane [CH_4], nitrous oxide [N_2O], hydrofluorocarbons [HFCs], perflurorocarbons [PFCs], and sulfur hexafluoride [SF_6]) in the atmosphere threaten the public health and welfare of current and future generations. The second addresses whether or not the combined emissions of GHGs

from new motor vehicles and motor vehicle engines contribute to atmospheric concentrations of GHGs and therefore the threat of climate change.

The Administrator proposed the finding that atmospheric concentrations of GHGs endanger the public health and welfare within the meaning of Section 202(a) of the CCA. The evidence supporting this finding consists of human activity resulting in "high atmospheric levels" of GHG emissions, which are very likely responsible for increases in average temperatures and other climatic changes. Furthermore, the observed and projected results of climate change (e.g., higher likelihood of heat waves, wild fires, droughts, sea level rise, higher intensity storms) are a threat to the public health and welfare. Therefore, GHGs were found to endanger the public health and welfare of current and future generations.

The Administrator also proposed the finding that GHG emissions from new motor vehicles and motor vehicle engines are contributing to air pollution, which is endangering public health and welfare. The proposed finding cites that in 2006, motor vehicles were the second largest contributor to domestic GHG emissions (24 percent of total) behind electricity generation. Furthermore, in 2005, the U.S. was responsible for 18 percent of global GHG emissions. Therefore, GHG emissions from motor vehicles and motor vehicle engines were found to contribute to air pollution that endangers public health and welfare.

State Greenhouse Gas Regulations

Assembly Bill 1493 (2002)

In 2002, then-Governor Gray Davis signed Assembly Bill (AB) 1493. AB 1493 requires that ARB develop and adopt, by January 1, 2005, regulations that achieve "the maximum feasible reduction of greenhouse gases emitted by passenger vehicles and light-duty trucks and other vehicles determined by ARB to be vehicles whose primary use is noncommercial personal transportation in the state."

To meet the requirements of AB 1493, in 2004 ARB approved amendments to the California Code of Regulations (CCR) adding GHG emissions standards to California's existing standards for motor vehicle emissions. Amendments to CCR Title 13, Sections 1900 and 1961 (13 CCR 1900, 1961), and adoption of Section 1961.1 (13 CCR 1961.1) require automobile manufacturers to meet fleet-average GHG emissions limits for all passenger cars, light-duty trucks within various weight criteria, and medium-duty passenger vehicle weight classes (i.e., any medium-duty vehicle with a gross vehicle weight rating less than 10,000 pounds that is designed primarily for the transportation of persons), beginning with the 2009 model year. For passenger cars and light-duty trucks with a loaded vehicle weight (LVW) of 3,750 pounds or less, the GHG emission limits for the 2016 model year are approximately 37percent lower than the limits for the first year of the regulations, the 2009 model year. For light-duty trucks with LVW of 3,751 pounds to gross vehicle weight (GVW) of 8,500 pounds, as well as medium-duty passenger vehicles, GHG emissions would be reduced approximately 24 percent between 2009 and 2016.

In December 2004, a group of car dealerships, automobile manufacturers, and trade groups representing automobile manufacturers filed suit against ARB to prevent enforcement of 13 CCR Sections 1900 and 1961 as amended by AB 1493 and 13 CCR 1961.1 (*Central Valley Chrysler-Jeep et al. v. Catherine E. Witherspoon, in Her Official Capacity as Executive Director of the California Air Resources Board, et al.*). The auto-makers' suit in the U.S. District Court for the Eastern District of California, contended California's implementation of regulations that, in effect, regulate vehicle fuel economy violates various federal laws, regulations, and policies.

On December 12, 2007, the Court found that if California receives appropriate authorization from EPA (the last remaining factor in enforcing the standard), these regulations would be consistent with and have the force of federal law, thus, rejecting the automakers' claim. This authorization to

implement more stringent standards in California was requested in the form of a CAA Section 209, subsection (b) waiver in 2005. Since that time, EPA failed to act on granting California authorization to implement the standards. Governor Schwarzenegger and Attorney General Edmund G. Brown filed suit against EPA for the delay. In December 2007, EPA Administrator Stephen Johnson denied California's request for the waiver to implement AB 1493. Johnson cited the need for a national approach to reducing GHG emissions, the lack of a "need to meet compelling and extraordinary conditions", and the emissions reductions that would be achieved through the Energy Independence and Security Act of 2007 as the reasoning for the denial.

The state of California filed suit against EPA for its decision to deny the CAA waiver. The recent change in presidential administration directed EPA to reexamine its position for denial of California's CAA waiver and for its past opposition to GHG emissions regulation. California received the waiver, notwithstanding the previous denial by EPA, on June 30, 2009.

Assembly Bill 32 (2006), California Global Warming Solutions Act

In September 2006, the governor of California signed AB 32 (Chapter 488, Statutes of 2006), the California Global Warming Solutions Act of 2006, which enacted Sections 38500–38599 of the California Health and Safety Code. AB 32 requires the reduction of statewide GHG emissions to 1990 levels by 2020. This equates to an approximate 15 percent reduction compared to existing statewide GHG emission levels or a 30 percent reduction from projected 2020 "business as usual" emission levels. The required reduction will be accomplished through an enforceable statewide cap on GHG emissions beginning in 2012.

To effectively implement the statewide cap on GHG emissions, AB 32 directs ARB to develop and implement regulations that reduce statewide GHG emissions generated by stationary sources. Specific actions required of ARB under AB 32 include adoption of a quantified cap on GHG emissions that represent 1990 emissions levels along with disclosing how the cap was quantified, institution of a schedule to meet the emissions cap, and development of tracking, reporting, and enforcement mechanisms to ensure that the state achieves the reductions in GHG emissions needed to meet the cap.

In addition, AB 32 states that if any regulations established under AB 1493 (2002) cannot be implemented then ARB is required to develop additional, new regulations to control GHG emissions from vehicles as part of AB 32.

AB 32 Climate Change Proposed Scoping Plan

In October of 2008, ARB published its *Climate Change Proposed Scoping Plan* (*Proposed Scoping Plan*), which is the State's plan to achieve GHG reductions in California required by AB 32. The *Proposed Scoping Plan* contains the main strategies California will implement to achieve reduction of 169 million metric tons (MMT) of carbon dioxide equivalent (CO_2e), or approximately 28 percent from the state's projected 2020 emission level of 596 MMT of CO_2e under a business-as-usual scenario (this is a reduction of 42 MMT CO_2e, or almost 10 percent, from 2002–2004 average emissions). The *Proposed Scoping Plan* also includes ARB-recommended GHG reductions for each emissions sector of the state's GHG inventory. The largest proposed GHG reductions are recommended from improving emission standards for light-duty vehicles (estimated reductions of 31.7 MMT CO_2e), implementation of the Low Carbon Fuel Standard (15.0 MMT CO_2e, discussed below), energy efficiency measures in buildings and appliances and the widespread development of combined heat and power systems (26.3 MMT CO_2e), and a renewable portfolio standard for electricity production (21.3 MMT CO_2e). ARB has not yet determined what amount of GHG reductions it recommends from local government operations; however, the *Proposed Scoping Plan* does state that land use planning and urban growth decisions will play an important role in the state's GHG reductions because local governments have primary authority to plan, zone, approve, and permit how land is developed to accommodate

population growth and the changing needs of their jurisdictions. (Meanwhile, ARB is also developing an additional protocol for community emissions.) ARB further acknowledges that decisions on how land is used will have large impacts on the GHG emissions that will result from the transportation, housing, industry, forestry, water, agriculture, electricity, and natural gas emission sectors. The *Proposed Scoping Plan* states that the ultimate GHG reduction assignment to local government operations is to be determined (ARB 2008). With regard to land use planning, the *Proposed Scoping Plan* expects approximately 5.0 MMT CO_2e will be achieved associated with implementation of SB 375, which is discussed further below. The *Proposed Scoping Plan* was approved by the ARB on December 11, 2008.

Senate Bills 1078 and 107 and Executive Order S-14-08

SB 1078 (Chapter 516, Statutes of 2002) requires retail sellers of electricity, including investor-owned utilities and community choice aggregators, to provide at least 20 percent of their supply from renewable sources by 2017. SB 107 (Chapter 464, Statutes of 2006) changed the target date to 2010. In November 2008 Governor Schwarzenegger signed Executive Order S-14-08, which expands the state's Renewable Energy Standard to 33 percent renewable power by 2020. Governor Schwarzenegger plans to propose legislative language that will codify the new higher standard.

Senate Bill 1368 (2006)

SB 1368 is the companion bill of AB 32 and was signed by Governor Schwarzenegger in September 2006. SB 1368 requires the California Public Utilities Commission (PUC) to establish a greenhouse gas emission performance standard for baseload generation from investor owned utilities by February 1, 2007. The California Energy Commission (CEC) must establish a similar standard for local publicly owned utilities by June 30, 2007. These standards cannot exceed the greenhouse gas emission rate from a baseload combined-cycle natural gas fired plant. The legislation further requires that all electricity provided to California, including imported electricity, must be generated from plants that meet the standards set by the PUC and CEC.

Senate Bill 97 (2007)

SB 97, signed by governor of California in August 2007 (Chapter 185, Statutes of 2007; Public Resources Code, Sections 21083.05 and 21097), acknowledges climate change is a prominent environmental issue that requires analysis under CEQA. This bill directed the Governor's Office of Planning and Research (OPR) to prepare, develop, and transmit to the California Resources Agency by July 1, 2009 guidelines for mitigating GHG emissions or the effects of GHG emissions, as required by CEQA. The California Resources Agency is required to certify and adopt these guidelines by January 1, 2010.

This bill also removes, both retroactively and prospectively, as legitimate causes of action in litigation any claim of inadequate CEQA analysis of effects of GHG emissions associated with environmental review for projects funded by the Highway Safety, Traffic Reduction, Air Quality and Port Security Bond Act of 2006 (Proposition 1B) or the Disaster Preparedness and Flood Protection Bond Act of 2006 (Proposition 1E). This provision will be repealed by provision of law on January 1, 2010 at that time such projects, if any remain unapproved, will no longer enjoy protection against litigation claims based on failure to adequately address issues related to GHG emissions.

Senate Bill 375 (2008)

SB 375, signed in September 2008, aligns regional transportation planning efforts, regional GHG reduction targets, and land use and housing allocation. As part of the alignment, SB 375 requires Metropolitan Planning Organizations (MPOs) to adopt a Sustainable Communities Strategy (SCS) or Alternative Planning Strategy (APS) which prescribes land use allocation in that MPO's Regional Transportation Plan (RTP). The ARB, in consultation with MPOs, is required to provide

each affected region with reduction targets for GHGs emitted by passenger cars and light trucks in the region for the years 2020 and 2035. These reduction targets will be updated every 8 years but can be updated every 4 years if advancements in emissions technologies affect the reduction strategies to achieve the targets. The ARB is also charged with reviewing each MPO's SCS or APS for consistency with its assigned GHG emission reduction targets. If MPOs do not meet the GHG reduction targets, transportation projects located in the MPO boundaries would not be eligible for funding programmed after January 1, 2012.

This bill also extends the minimum time period for the Regional Housing Needs Allocation (RNHA) cycle from 5 years to 8 years for local governments located in an MPO that meets certain requirements. City or County land use policies (e.g., General Plans) are not required to be consistent with the RTP including associated SCSs or APSs. Qualified projects consistent with an approved SCS or APS and categorized as "transit priority projects" would receive incentives under new provisions of CEQA.

Executive Order S-3-05 (2005)

Governor Schwarzenegger signed Executive Order S-3-05 on June 1, 2005 which proclaimed California is vulnerable to the impacts of climate change. The executive order declared increased temperatures could reduce snowpack in the Sierra Nevada Mountains, further exacerbate California's air quality problems, and potentially cause a rise in sea levels. To combat those concerns, the executive order established targets for total GHG emissions which include reducing GHG emissions to the 2000 level by 2010, to the 1990 level by 2020, and to 80 percent below the 1990 level by 2050.

The executive order also directed the secretary of the California Environmental Protection Agency to coordinate a multiagency effort to reduce GHG emissions to the target levels. The secretary will submit biannual reports to the governor and legislature describing progress made toward reaching the emission targets; impacts of global warming on California's resources; and mitigation and adaptation plans to combat impacts of global warming.

To comply with the executive order, the Secretary of the California Environmental Protection Agency created the California Climate Action Team which is made up of members from various state agencies and commissions. The California Climate Action Team released its first report in March 2006 of which proposed achieving the GHG emissions targets by building on voluntary actions of California businesses and actions by local governments and communities along with continued implementation of state incentive and regulatory programs.

Executive Order S-13-08

Governor Schwarzenegger signed Executive Order S-13-08 on November 14, 2008 which directs California to develop methods for adapting to climate change through preparation of a statewide plan. The executive order directs OPR, in cooperation with the California Resources Agency (CRA), to provide land use planning guidance related to sea level rise and other climate change impacts by May 30, 2009. The order also directs the CRA to develop a state Climate Adaptation Strategy by June 30, 2009 and to convene an independent panel to complete the first California Sea Level Rise Assessment Report. The assessment report is required to be completed by December 1, 2010 and required to include the following four items:

1. Project the relative sea level rise specific to California by taking into account issues such as coastal erosion rates, tidal impacts, El Niño and La Niña events, storm surge, and land subsidence rates;
2. Identify the range of uncertainty in selected sea level rise projections;

3. Synthesize existing information on projected sea level rise impacts to state infrastructure (e.g., roads, public facilities, beaches), natural areas, and coastal and marine ecosystems; and
4. Discuss future research needs relating to sea level rise in California.

Executive Order S-1-07

Governor Schwarzenegger signed Executive Order S-1-07 in 2007 which proclaimed the transportation sector as the main source of GHG emissions in California. The executive order proclaims the transportation sector accounts for over 40 percent of statewide GHG emissions. The executive order also establishes a goal to reduce the carbon intensity of transportation fuels sold in California by a minimum of 10 percent by 2020.

In particular, the executive order established a Low-Carbon Fuel Standard (LCFS) and directed the Secretary for Environmental Protection to coordinate the actions of the CEC, the ARB, the University of California, and other agencies to develop and propose protocols for measuring the "life-cycle carbon intensity" of transportation fuels. This analysis supporting development of the protocols was included in the State Implementation Plan for alternative fuels (*State Alternative Fuels Plan* adopted by CEC on December 24, 2007) and was submitted to ARB for consideration as an "early action" item under AB 32. The ARB adopted the LCFS on April 23, 2009.

Local Greenhouse Gas Regulations

Bay Area Air Quality Management District Climate Protection Program

The BAAQMD established a climate protection program to reduce pollutants that contribute to global climate change and affect air quality in the SFBAAB. The climate protection program includes measures that promote energy efficiency, reduce vehicle miles traveled, and develop alternative sources of energy all of which assist in reducing emissions of GHG and in reducing air pollutants that affect the health of residents. BAAQMD also seeks to support current climate protection programs in the region and to stimulate additional efforts through public education and outreach, technical assistance to local governments and other interested parties, and promotion of collaborative efforts among stakeholders.

C. THRESHOLD OF SIGNIFICANCE JUSTIFICATION [TBD]