

## 4.10 Air Quality and Greenhouse Gases

This section considers the potential of the project alternatives to result in adverse emissions of air pollutants including greenhouse gases (GHGs). Information in this section was drawn from a project-specific air quality and GHG report, which is included as Appendix G and is on file with the San Francisco County Transportation Authority (SFCTA).

### 4.10.1 | Regulatory Setting

#### 4.10.1.1 | FEDERAL

##### *United States Environmental Protection Agency*

The Federal Clean Air Act (CAA) governs air quality in the United States. The United States Environmental Protection Agency (EPA) is responsible for enforcing the CAA. EPA is also responsible for establishing the National Ambient Air Quality Standards (NAAQS). NAAQS are required under the 1977 CAA and subsequent amendments. EPA regulates emission sources that are under the exclusive authority of the federal government, such as aircraft, ships, and certain types of locomotives. EPA has jurisdiction over emission sources outside state waters (e.g., beyond the outer continental shelf) and establishes various emission standards, including those for vehicles sold in states other than California.<sup>1</sup>

Air quality in the United States is governed by the Federal Clean Air Act (CAA). EPA is responsible for enforcing the CAA

Information on the National Ambient Air Quality Standards can be found here: <http://www.epa.gov/air/criteria.html>

Under the CAA, NAAQS have been established for seven major air pollutants:

- carbon monoxide
- ozone
- nitrogen dioxide
- sulfur dioxide
- particulate matter 2.5 microns or less in diameter (PM<sub>2.5</sub>)
- particulate matter 10 microns or less in diameter (PM<sub>10</sub>)
- lead

The CAA requires EPA to designate areas as *attainment*, *nonattainment*, or *maintenance* (previously nonattainment and currently attainment) for each criteria pollutant based on whether the NAAQS have been achieved. Table 4.10-1 summarizes both federal and state standards (state standards further discussed below).

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<sup>1</sup> Automobiles sold in California must meet stricter emission standards established by California Air Resources Board (CARB).

DEFINITIONS

*Ozone* is a colorless gas resulting from the interaction of two other pollutants and sunlight

*Respirable particulate matter* consists of very small particles that are inhalable, such as dust stirred up by vehicles

*Fine particulate matter* consists of even smaller particles, usually resulting from fuel combustion

*Carbon monoxide* is an odorless, colorless gas formed by incomplete combustion of fuels, almost exclusively from vehicles, power plants, and industrial activities

*Nitrogen dioxide* results from the interaction of another pollutant and oxygen, and contributes to the formation of ozone and respirable particulate matter

*Sulfur dioxide* is a colorless, pungent gas formed primarily by combustion of fossil fuels such as coal and oil used in power plants and industrial operations

*Lead* is a heavy metal that may be a part of particulate matter, resulting from lead smelting, battery recycling, and manufacturing

*Visibility reducing particles* consist of tiny solid particles surrounded by droplets of liquid, and created by hazy conditions

*Sulfates* are mineral salts containing sulfur, resulting from the decay of plants and animals and certain industrial processes

*Hydrogen sulfide* is a colorless, pungent gas occurring in coal pits, gas wells and as a product of decaying sulfur-containing organic matter, such as in sewers

**Table 4.10-1 Federal and State Air Quality Standards and Attainment Status, San Francisco Bay Area**

POLLUTANT	AVERAGING PERIOD	FEDERAL (NAAQS) <sup>2</sup>		CALIFORNIA <sup>1</sup>	
		STANDARDS <sup>3</sup>	ATTAINMENT STATUS	STANDARDS	ATTAINMENT STATUS
Ozone	1-hour	No federal standard	No federal standard <sup>5</sup>	0.09 ppm (180 µg/m <sup>3</sup> )	Nonattainment
	8-hour	0.075 ppm (147 µg/m <sup>3</sup> )	Nonattainment <sup>4</sup>	0.070 ppm (137 µg/m <sup>3</sup> )	Nonattainment <sup>9</sup>
Respirable particulate matter (PM <sub>10</sub> )	24-hour	150 µg/m <sup>3</sup>	Unclassified	50 µg/m <sup>3</sup>	Nonattainment
	Annual Arithmetic Mean	No federal standard	No federal standard	20 µg/m <sup>3</sup>	Nonattainment <sup>7</sup>
Fine particulate matter (PM <sub>2.5</sub> )	24-hour	35 µg/m <sup>3</sup> <sup>10</sup>	Nonattainment	No state standard	No state standard
	Annual Arithmetic Mean	12 µg/m <sup>3</sup>	Attainment	12 µg/m <sup>3</sup>	Nonattainment <sup>7</sup>
Carbon monoxide	8-hour	9 ppm (10 mg/m <sup>3</sup> )	Attainment/Maintenance <sup>6</sup>	9.0 ppm (10 mg/m <sup>3</sup> )	Attainment
	1-hour	35 ppm (40 mg/m <sup>3</sup> )	Attainment/Maintenance	20 ppm (23 mg/m <sup>3</sup> )	Attainment
Nitrogen dioxide	Annual Arithmetic Mean	53 ppb (100 µg/m <sup>3</sup> )	Attainment	0.030 ppm (57 µg/m <sup>3</sup> )	Attainment
	1-hour	100 ppb <sup>11</sup> (188 µg/m <sup>3</sup> ) /a/	Unclassified	0.18 ppm (338 µg/m <sup>3</sup> )	Attainment
Sulfur dioxide <sup>12</sup>	24-hour	0.14 ppm (365 µg/m <sup>3</sup> )	Attainment	0.04 ppm (105 µg/m <sup>3</sup> )	Attainment
	1-hour	75 ppb (196 µg/m <sup>3</sup> )	Attainment	0.25 ppm (655 µg/m <sup>3</sup> )	Attainment
Lead <sup>13</sup>	30-day average	--	Attainment	1.5 µg/m <sup>3</sup>	Attainment
	Calendar Quarter	1.5 µg/m <sup>3</sup>	Attainment	No state standard	No state standard
	Rolling 3-Month Average	0.15 µg/m <sup>3</sup>	-- <sup>14</sup>	No state standard	No state standard
Visibility reducing particles	8-hour	No federal standard		Extinction coefficient of 0.23 per kilometer <sup>8</sup>	Unclassified
Sulfates	24-hour	No federal standard		25 µg/m <sup>3</sup>	Attainment
Hydrogen sulfide	1-hour	No federal standard		0.03 ppm (42 µg/m <sup>3</sup> )	Unclassified

Notes: 1. California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1-hour and 24-hour), nitrogen dioxide, suspended particulate matter - PM<sub>10</sub>, and visibility reducing particles are values that are not to be exceeded. The standards for sulfates, Lake Tahoe carbon monoxide, lead, hydrogen sulfide, and vinyl chloride are not to be equalled or exceeded. If the standard is for a 1-hour, 8-hour or 24-hour average (i.e., all standards except for lead and the PM<sub>10</sub> annual standard), then some measurements may be excluded. In particular, measurements are excluded that ARB determines would occur less than once per year on the average. The Lake Tahoe CO standard is 6.0 ppm, a level one-half the national standard and two-thirds the state standard.

2. National standards shown are the "primary standards" designed to protect public health. National standards other than for ozone, particulates and those based on annual averages are not to be exceeded more than once a year. The 1-hour ozone standard is attained if, during the most recent three-year period, the average number of days per year with maximum hourly concentrations above the standard is equal to or less than one. The 8-hour ozone standard is attained when the 3-year average of the 4th highest daily concentrations is 0.075 ppm (75 ppb) or less. The 24-hour PM<sub>10</sub> standard is attained when the 3-year average of the 99th percentile of monitored concentrations is less than 150 µg/m<sup>3</sup>. The 24-hour PM<sub>2.5</sub> standard is attained when the 3-year average of 98th percentiles is less than 35 µg/m<sup>3</sup>.

Except for the national particulate standards, annual standards are met if the annual average falls below the standard at every site. The national annual particulate standard for PM<sub>10</sub> is met if the 3-year average falls below the standard at every site. The annual PM<sub>2.5</sub> standard is met if the 3-year average of annual averages spatially-averaged across officially designed clusters of sites falls below the standard.

3. National air quality standards are set by US EPA at levels determined to be protective of public health with an adequate margin of safety.

4. Final designations effective July 20, 2012.
  5. The national 1-hour ozone standard was revoked by U.S. EPA on June 15, 2005.
  6. In April 1998, the Bay Area was redesignated to attainment for the national 8-hour carbon monoxide standard.
  7. In June 2002, CARB established new annual standards for PM<sub>2.5</sub> and PM<sub>10</sub>.
  8. Statewide VRP Standard (except Lake Tahoe Air Basin): Particles in sufficient amount to produce an extinction coefficient of 0.23 per kilometer when the relative humidity is less than 70 percent. This standard is intended to limit the frequency and severity of visibility impairment due to regional haze and is equivalent to a 10-mile nominal visual range.
  9. The 8-hour CA ozone standard was approved by the Air Resources Board on April 28, 2005 and became effective on May 17, 2006.
  10. On January 9, 2013, EPA issued a final rule to determine that the Bay Area attains the 24-hour PM<sub>2.5</sub> national standard. This EPA rule suspends key SIP requirements as long as monitoring data continues to show that the Bay Area attains the standard. Despite this EPA action, the Bay Area will continue to be designated as “non-attainment” for the national 24-hour PM<sub>2.5</sub> standard until such time as the Air District submits a “redesignation request” and a “maintenance plan” to EPA, and EPA approves the proposed redesignation.
  11. To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100ppm (effective January 22, 2010).
  12. On June 2, 2010, the U.S. EPA established a new 1-hour SO<sub>2</sub> standard, effective August 23, 2010, which is based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations. The existing 0.030 ppm annual and 0.14 ppm 24-hour SO<sub>2</sub> NAAQS however must continue to be used until one year following U.S. EPA initial designations of the new 1-hour SO<sub>2</sub> NAAQS. EPA expects to designate areas by June 2012.
  13. ARB has identified lead and vinyl chloride as ‘toxic air contaminants’ with no threshold level of exposure below which there are no adverse health effects determined.
  14. National lead standard, rolling 3-month average: final rule signed October 15, 2008. Final designations effective December 31, 2011.
- Source: CARB, Ambient Air Quality Standards, June 4, 2013. CARB, Area Designation Maps, March 2014

In addition to the above “criteria pollutants,” the air toxics provisions of the Clean Air Act (CAA) require EPA to develop and enforce regulations to protect the public from exposure to airborne contaminants that are known to be hazardous to human health. In accordance with Section 112 of the CAA, EPA establishes National Emission Standards for Hazardous Air Pollutants (NESHAP). The list of hazardous air pollutants (HAP), or “air toxics” includes specific compounds that are known or suspected to cause cancer or other serious health effects. Asbestos was one of the first hazardous air pollutants regulated under the air toxics program, and EPA established the Asbestos NESHAP. It is intended to minimize the release of asbestos fibers during activities involving the handling of asbestos. It specifies work practices to be followed during renovation, demolition, or other abatement activities when friable asbestos is involved.

The CAA requires 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, Section 219 of the CAA requires certain urban bus systems (those in areas with the most severe ozone nonattainment conditions) to use reformulated gasoline to further reduce mobile-source emissions.

The U.S. Supreme Court has ruled that carbon dioxide (CO<sub>2</sub>), a greenhouse gas (GHG) is also an air pollutant as defined under the CAA, and that EPA has the authority to regulate emissions of GHGs. Further discussion federal regulations on GHG follows below.<sup>2</sup>

### ***Transportation Conformity***

Transportation conformity is an analysis required to ensure that federally supported highway and transit project activities are consistent with the purpose of the state Implementation Plan (SIP).<sup>3</sup> Regional conformity for a given project is analyzed by discussing if a proposed project is included in a conforming Regional Transportation Plan (RTP) or Transportation Improvement Plan (TIP) with substantially the same

<sup>2</sup> *Massachusetts v. Environmental Protection Agency* ([2007] 549 U.S. 05-1120).

<sup>3</sup> CAA Section 176(c) (42 U.S.C. 7506(c)).

DEFINITION

**ROGs/NO<sub>x</sub>: Reactive Organic Gases and Nitrogen Oxides are not criteria air pollutants and thus are not monitored. However, both are considered precursors of ozone, which is a criteria pollutant**

design concept and scope that was used for the regional conformity analysis. Project level conformity is analyzed by discussing if a proposed project would cause localized exceedances of carbon monoxide, PM<sub>2.5</sub>, and/or PM<sub>10</sub> standards, or if it would interfere with “timely implementation” of Transportation Control Measures called out in the (SIP).

### ***Mobile Source Air Toxics (MSAT)***

In addition to NAAQS for criteria pollutants, the CAA identified a list of 188 urban air toxics, alternatively known as toxic air contaminants (TACs). In its final ruling in March 2001, EPA narrowed this list to a group of 21 mobile-source air toxics (MSAT).<sup>4</sup> From this list of 21 MSATs, EPA identified six priority MSATs: benzene, formaldehyde, acetaldehyde, diesel particulate matter/diesel exhaust organic gases, acrolein, and 1,3-butadiene. To address emissions of MSATs, EPA has introduced a number of measures targeting cleaner fuels and cleaner engines.

In March 2001, EPA issued regulations requiring the producers of urban air toxics to decrease emissions of these pollutants by target dates in 2007 and 2020. As a result, on-highway emissions of benzene, formaldehyde, 1,3-butadiene and acetaldehyde will be reduced by amounts ranging from 67 percent to 76 percent between 1990 and 2020. On-highway diesel particulate matter (DPM) emissions will be reduced by 90 percent. These reductions are expected as a result of the national mobile source control programs, including:

- The reformulated gasoline program;
- A new threshold for the toxic content of gasoline;
- The national low-emission vehicle standards;
- The Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements; and
- The heavy-duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements.

These predicted improvements are expected to result in net emission reductions, even after anticipated growth in vehicle miles traveled (VMT) is taken into account.

### ***Mandatory Greenhouse Gas Reporting Rule***

In 2009, EPA issued a final rule for mandatory reporting of GHGs from large GHG emissions sources in the United States. In general, this national reporting requirement will provide EPA with accurate and timely GHG emissions data from facilities that emit 25,000 metric tons or more of carbon dioxide per year. This publically available data will allow the reporters to track their own emissions, compare them to similar facilities, and aid in identifying cost effective opportunities to reduce emissions in the future. Reporting is at the facility level, except that certain suppliers of fossil fuels and industrial greenhouse gases along with vehicle and engine manufacturers will report at the corporate level. An estimated 85 percent of the total US GHG emissions, from approximately 10,000 facilities, are covered by this final rule.<sup>5</sup>

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<sup>4</sup> Control of Emissions of Hazardous Air Pollutants from Mobile Sources, 66 F.R. 17235.

<sup>5</sup> BAAQMD, *CEQA Air Quality Guidelines*, June 2010.

### ***Endangerment and Cause or Contribute Findings for Greenhouse Gases under Clean Air Act Section 202(a)***

In December 2009, the EPA Administrator signed two distinct findings regarding greenhouse gases under Section 202(a) of the Clean Air Act.

**Endangerment Finding:** The Administrator found that the current and projected concentrations of the six key GHGs (i.e., carbon dioxide, methane, nitrogen dioxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride) in the atmosphere threaten the public health and welfare of current and future generations.

**Cause or Contribute Finding:** The Administrator found that the combined emissions of these GHGs from new motor vehicles and motor vehicle engines contribute to the GHG pollution which threatens public health and welfare.

These findings were necessary prerequisites for implementing GHG emissions standards for vehicles. In collaboration with the National Highway Traffic Safety Administration (NHTSA), EPA finalized emission standards for light-duty vehicles (2012-2016 model years) in May of 2010 and heavy-duty vehicles (2014-2018 model years) in August of 2011.

### ***Council on Environmental Quality Guidelines***

In August 2016, the Council on Environmental Quality (CEQ) provided final guidance for federal agencies on how to consider the effects of GHG emissions and climate change in NEPA documents. Pursuant to Executive Order 13783, “Promoting Energy Independence and Economic Growth,” as of March 28, 2017, the CEQ has withdrawn its final guidance for further consideration.<sup>6</sup> The withdrawal of the final guidance does not change any law, regulations, or otherwise legally binding requirements.

#### **4.10.1.2 | STATE**

##### ***California Air Resources Board***

In addition to being subject to the requirements of CAA, air quality in California is also governed by more stringent regulations under the California Clean Air Act (CCAA). In California, the CCAA is administered by CARB at the state level and by the air quality management districts and air pollution control districts at the regional and local levels. CARB is responsible for meeting the state requirements of the CAA, administering the CCAA, and establishing the California Ambient Air Quality Standards (CAAQS). The CCAA requires all air districts in the state to endeavor to achieve and maintain the CAAQS. CAAQS are generally more stringent than the corresponding federal standards and incorporate additional standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particles. CARB is responsible for setting emission standards for vehicles sold in California and for other emission sources, such as consumer products and certain off-road equipment. CARB established passenger vehicle fuel specifications. CARB oversees the functions of local air pollution control districts and air quality management districts,

<sup>6</sup> Council on Environmental Quality. March 28, 2017. *Final Guidance for Greenhouse Gases and Climate Change*. Accessed November 7, 2017 at [https://ceq.doe.gov/guidance/ceq\\_guidance\\_nepa-ghg-climate\\_final\\_guidance.html](https://ceq.doe.gov/guidance/ceq_guidance_nepa-ghg-climate_final_guidance.html).

which, in turn, administer air quality activities at the regional and county levels. Table 4.10-1 summarizes state standards.

The CCAA requires CARB to designate areas within California as either attainment or non-attainment for each criteria pollutant based on whether the CAAQS have been achieved. Under the CCAA, areas are designated as non-attainment for a pollutant if air quality data shows that a state standard for the pollutant was violated at least once during the previous three calendar years. Exceedances that are affected by highly irregular or infrequent events are not considered violations of a state standard and are not used as a basis for designating areas as nonattainment.

### ***State Toxic Air Contaminant Programs***

California regulates Toxic Air Contaminants (TACs) primarily through the Tanner Air Toxics Act (AB 1807) and the Air Toxics Hot Spots Information and Assessment Act of 1987 (AB 2588).

AB 1807 sets forth a formal procedure for CARB to designate substances as TACs. This includes research, public participation, and scientific peer review before CARB can designate a substance as a TAC. To date, CARB has identified over 21 TACs, including diesel exhaust particulate. Once a TAC is identified, CARB then adopts air toxics control measures (ATCM) for sources that emit that particular TAC.

None of the TACs identified by CARB have a “safe threshold;” exposure to these TACs is therefore considered in terms of long-term elevated health risk.

AB 2588 requires that existing facilities that emit toxic substances above specified levels:

- Prepare a toxic emission inventory;
- Prepare a risk assessment if emissions are significant;
- Notify the public of significant risk levels; and
- Prepare and implement risk reduction measures.

CARB has adopted diesel exhaust control measures and more stringent emission standards for various on-road mobile sources of emissions, including transit buses and certain other diesel-powered equipment.

In February 2000, CARB adopted a new public transit bus fleet rule and emission standards for new urban buses. These rules and standards provide for more stringent emission standards for some new urban bus engines, zero-emission bus demonstration and purchase requirements applicable to transit agencies, and reporting requirements with which transit agencies must demonstrate compliance with the urban transit bus fleet rule. Milestones include the low sulfur diesel fuel requirement, and tighter emission standards for heavy-duty diesel trucks and off-road diesel equipment nationwide.

Over time, the replacement of older vehicles will result in a vehicle fleet that produces substantially less TACs than under current conditions. Mobile-source emissions of TACs (e.g., benzene, 1,3-butadiene, diesel PM) have been reduced significantly over the last decade, and will be reduced further in California through a progression of regulatory measures (e.g., Low Emission Vehicle/Clean Fuels and Phase II reformulated gasoline regulations) and control technologies. With

implementation of CARB's Risk Reduction Plan, it is expected that diesel PM concentrations will be reduced by 85 percent by 2020 from year 2000 levels.<sup>7</sup> Adopted regulations are also expected to continue to reduce formaldehyde emissions from cars and light-duty trucks. As emissions are reduced, it is expected that risks associated with exposure to the emissions will also be reduced.

***Assembly Bill 1493 (AB 1493)***

AB 1493 requires the development and adoption of regulations to achieve “the maximum feasible reduction of greenhouse gases” emitted by noncommercial passenger vehicles, light-duty trucks, and other vehicles used primarily for personal transportation in the state. In 2009, CARB adopted amendments to the AB 1493 regulations that reduce greenhouse gas (GHG) emissions in new passenger vehicles from 2009 through 2016. These amendments are part of California's commitment toward a nation-wide program to reduce new passenger vehicle GHGs from 2012 through 2016.

***Executive Order (E.O.) S-3-05***

This order established state GHG emission targets of 1990 levels by 2020 (the same as AB 32, enacted later and discussed below) and 80 percent below 1990 levels by 2050. It calls for the Secretary of the Cal/EPA to be responsible for coordination of state agencies and progress reporting.

In response to the E.O., the Secretary of the Cal/EPA created the Climate Action Team (CAT). California's CAT originated as a coordinating council organized by the Secretary for Environmental Protection.

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

AB 32 focuses on reducing GHG emissions in California, and requires CARB to adopt rules and regulations that would achieve greenhouse gas emissions equivalent to statewide levels in 1990 by 2020. To achieve this goal, AB 32 mandates that CARB establish a quantified emissions cap, institute a schedule to meet the cap, implement regulations to reduce statewide GHG emissions from stationary sources, and develop tracking, reporting, and enforcement mechanisms to ensure that reductions are achieved. Because the intent of AB 32 is to limit 2020 emissions to the equivalent of 1990, it is expected that the regulations would affect many existing sources of GHG emissions.

AB 32 charges CARB with the responsibility to monitor and regulate sources of GHG emissions in order to reduce those emissions. In 2007, CARB adopted a series of early action measures to reduce GHG emissions. Among these, transportation-related measures included complying with a low carbon fuel standard, reducing refrigerant loss from motor vehicle air conditioning maintenance, and promoting proper tire inflation in vehicles.

CARB has determined that the total statewide aggregated GHG 1990 emissions level and 2020 emissions limit is 427 million metric tons of CO<sub>2e</sub>. The 2020 target reductions are currently estimated to be 174 million metric tons of CO<sub>2e</sub>.

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<sup>7</sup> BAAQMD. June 2010. *CEQA Air Quality Guidelines*.

### ***AB 32 Climate Change Scoping Plan***

The CARB AB 32 Scoping Plan contains the main strategies to achieve the 2020 emissions cap. The Scoping Plan was developed by CARB with input from the CAT and proposes a comprehensive set of actions designed to reduce overall carbon emissions in California, improve the environment, reduce oil dependency, diversify energy sources, and enhance public health while creating new jobs and improving the state economy. The GHG reduction strategies contained in the Scoping Plan include direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, and market-based mechanisms such as a cap-and-trade system. Two of several key approaches for reducing greenhouse gas emissions to 1990 levels by 2020 include:

- Establishing targets for transportation-related GHG emissions for regions throughout California, and pursuing policies and incentives to achieve those targets; and
- Adopting and implementing measures to reduce transportation sector emissions, including California’s measures.

CARB has also developed the GHG mandatory reporting regulation, which required reporting beginning on January 1, 2008 pursuant to requirements of AB 32. The regulations require reporting for certain types of facilities that make up the bulk (up to 94 percent) of the stationary source emissions in California.

In February 2014, CARB published a draft Proposed First Update to the Climate Change Scoping Plan. This Update identifies the next steps for California’s leadership on climate change and updates statewide emissions reduction targets.

As part of the Update, CARB is proposing to revise the 2020 statewide limit to 431 million metric tons of CO<sub>2e</sub>, an approximately one percent increase from the original estimate. The 2020 business-as-usual (BAU) forecast in the Update is 509 million metric tons of CO<sub>2e</sub>. The state would need to reduce those emissions by 15 percent to meet the new limit of 431 million metric tons.

#### ***Executive Order (E.O.) S-1-07***

This E.O. established a Low-Carbon Fuel Standard (LCFS) and directed the Secretary for Environmental Protection to develop and propose protocols for measuring the “life-cycle carbon intensity” of transportation fuels.

#### **4.10.1.3 | REGIONAL**

The Bay Area Air Quality Management District (BAAQMD) attains and maintains air quality conditions in the San Francisco Bay Area Air Basin (Air Basin) through a comprehensive program of planning, regulation, enforcement, technical innovation, and promotion of the understanding of air quality issues. BAAQMD has jurisdiction over an approximately 5,600-square-mile area of the San Francisco Bay Area (Bay Area), including all of San Francisco County.

The BAAQMD established a climate protection program to reduce pollutants that contribute to global climate change and affect air quality in the Air Basin. 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.

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 CAA and the CCAA.

The BAAQMD last updated its CEQA Guidelines between 2009 and 2011 (BAAQMD 2010b). This is an advisory document that offers guidance to the Lead Agency, consultants, and project applicants for addressing air quality in environmental documents.<sup>8</sup> The handbook contains the following applicable components:

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

As stated above, the BAAQMD prepares plans to attain ambient air quality standards in the Air Basin. 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 (MTC) and the Association of Bay Area Governments (ABAG).

With respect to applicable air quality plans, the BAAQMD prepared the 2017 CAP to address nonattainment of the national one- and eight-hour ozone standard in the Air Basin. The three purposes of the 2017 CAP are to: 1) reduce emissions and decrease ambient concentrations of harmful pollutants, 2) safeguard public health by reducing exposure to air pollutants that pose the greatest health risk, and 3) reduce greenhouse gas emissions to protect the climate. To achieve the three core purposes of the 2017 CAP, the control strategies proposed are designed to:

- Reduce emissions of ozone precursors, PM, air toxics, and greenhouse gases;

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<sup>8</sup> The preparers of this Draft EIS/EIR have reviewed the evidence used to formulate the BAAQMD CEQA Guidelines including BAAQMD's May 2010 staff report recommending the adoption of the thresholds and its attachments, and conclude that substantial evidence supports the continued use of BAAQMD's 2010 thresholds of significance as thresholds of significance for air quality and greenhouse gas effects in this Draft EIS/EIR.

- Continue progress toward attainment of state ozone standards;
- Reduce transport of ozone precursors to neighboring air basins;
- Protect public health by reducing population exposure to the most harmful air pollutants; and
- Protect the climate.

Similarly, the BAAQMD prepared the 2017 CAP to address nonattainment of the CAAQS.

The BAAQMD has regulated TACs since the 1980s. At the local level, air pollution control or management districts may adopt and enforce CARB's control measures. Under BAAQMD Regulation 2-1 (General Permit Requirements), Regulation 2-2 (New Source Review), and Regulation 2-5 (New Source Review of Toxic Air Contaminants), 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 ATCMs. 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.

CARB defines naturally occurring asbestos (NOA) as a TAC. NOA is located in many parts of California and is commonly associated with certain rocks found in the Bay Area.<sup>9</sup> BAAQMD's NOA program requires that the applicable notification forms be submitted by qualifying operations in accordance with the procedures detailed in the *ATCM Inspection Guidelines Policies and Procedures*. 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.

In addition, the BAAQMD has adopted Regulation 11, Rule 2 which addresses asbestos demolition renovation, manufacturing, and standards for asbestos containing serpentine. The purpose of Regulation 11, Rule 2 is to control emissions of asbestos to the atmosphere during demolition, renovation, milling and manufacturing and establish appropriate waste disposal procedures.<sup>10</sup>

#### **4.10.1.4 | LOCAL**

##### ***San Francisco General Plan Air Quality Element***

The San Francisco General Plan includes an Air Quality Element.<sup>11</sup> Relevant objectives include the following:

<sup>9</sup> California Geological Survey. 2002. *Guidelines for Geologic Investigations of Naturally Occurring Asbestos in California*. California Department of Geology's Special Publication 124. Retrieved from: [http://www.conservation.ca.gov/cgs/minerals/hazardous\\_minerals/asbestos/Documents/Asbestos\\_Guidelines\\_SP124.pdf](http://www.conservation.ca.gov/cgs/minerals/hazardous_minerals/asbestos/Documents/Asbestos_Guidelines_SP124.pdf). Last accessed April 14, 2014.

<sup>10</sup> BAAQMD. October 1998. *Regulation 11, Rule 2*.

<sup>11</sup> City and County of San Francisco General Plan. 1997. Air Quality Element. Updated 2000. Retrieved from: [http://www.sf-planning.org/ftp/General\\_Plan/I10\\_Air\\_Quality.htm](http://www.sf-planning.org/ftp/General_Plan/I10_Air_Quality.htm). Last accessed October 16, 2013.

- Objective 1: Adhere to state and federal standards and regional programs.
- Objective 2: Reduce mobile sources of air pollution through implementation of the Transportation Element of the San Francisco General Plan.
- Objective 3: Decrease the air quality impacts of development by coordination of land use and transportation decisions.
- Objective 4: Improve air quality by increasing public awareness regarding the negative health effects of pollutants generated by stationary and mobile sources.
- Objective 5: Minimize particulate matter emissions from road and construction sites.
- Objective 6: Link the positive effects of energy conservation and waste management to emission reductions.

***San Francisco Health Code Construction Dust Control Ordinance***

The San Francisco Health Code Article 22B and San Francisco Building Code §106A.3.2.6 collectively constitute the City’s Construction Dust Control Ordinance. The Construction Dust Control Ordinance requires that all site preparation work, demolition, or other construction activities within the City that have the potential to create dust or to expose or disturb more than 10 cubic yards or 500 square feet of soil comply with specific dust control measures whether or not the activity requires a permit from the Department of Building Inspection (DBI). For projects over one-half acre, the Construction Dust Control Ordinance requires that the project sponsor submit a Dust Control Plan for approval by the San Francisco Department of Public Health (DPH) prior to issuance of a building permit by the DBI.

***San Francisco Health Code Clean Construction Ordinance***

This ordinance requires clean construction practices for all City projects that entail 20 or more cumulative days of construction. The ordinance requires that off-road equipment and off-road engines with 25 horsepower or greater: 1) be fueled by higher grade biodiesel fuel; and 2) if used more than 20 hours, either meet or exceed federal “Tier 2” emissions standards for off-road engines or operate with the most effective verified diesel emission control technology. The requirement does not apply to portable or stationary generators (engines). As of October 2014, this ordinance was under review.

***Local GHG Reduction Strategies***

The San Francisco Department of the Environment and the San Francisco Public Utilities Commission (SFPUC) prepared a Climate Action Plan (CAP).

The City’s *Strategies to Address Greenhouse Gas Emissions* presents an assessment of policies, programs, and ordinances that collectively represent San Francisco’s qualified GHG reduction in compliance with the BAAQMD’s recommendations. The *Strategies to Address Greenhouse Gas Emissions* identifies a number of actions that the City has taken in support of the CAP, and mandatory requirements and incentives that have measurably reduced GHG emissions. These include, but are not limited to, increases in the energy efficiency of new and existing buildings, installation of solar panels on building roofs, implementation of a green building strategy, adoption of a zero waste strategy, a construction and demolition debris recovery ordinance, a solar energy generation subsidy, incorporation of alternative fuel vehicles in municipal transportation fleet (including buses and taxis), and a

mandatory composting ordinance. The strategy also identifies 42 specific regulations intended reduce GHG emissions of proposed development projects.

### ***Greenhouse Gas Reduction Ordinance***

This ordinance establishes the following GHG emission reduction limits for San Francisco and the target dates by which they must be achieved. Reductions from 1990 levels and target years are noted below.

- 25 percent by 2017
- 40 percent by 2025
- 80 percent by 2050

## **4.10.2 | Affected Environment**

### **4.10.2.1 | LOCAL CLIMATE**

The peninsula region extends from northwest of San Jose to the Golden Gate Bridge. 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.

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. In the vicinity of the Geary corridor, the average wind speed is approximately 10 miles from the northwest.<sup>12</sup>

The annual average temperature in the Geary corridor is approximately 57°F.<sup>13</sup> The Geary corridor area experiences an average winter temperature of approximately 52°F and an average summer temperature of approximately 60°F. Total precipitation in the Geary corridor averages approximately 21 inches annually. Precipitation occurs mostly during the winter and relatively infrequently during the summer.

### **4.10.2.2 | AIR QUALITY**

The federal and state governments have established ambient air quality standards for outdoor concentrations of six common pollutants, called criteria pollutants, to protect public health. The criteria pollutant standards have been set at levels above which concentrations could be harmful to human health and welfare. These standards are designed to protect the most sensitive persons from illness or discomfort.

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<sup>12</sup> As recorded at the San Francisco/International Airport Wind Monitoring Station.

<sup>13</sup> As recorded at the San Francisco Mission Dolores Station.

**Pollutants and Effects Overview**

Other air quality issues of concern in the Air Basin include nuisance effects of odors and dust. Objectionable odors may be associated with a variety of pollutants. Odors rarely have direct health effects, but they can be 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.<sup>14</sup>

Similarly, nuisance dust may be generated by a variety of sources including quarries, agriculture, grading and construction. Dust emissions can contribute to increased ambient concentrations of PM<sub>10</sub>, and can also contribute to reduced visibility and soiling of exposed surfaces.

**4.10.2.2.1 AIR MONITORING DATA**

The BAAQMD monitors air quality conditions at 23 locations throughout the Bay Area. The closest air monitoring station to the Geary corridor is the Arkansas Street Monitoring Station, about 7.7 miles from the intersection of 48th Avenue and Geary Boulevard, and 3.8 miles from the intersection of Divisadero Street and Geary Boulevard. Historical data from this station was used to characterize existing conditions within the vicinity of the Geary corridor and to establish a baseline for estimating future conditions with and without implementation of the build alternatives. Table 4.10-2 summarizes ambient air quality conditions recorded during the 2009 to 2013 period.

**Table 4.10-2 2009-2013 Ambient Air Quality Data in Project Vicinity**

POLLUTANT	POLLUTANT CONCENTRATION & STANDARDS	NUMBER OF DAYS ABOVE STATE STANDARD				
		2009	2010	2011	2012	2013
Ozone	Maximum 1-hr Concentration (ppm)	0.07	0.08	0.07	0.07	0.07
	Days > 0.09 ppm (State 1-hr standard)	0	0	0	0	0
	Maximum 8-hr Concentration (ppm)	0.06	0.05	0.05	0.05	0.06
	Days > 0.07 ppm (State 8-hr standard)	0	0	0	0	0
	Days > 0.075 ppm (Federal 8-hr standard)	0	0	0	0	0
Carbon Monoxide	Maximum 1-hr concentration (ppm)	4.3	1.8	1.8	2	n/a
	Days > 20 ppm (State 1-hr standard)	0	0	0	0	
	Days > 35 ppm (Federal 1-hr standard)	0	0	0	0	
	Maximum 8-hr concentration (ppm)	2.9	1.4	1.2	1.2	
	Days > 9.0 ppm (State 8-hr standard)	0	0	0	0	
	Days > 9.0 ppm (Federal 8-hr standard)	0	0	0	0	n/a
Nitrogen Dioxide	Maximum 1-hr Concentration (ppm)	0.06	0.09	0.09	0.12	0.07
	Days > 0.18 ppm (State 1-hr standard)	0	0	0	0	0
	Days > 0.100 (Federal 1-hr standard)	0	0	0	1	0
Respirable Particulate Matter (PM <sub>10</sub> )	Maximum 24-hr Concentration (µg/m <sup>3</sup> )	36.0		45.6	50.6	
	Estimated Days > 50 µg/m <sup>3</sup> (State 24-hr standard)	0	39.7	0	0	41.9
	Estimated Days > 150 µg/m <sup>3</sup> (Federal 24-hr standard)	0	0	0	1	*
Fine Particulate Matter (PM <sub>2.5</sub> )	Maximum 24-hr Concentration (µg/m <sup>3</sup> )	36	45	48	36	48.5
	Estimated Days > 35 µg/m <sup>3</sup> (Federal Standard)	1	3	2	1	2

Notes: ROG and NOx are not monitored pollutants but combine to form ozone. n/a stands for data not available. \* means there was insufficient data available to determine the value.

Bolded text = exceeds standard

Source: CARB, Historical Data by Year, available at <http://www.arb.ca.gov/adam/welcome.html>, last accessed October 15, 2014.

<sup>14</sup> As recorded at the San Francisco Mission Dolores Station.

Relative to other roadways throughout San Francisco, the Geary corridor has a high level of air pollution from transportation sources and associated high levels of air pollution health risks.

In addition to monitoring criteria air pollutants, both the BAAQMD and CARB operate TAC monitoring networks in the Air Basin. These stations measure 10 to 15 TACs, depending on the specific station. The TACs selected for monitoring are those that have traditionally been found in the highest concentrations in ambient air, and therefore tend to be substantial contributors to community health risk. The BAAQMD operates an ambient TAC monitoring station at its 16th and Arkansas streets facility, which is the only monitoring site for air toxics in the City.

TACs are generally defined as those contaminants that are known or suspected to cause serious health problems, but do not have a corresponding ambient air quality standard. TACs are also defined as an air pollutant that may increase a person's risk of developing cancer and/or other serious health effects; however, the emission of a toxic chemical does not automatically create a health hazard. Other factors, such as the amount of the chemical; its toxicity, and how it is released into the air, the weather, and the terrain, all influence whether the emission could be hazardous to human health. TACs are emitted by a variety of industrial processes such as petroleum refining, electric utility and chrome plating operations, commercial operations such as gasoline stations and dry cleaners, and motor vehicle exhaust and may exist as PM<sub>10</sub> and PM<sub>2.5</sub> or as vapors (gases). TACs include metals, other particles, gases absorbed by particles, and certain vapors from fuels and other sources.

The emission of toxic substances into the air can be damaging to human health and to the environment. Human exposure to these pollutants at sufficient concentrations and durations can result in cancer, poisoning, and rapid onset of sickness, such as nausea or difficulty in breathing. Other less measurable effects include immunological, neurological, reproductive, developmental, and respiratory problems. Pollutants deposited onto soil or into lakes and streams affect ecological systems and eventually human health through consumption of contaminated food. The carcinogenic potential of TACs is a particular public health concern because many scientists currently believe that there is no "safe" level of exposure to carcinogens. Any exposure to a carcinogen poses some risk of contracting cancer.

Table 4.10-3 shows ambient concentrations of carcinogenic TACs measured at the Arkansas Street station and the estimated cancer risks from lifetime (i.e., 70 years) exposure to these substances. When TAC measurements at this station are compared to ambient concentrations of various TACs for the Bay Area as a whole, the cancer risks associated with mean TAC concentrations in the City are similar to those for the Bay Area. Therefore, the estimated average lifetime cancer risk resulting from exposure to TAC concentrations measured at the Arkansas Street air monitoring station do not appear to be any greater than for the Bay Area as a region.

**Table 4.10-3 Measurements of Carcinogenic Toxic Air Contaminants Concentrations at Arkansas Street Station and Estimated Cancer Risk from Lifetime Exposure**

SUBSTANCE	CONCENTRATION	CANCER RISK PER MILLION <sup>A</sup>
<b>Gaseous TACS</b>	<b>(PPB)</b>	
Acetaldehyde	0.68	2
Benzene	0.23	19
1,3-Butadiene	0.044	13
Para-Dichlorobenzene	0.15	10
Carbon Tetrachloride	0.088	21
Ethylene Dibromide	0.006	3
Formaldehyde	1.32	8
Perchloroethylene	0.018	0.4
Methylene Chloride	0.12	0.3
Methyl Tertiary Butyl Ether (MTBE)	0.26	0.3
Chloroform	0.023	0.5
Trichloroethylene	0.01	0.1
<b>Particulate TACS</b>	<b>(ng/m<sup>3</sup>)</b>	
Chromium (Hexavalent)	0.05	10

Notes: All values are from BAAQMD 2012 monitoring data from the Arkansas Street station, except for Para-Dichlorobenzene (2006), Ethylene Dibromide (1992), MTBE (2003).

ppb=parts per billion; ng/m<sup>3</sup> = nanograms per cubic meter

<sup>A</sup> Cancer risks were estimated by applying published unit risk values to the measured concentrations.

Source: California Air Resources Board (CARB), Ambient Air Toxics Summary, 2011a. Information available online at: <http://www.arb.ca.gov/adam/toxics/sitesubstance.html>. Last accessed February 20, 2013.

**4.10.2.2.2 SENSITIVE RECEPTORS**

Some land uses are considered more sensitive to changes in air quality than others, depending on the population groups and the activities involved. CARB has identified the following groups who are most likely to be affected by air pollution: children under 14, the elderly over 65 years of age, athletes, and people with cardiovascular and chronic respiratory diseases. Typically, sensitive receptors include residences, schools, playgrounds, child-care centers, athletic facilities, long-term health care facilities, rehabilitation centers, convalescent centers, and retirement homes. All sensitive receptors discussed above are located in proximity to the Geary corridor.

**4.10.3 | Methodology**

The alternatives were evaluated for potential air quality effects in terms of several considerations, including conformity with the CAA, daily construction emissions, passenger vehicle emissions, and pollutant concentrations and dispersion.

To assess transportation conformity with the CAA, regional and project-level air quality conformity analyses were conducted. Regional conformity was determined by reviewing the current RTP and TIP to establish whether the project is incorporated and thus covered for regional conformity. To determine project-level conformity hot spot analyses were conducted for carbon monoxide and particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>).

Daily construction emissions were assessed for all build alternatives by comparing estimated emissions of criteria air pollutants against regional significance thresholds. An analysis was also completed to assess health risks using the same methodology as was used for daily construction emissions. Exposure parameters and risk calculation equations were obtained from the BAAQMD guidance document *Recommended Methods and Modeling Local Risks and Hazards* (May 2011). It is anticipated that highest health risk would be associated with bringing Fillmore Street to grade under Alternative 3 and 3-Consolidated as this work would result in by far the highest level of construction intensity in terms of equipment use and truck activity and by extension, this activity would result in the highest health-related risks. In comparison, all other build alternative construction activities would be of substantially lower intensity/shorter duration. Accordingly, analysis of the Fillmore Street work proposed in Alternatives 3 and 3-Consolidated provides a worst-case scenario of potential health risks associated with any of the build alternatives.

Pollutant concentrations and dispersion was modeled using AERMOD, which considered two source locations: 1) side of the roadway for Alternative 2 and 2) the center lane for Alternative 3, 3-Consolidated, and the Hybrid Alternative/LPA.

Passenger vehicle emissions were estimated using VMT and traffic speed data. Emission rates were obtained from the CARB EMFAC2011 Motor Vehicle Emissions Inventory Model. Existing and future emissions from buses were also estimated using EMFAC2011, which also accounted for the use of emission control technology.

To determine the potential public health effects related to operation, pollutant concentrations were estimated in two steps: 1) Dispersion modeling was used to estimate total volatile organic compound (VOC) and PM<sub>10</sub> concentrations, and 2) individual organic or particulate TAC concentrations were calculated using emissions profiles to determine total VOC and PM<sub>10</sub> estimates. Similarly to construction-related emissions, operational TAC concentrations were also estimated using the air dispersion model AERMOD with model options for 1-hour maximum and annual average concentrations selected. Two source locations were considered in the dispersion modeling: 1) side of the roadway for Alternative 2, and 2) the center lane for Alternative 3, 3-Consolidated, and the Hybrid Alternative/LPA. Meteorological data from the BAAQMD Mission Bay-San Francisco Monitoring Station was used to represent local conditions.

The maximum incremental cancer risk from exposure to diesel particulate matter was calculated by estimating exposure to carcinogenic chemicals and multiplying the dose (which is the exposure and duration of the pollutant) times the cancer potency factor (a metric that estimates risk associated with exposure to a carcinogen).

The potential for exposure to result in chronic and acute non-cancer effects is evaluated by comparing the estimated annual and hourly average air concentrations to the chemical-specific non-cancer chronic reference exposure levels (RELs). The chronic REL is the inhalation exposure concentration at which no adverse chronic health effects would be anticipated following exposure. When calculated for a single chemical, the comparison yields a ratio termed a hazard quotient.



This analysis considered year 2020 No Build conditions as the environmental baseline against which future conditions were compared. Year 2020 was used as the baseline so as to more accurately compare the build alternatives taking into account future traffic conditions given the length of time between issuing the Notice of Preparation (2008) and the anticipated opening year of the project (2020).

#### **4.10.4 | Environmental Consequences**

This section summarizes effects of the project alternatives on regional and local air quality. The various regulatory requirements described in Section 4.10.1 above require consideration of potential consequences through several means. Accordingly, this section is organized as follows:

- Section 4.10.4.1: Hybrid Alternative/LPA Modifications - Analysis of Potential Additive Effects since Publication of the Draft EIS/EIR
- Section 4.10.4.2: Transportation Conformity with Federal Clean Air Act
- Section 4.10.4.3: Consistency with Applicable Air Quality Plan
- Section 4.10.4.4: No Build Alternative Construction Effects
- Section 4.10.4.5: Build Alternatives Construction Effects, including:
  - Air Quality and Greenhouse Gas Emissions
  - Health Risks/Toxic Air Contaminants
  - Odors
- Section 4.10.4.6: No Build Alternative Operational Effects
- Section 4.10.4.7: Build Alternatives Operational Effects, including:
  - Air Quality and Greenhouse Gas Emissions
  - Health Risks/Toxic Air Contaminants
  - Odors

This section also describes potential impacts and benefits for air quality. The analysis compares each build alternative relative to the No Build Alternative.

As set forth in Section 4.10.4.1, the modifications to the Hybrid Alternative/LPA since publication of the Draft EIS/EIR do not change the conclusions regarding air quality impacts in the Draft EIS/EIR.

##### **4.10.4.1 | HYBRID ALTERNATIVE/LPA MODIFICATIONS: SUMMARY OF POTENTIAL ADDITIVE EFFECTS SINCE PUBLICATION OF THE DRAFT EIS/EIR**

As discussed in Section 2.2.7.6, the Hybrid Alternative/LPA now includes the following six minor modifications added since the publication of the Draft EIS/EIR:

- 1) Retention of the Webster Street pedestrian bridge;
- 2) Removal of proposed BRT stops between Spruce and Cook streets (existing stops would remain and provide local and express services);
- 3) Addition of more pedestrian crossing and safety improvements;

- 4) Addition of BRT stops at Laguna Street;
- 5) Retention of existing local and express stops at Collins Street; and
- 6) Relocation of the westbound center- to side-running bus lane transition to the block between 27th and 28th avenues.

This section presents analysis of whether these six modifications could result in any new or more severe air quality impacts during construction or operation. As documented below, the Hybrid Alternative/LPA as modified would not result in any new or more severe air quality impacts relative to what was disclosed in the Draft EIS/EIR.

#### ***Retention of the Webster Street Pedestrian Bridge***

**Construction:** Retention (i.e., no demolition) of the Webster Street bridge would substantially reduce temporary construction activity (and associated construction-period emissions) in this area. Therefore, this modification would not result in any new or more severe air quality impacts during construction.

**Operation:** Because this modification would not substantially affect bus operations relative to what was described in the Draft EIS/EIR (see Section 3.3), anticipated long-term operational benefits regarding air quality and GHG emissions over the No Build Alternative would still be expected.

#### ***Removal of Proposed BRT Stops between Spruce and Cook Streets***

**Construction:** This change would result in no new BRT stops being constructed in this area, which would in turn substantially reduce the amount of project-related construction in this area. The reduction in the extent of construction would not result in any new or more severe air quality impacts during construction.

**Operation:** Because this modification would not substantially affect bus operations relative to what was described in the Draft EIS/EIR (see Section 3.3), it would retain anticipated benefits regarding air quality and GHG emissions over the No Build Alternative. Therefore, this modification would not result in any new or more severe air quality impacts during operation.

#### ***Addition of More Pedestrian Crossing and Safety Improvements***

**Construction:** Construction of additional pedestrian improvements would require the same type of construction activity associated with other similar elements of the project. Each new pedestrian crossing bulb entails a relatively shallow excavation (1.5 feet) and a short work period duration (4-6 days). Although the proposed modification increases the number of new pedestrian crossing bulbs (from 65 as proposed in the Draft EIS/EIR to 91), the added bulbs would be widely dispersed throughout the 6.5-mile Geary corridor and would be constructed over time (within the various project phases). In the context of other elements of the Hybrid Alternative/LPA, any additional air quality impacts associated with construction at these locations would be marginal in their contribution to the project's overall emissions. Therefore, this modification would not result in any new or more severe air quality impacts during construction.

**Operation:** Neither the previously proposed nor the newly proposed pedestrian crossing bulbs would introduce any further change in traffic lane configurations, turning movements, or bus operations relative to what was described in the Draft EIS/EIR. Accordingly, with the inclusion of the additional pedestrian

improvements, the Hybrid Alternative/LPA would retain anticipated benefits regarding air quality and GHG emissions over the No Build Alternative. Therefore, this modification would not result in any new or more severe air quality impacts during operation.

***Addition of BRT Stops at Laguna Street***

**Construction:** Construction of additional BRT stops on new transit islands at Laguna Street would require the same type of construction activity associated with other similar elements of the project. The two new islands would require minor excavation and temporary lane reductions, similar in nature to the other project elements proposed for construction elsewhere along the corridor. Accordingly, the additional construction period air quality effects associated with these would, in the context of the construction of the Hybrid Alternative/LPA as a whole be marginal/negligible. Therefore, this modification would not result in any new or more severe air quality impacts during construction.

**Operation:** Implementation of this modification would increase the average end-to-end travel time of the inbound and outbound BRT service by about 49 seconds, compared to the Hybrid Alternative as analyzed in the Draft EIS/EIS. As this modification would not substantially affect bus operations by increasing travel delay, relative to what was described in the Draft EIS/EIR (see Section 3.3), it would retain anticipated benefits regarding air quality and GHG emissions over the No Build Alternative. Therefore, this modification would not result in any new or more severe air quality impacts during operation.

***Retention of Existing Local and Express Stops at Collins Street***

**Construction:** Temporary and localized air quality impacts would be reduced in the Collins Street area due to reduced construction and demolition activities at this location. Therefore, this modification would not result in any new or more severe noise and vibration impacts during construction.

**Operation:** Because this modification would not alter traffic signal timing, and no changes in traffic lane alignment are proposed, retention of existing bus stops would not substantially affect bus operations relative to what was described in the Draft EIS/EIR (see Section 3.3). Anticipated benefits regarding air quality and GHG emissions over the No Build Alternative would be maintained. Therefore, this modification would not result in any new or more severe air quality impacts during operation.

***Relocation of the Westbound Center- to Side-Running Bus Lane Transition***

**Construction:** Relocation of the westbound bus lane transition at 27th Avenue would not alter the total level of construction activities but would simply shift about half of it one block to the west. This modification would alter roadway striping and the location of the transit signal queue jump, but would not require additional median removal or other intensive construction activities beyond what was described in the Draft EIS/EIR and, thus, would not create new or more severe air quality effects. Therefore, this modification would not result in any new or more severe noise and vibration impacts during construction.

## DEFINITION

**POAQC:** The EPA Transportation Conformity Guidance defines a POAQC as any project in a place with a significant number of diesel vehicles or that will lead to a significant increase in diesel vehicles, including:

- Highway projects;
- Projects affecting intersections with poor traffic flow;
- New or expanded bus or rail terminals and transfer points with diesel vehicles congregating in one place; and
- Projects in places or categories identified in the  $PM_{2.5}$  or  $PM_{10}$  implementation plan as sites of possible violation.

**Operation:** Because this modification would not add or remove bus stops or bus-only lanes, no change to travel time would result. As relocation of the transition would not substantially affect bus operations relative to what was described in the Draft EIS/EIR (see Section 3.3), it would retain anticipated benefits regarding air quality and GHG emissions over the No Build Alternative. Therefore, this modification would not result in any new or more severe air quality impacts during operation.

#### 4.10.4.2 | TRANSPORTATION CONFORMITY WITH FEDERAL CLEAN AIR ACT

Transportation conformity is required under CAA section 176(c) (42 U.S.C. 7506(c)) to ensure that federally supported highway and transit project activities are consistent with the purpose of the SIP. Conformity to the purpose of the SIP means that transportation activities will not cause new air quality violations, worsen existing violations, or delay timely attainment of the relevant NAAQS. EPA's transportation conformity rule (40 CFR 51.390 and Part 93) establishes the criteria and procedures for determining whether transportation activities conform to the SIP. Under the criteria, transportation projects must demonstrate conformity on regional and local levels.

##### 4.10.4.2.1 REGIONAL CONFORMITY

The current RTP is the *2040 Plan for the San Francisco Bay Area* (MTC 2017). The RTP includes the Geary Corridor Bus Rapid Transit project. Both FHWA and the lead agency made a regional conformity determination for the current RTP in July 2017.

The Geary BRT project is also included in the 2017 TIP. FHWA and FTA determined the TIP to conform to the SIP on August 23, 2017.

The design, concept, and scope of the build alternatives are consistent with the project descriptions in the RTP and TIP, and also with the "open to traffic" assumptions of the regional emissions analysis MTC conducted in association with its adoption of the RTP. Therefore, the build alternatives are considered to have demonstrated regional conformity.

##### 4.10.4.2.2 PROJECT CONFORMITY

###### Carbon Monoxide Hotspot Analysis

To demonstrate conformity, a project must not cause or contribute to new localized carbon monoxide violations or increase the frequency or severity of existing carbon monoxide violations. According to the BAAQMD, air quality monitors have not recorded an air exceedance of the federal carbon monoxide standards since at least 1994. Carbon monoxide concentrations throughout the state have steadily declined over time as vehicle engines have become more efficient and less polluting. The BAAQMD has recognized this trend and completed technical analyses that indicate that there is no potential for a carbon monoxide hotspot to occur when:

- Project traffic would not increase traffic volumes at affected intersections to more than 44,000 vehicles per hour; or
- Project traffic would not increase traffic volumes at affected intersections to more than 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). The fact that the Geary corridor study area is a highly developed urban area with multi-story buildings and contains streets with canyon-like air dispersion characteristics means that this criterion may be applied to certain blocks along the Geary corridor and some of its parallel streets.

None of the alternatives (build or no build) would increase traffic volumes at any intersection in the traffic study area to more than 24,000 vehicles per day.<sup>15</sup> There is therefore no potential for a new localized carbon monoxide violation and further analysis of carbon monoxide concentrations is not required.

***PM<sub>2.5</sub>/PM<sub>10</sub> Hotspot Analyses***

Qualitative PM hotspot analysis is required under the EPA Transportation Conformity rule for Projects of Air Quality Concern (POAQC). Projects that are not POAQC are not required to complete a detailed PM hotspot analysis.

The build alternatives are not considered POAQC because they do not meet the definition of a POAQC as defined in EPA’s Transportation Conformity Guidance. The build alternatives would not increase the percentage of diesel vehicles on the roadway, do not involve a bus or rail terminal that significantly increases diesel vehicles, and are not identified in the SIP as a possible PM<sub>2.5</sub> or PM<sub>10</sub> violation site. The build alternatives have undergone Interagency Consultation (IAC). IAC participants concurred that the build alternatives are not POAQC (refer to Appendix G).

**4.10.4.3 | CONSISTENCY WITH APPLICABLE AIR QUALITY PLAN**

The most recently adopted air quality plan for the Air Basin is the 2017 Clean Air Plan (2017 CAP).<sup>16</sup> In determining consistency with the 2017 CAP this analysis considers whether the project would: (1) support the primary goals of the 2017 CAP, (2) include applicable control measures from the 2017 CAP, and (3) disrupt or hinder implementation of control measures identified in the 2017 CAP.

The primary goals of the 2017 CAP are to attain all state and national air quality standards, eliminate disparities among Bay Area communities in cancer health risk from toxic air contaminants, and reduce Bay Area greenhouse gas (GHG) emissions 40 percent below 1990 levels by 2030 and 80 percent below 1990 levels by 2050. The discussion of GHG emissions presented demonstrated that the build alternatives would comply with the applicable provisions of the City’s Greenhouse Gas Reduction Strategy.

A key objective of the project purpose is to improve transit conditions in the Geary corridor, and thus attract a greater portion of commuters to use bus instead of private passenger vehicles.

The 2017 CAP control strategies consist of the following:

- 40 Stationary Source Control Measures
- 23 Transportation Control Measures
- 2 Energy Control Measures
- 4 Buildings Control Measures
- 4 Agriculture Control Measures
- 3 Natural and Working Lands Control Measures
- 4 Waste Management Control Measures
- 2 Water Control Measures
- 3 Super-GHG Control Measures

<sup>15</sup> The traffic study area includes not only Geary Street/Boulevard but also portions of O’Farrell Street and other streets.

<sup>16</sup>BAAQMD. 2017. Bay Area 2017 Clean Air Plan. Available online at: [http://www.baaqmd.gov/~media/files/planning-and-research/plans/2017-clean-air-plan/attachment-a\\_-proposed-final-cap-vol-1-pdf.pdf?la=en](http://www.baaqmd.gov/~media/files/planning-and-research/plans/2017-clean-air-plan/attachment-a_-proposed-final-cap-vol-1-pdf.pdf?la=en). Last accessed December 21, 2017.

Implementation of any of the build alternatives, including the No Build Alternative, would result in short-term criteria pollutant emissions during construction.

However, replacement of standard motor coaches with diesel-hybrid electric buses would result in a decrease in several pollutants over the long-term. The analysis herein illustrates that neither construction nor operation of any of the project alternatives would result in emissions of criteria air pollutants that would impede attainment of air quality standards. The construction and operational health risk assessment demonstrates that implementation of any of the project alternatives would not substantially increase risks to public health.

As none of the build alternatives would result in substantial, long-term increases in criteria air pollutants, would not expose receptors to substantial pollutant concentrations, and would not result in substantial, long-term increases in GHG emissions, all of the project alternatives would support the primary goals of the 2017 CAP.

The measures most applicable to the project alternatives are transportation control measures (TCMs), which are strategies to reduce vehicle trips, vehicle use, vehicle miles traveled, vehicle idling, or traffic congestion for the purpose of reducing motor vehicle emissions as well as use of more advanced and less polluting fleet of vehicles. The 2017 CAP includes 23 TCMs to improve transit service, improve system efficiency, encourage sustainable travel behavior, support focused growth, and implement pricing strategies. In particular, the TCMs have been updated to support and complement critical land use and transportation strategies outlines in *Plan Bay Area*.<sup>17</sup> Implementation of the project alternatives would be consistent with the following 2017 CAP TCMs:

**TCM TR3 Local and Regional Bus Service** - Fund local and regional bus projects, including operations and maintenance.

**TCM TR5 Transit Efficiency and Use** – Improve transit efficiency and make transit more convenient for riders through continued operation of 511 Transit, full implementation of Clipper fare payment system and the Transit Hub Signage Program.

**TCM TR9 Bicycle and Pedestrian Access and Facilities** – Encourage planning for bicycle and pedestrian facilities in local plans, e.g., general and specific plans, fund bike lanes, routes, paths and bicycle parking facilities.

**TCM TR10 Land Use Strategies** – Support implementation of *Plan Bay Area*, maintain and disseminate information on current climate action plans and other local best practices, and collaborate with regional partners to identify innovative funding mechanisms to help local governments address air quality and climate change in their general plans.

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<sup>17</sup>Metropolitan Transportation Commission. July 2017. Final Plan Bay Area 2040. Available online at: [https://mtc.ca.gov/sites/default/files/Final\\_Plan\\_Bay\\_Area\\_2040.pdf](https://mtc.ca.gov/sites/default/files/Final_Plan_Bay_Area_2040.pdf). Last accessed December 21, 2017.

An evaluation of the 2017 CAP's 85 control measures determined that none of the project alternatives would disrupt or hinder implementation of any of the CAP's 85 control measures.

For the reasons stated above, the project alternatives (build and No Build) would be consistent with the most recent air quality plan that shows how the region will improve ambient air quality and achieve state and federal ambient air quality standards.

#### **4.10.4.4 | NO BUILD ALTERNATIVE - CONSTRUCTION EFFECTS**

Under the No Build Alternative, transit and transportation facilities and services would remain unaltered except for changes that are currently planned or programmed to be implemented in the Geary corridor by 2020. These projects have already undergone or will undergo individual environmental review, in which construction effects would be analyzed. Given the relatively small scale of the improvements comprising the No Build Alternative, no adverse effects relative to regional emissions, health risks and toxic air contaminants, asbestos, or odors are expected to result from construction.

#### **4.10.4.5 | BUILD ALTERNATIVES - CONSTRUCTION EFFECTS**

##### **4.10.4.5.1 AIR QUALITY AND GREENHOUSE GAS EMISSIONS - CONSTRUCTION EFFECTS**

Construction activity would generate air pollutant emissions from various sources, including equipment engines, truck engines, and earthwork activity. All build alternatives would be required to comply with San Francisco Health Code Article 22B and San Francisco Building Code §106A.3.2.6, which collectively constitute the City's Construction Dust Control Ordinance (adopted in July 2008). Recycled water would be required for use for dust control activities under City Ordinance 175-91. The build alternatives would further be required to comply with Section 6.25 of Chapter 6 of the San Francisco Administrative Code (Clean Construction Ordinance), which requires clean construction practices for all City projects that consist of 20 or more cumulative days of construction. The Clean Construction Ordinance requires that off-road equipment and off-road engines with 25 horsepower or greater: 1) be fueled by biodiesel fuel grade B20 or higher; and 2) if used more than 20 hours, either meet or exceed Tier 2 emissions standard for off-road engines or operate with the most effective verified diesel emission control technology. The requirement does not apply to portable or stationary generators (engines). Compliance with these regulations would control fugitive dust emissions and substantially reduce exhaust emissions associated with standard construction equipment.

From an air quality perspective (e.g., equipment use), the majority of construction activity would be similar for the various alternatives. However, construction activity associated with bringing Fillmore Street to grade (Alternatives 3 and 3-Consolidated) would generate the maximum daily emissions as a result of additional truck and equipment activity. Regional construction emissions associated with the project alternatives are presented in Table 4.10-4 for Alternatives 3, 3-Consolidated, and the Hybrid Alternative/LPA. Table 4.10-4 also includes emissions for Alternative 2, which represents a typical segment that includes fewer truck trips and less equipment activity than needed to bring Fillmore Street to grade level. Accordingly, Alternative 2 is projected to result in lower daily levels of emissions. As shown in Table 4.10-4, each of the build alternatives is projected to generate daily emissions

of criteria pollutants below applicable thresholds. Therefore, none of the alternatives would result in an adverse effect regarding construction period emissions.

**Table 4.10-4 Estimated Daily Construction Emissions for all Build Alternatives**

CRITERIA POLLUTANT OR OZONE PRECURSOR	POUNDS PER DAY			
	REACTIVE ORGANIC GASES	NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
<b>Alternative 2</b>				
General Construction Emissions	5	21	1	1
Roadway Striping	3	--	--	--
Regional Significance Threshold	54	54	82	54
Exceed Threshold?	No	No	No	No
<b>Alternative 3</b>				
General Construction Emissions	6	41	1	1
Roadway Striping	3	--	--	--
Regional Significance Threshold	54	54	82	54
Exceed Threshold?	No	No	No	No
<b>Alternative 3-Consolidated</b>				
General Construction Emissions	6	41	1	1
Roadway Striping	3	--	--	--
Regional Significance Threshold	54	54	82	54
Exceed Threshold?	No	No	No	No
<b>Hybrid Alternative/LPA</b>				
General Construction Emissions	6	37	1	1
Roadway Striping	3	--	--	--
Regional Significance Threshold	54	54	82	54
Exceed Threshold?	No	No	No	No

Source: CARB, 2011b and TAHA, 2014

**4.10.4.5.2 HEALTH RISK AND TOXIC AIR CONTAMINANTS -CONSTRUCTION EFFECTS**

It is anticipated that highest risk to public health would be associated with bringing Fillmore Street to grade under Alternatives 3 and 3-Consolidated. This segment would experience the highest level of construction intensity in terms of equipment use and truck activity. As shown in Table 4.10-5, construction activity would not generate emissions that would exceed the BAAQMD health risk significance thresholds. Construction activity associated with Alternative 2 or a typical segment for Alternatives 3, 3-Consolidated, and the Hybrid Alternative/LPA would result in lower risks. Therefore, implementation of the build alternatives would not result in adverse effects related to construction health risk.

**Table 4.10-5 Construction Health Risk Assessment**

HEALTH RISK TYPE	UNIT OF MEASUREMENT	FILLMORE STREET	THRESHOLD
Excess Cancer Risk (per million)	Probability per one million population	0.83	10
Chronic Health Risk	Health Index	0.05	1
Acute Health Risk	Health Index	0.40	1
Increase in PM Concentration	Annual Average (µg/m <sup>3</sup> )	0.25	0.3

Source: TAHA, 2014



***Asbestos-Containing Materials and Naturally Occurring Asbestos***

Asbestos has not been identified in the existing roadway surface that would be removed during the construction process. The use of asbestos in asphalt was discontinued in May of 1979; streets comprising the Geary corridor have been demolished and repaved since that date.

As a part of an ongoing study, the U.S. Geological Survey (USGS) identifies and maps reported occurrences of asbestos in the United States.<sup>18</sup> It is not anticipated that construction activity would encounter naturally occurring asbestos. Moreover, the City's Construction Dust Control Ordinance would effectively control unanticipated naturally occurring asbestos exposure through a variety of required control measures including watering.<sup>19</sup>

Therefore, the only components of the build alternatives to potentially involve exposure of asbestos would be the demolition of the pedestrian bridges at Webster Street and Steiner Street; in addition, Alternatives 3 and 3-Consolidated would decommission an existing below-grade pump station, including removal of a portion of its structure which could contain asbestos.

Accordingly, construction contractors shall comply with BAAQMD Regulation 11 (Hazardous Pollutants) Rule 2 (Asbestos Demolition, Renovation, and Manufacturing). The requirements for demolition activities include removal standards, reporting requirements, and mandatory monitoring and record keeping.

**4.10.4.5.3 ODORS - CONSTRUCTION EFFECTS**

Equipment exhaust and paving activities would result in odor emissions for each of the build alternatives. Odors would be localized and generally confined to the construction area. Each build alternative would utilize typical construction techniques, and the odors would be typical of most construction sites and temporary in nature. Construction activity would not cause an odor nuisance, and construction odors would not result in any adverse effects for any of the build alternatives.

**4.10.4.6 | NO BUILD ALTERNATIVE - OPERATIONAL EFFECTS**

Under the No Build Alternative, transit and transportation facilities and services would remain unaltered except for changes that are currently planned or programmed to be implemented in the Geary corridor by 2020. Most of these improvements would have a negligible effect on operational air pollutant emissions. However, one planned improvement is the replacement of current diesel buses with lower emissions diesel hybrid electric buses. This aspect of the No Build Alternative would represent a beneficial effect relative to existing conditions in terms of both

<sup>18</sup> U.S. Geological Survey (USGS). 2011. Van Gosen, B.S., and Clinkenbeard, J.P. California Geological Survey Map Sheet 59. Reported Historic Asbestos Mines, Historic Asbestos Prospects, and Other Natural Occurrences of Asbestos in California. Open - File Report 2011 - 1188 Website: <http://pubs.usgs.gov/of/2011/1188/>. Last accessed October 15, 2014.

<sup>19</sup> According to the USGS Survey Map for Asbestos in California, the following areas in the County of San Francisco have been identified with asbestos occurrence:

1) U.S. Mint area, located 1 mile to the south of the Geary corridor; 2) Potrero Hill area, located 2 miles to the south of the Geary corridor; 3) Fort Point-Presidio area, located 2 mile to the northwest of the Geary corridor; and 4) Hunter Points Area, located approximately 5 miles to the southwest of the Geary corridor.

According to the California Geologic Survey, naturally-occurring asbestos has been identified in San Francisco County

criteria air pollutants and greenhouse gas emissions. However, compared to the build alternatives, criteria air pollutant and GHG emissions would be the greatest under the No Build Alternative for forecast years 2020 and 2035 (refer to Table 4.10-6). The No Build Alternative would have no adverse effects on health risks and toxic air contaminants or odors.

**4.10.4.7 | BUILD ALTERNATIVES - OPERATIONAL EFFECTS**

**4.10.4.7.1 CRITERIA AIR POLLUTANT AND GREENHOUSE GAS EMISSIONS - OPERATIONAL EFFECTS**

Table 4.10-6 below summarizes regional operational period criteria air pollutant and GHG emissions for each of the build alternatives. Regional emissions are based on changes to countywide VMT, as each of the project alternatives have the potential to influence the regional transportation network. The table reflects expected emissions of criteria pollutants and GHGs that are likely to be emitted by the build alternatives. Therefore, certain criteria pollutants that are not associated with bus or auto emissions (including but not limited to sulfur dioxide and lead) are not reflected in the table. VMT and speed estimates were included in the air quality modeling.<sup>20</sup> Model outputs are estimated calculations of pollutants and greenhouse gases in terms of projected tons or metric tons per year.

Implementation of any of the build alternatives would generate operational emissions associated with a shift in regional passenger VMT and new buses servicing the Geary corridor. The operational analysis focused on estimating emissions associated with changes to transit and non-transit VMT. SFCTA estimated citywide passenger-vehicle VMT for various scenarios with and without implementation of the build alternatives. Tables 4.10-6 and 4.10-7 below summarize these estimates.

**Table 4.10-6 Criteria Pollutant and GHG Emissions - Operational Effects**

EMISSIONS BY ALTERNATIVE	TONS PER YEAR				CARBON DIOXIDE EQUIVALENT (METRIC TONS)
	REACTIVE ORGANIC GAS	NITROGEN OXIDES	PM <sub>10</sub>	PM <sub>2.5</sub>	
<b>2020</b>					
No Build Alternative	73.8	306.4	168.6	73.8	1,373,485
Alternative 2 Emissions	0.0	0.0	-0.2	-0.1	+127
<i>Regional + Alternative 2 Emissions</i>	73.8	306.4	168.4	73.7	1,373,612
Alternative 3 Emissions	-0.1	-0.3	-0.3	-0.2	-1,301
<i>Regional + Alternative 3 Emissions</i>	73.7	306.1	168.3	73.6	1,372,184
Alternative 3-Consolidated Emissions	-0.2	-0.6	-0.5	-0.2	-2,501
<i>Regional + Alternative 3 Consolidated Emissions</i>	73.6	305.8	168.1	73.6	1,370,984
Hybrid Alternative/LPA Emissions	-0.1	-0.3	-0.3	-0.2	-1,168
<i>Regional + Hybrid Alternative/LPA Emissions</i>	73.7	306.1	168.3	73.6	1,373,317

<sup>20</sup> CARB EMFAC2011 Motor Vehicle Emissions Inventory Model.

EMISSIONS BY ALTERNATIVE	TONS PER YEAR				CARBON DIOXIDE EQUIVALENT (METRIC TONS)
	REACTIVE ORGANIC GAS	NITROGEN OXIDES	PM <sub>10</sub>	PM <sub>2.5</sub>	
<b>2035</b>					
No Build Alternative	85.5	354.9	195.4	85.5	1,591,020
Alternative 2 Emissions	-0.1	-0.2	-0.4	-0.2	-1,816
<i>Regional + Alternative 2 Emissions</i>	<i>85.4</i>	<i>354.7</i>	<i>195.0</i>	<i>85.3</i>	<i>1,589,204</i>
Alternative 3 Emissions	-0.1	-0.4	-0.5	-0.2	-2,957
<i>Regional + Alternative 3 Emissions</i>	<i>85.4</i>	<i>354.5</i>	<i>194.9</i>	<i>85.3</i>	<i>1,588,063</i>
Alternative 3-Consolidated Emissions	-0.2	-0.8	-0.8	-0.4	-5,712
<i>Regional + Alternative 3 Consolidated Emissions</i>	<i>85.3</i>	<i>354.1</i>	<i>194.6</i>	<i>85.1</i>	<i>1,585,308</i>
Hybrid Alternative/LPA Emissions	-0.2	-0.8	-0.8	-0.4	-5,841
<i>Regional + Hybrid Alternative/LPA Emissions</i>	<i>85.3</i>	<i>354.1</i>	<i>194.6</i>	<i>85.1</i>	<i>1,585,179</i>

Note: the incremental project emissions show an increase (+) or decrease (-) in comparison to the No Build Alternative. This table does not represent all of the criteria air pollutants, only those that are reasonably expected to result from the project alternatives.

Source: CARB, 2011b and TAHA, 2014

**Table 4.10-7 Regional VMT and Traffic Speed Data Under the No Build and Build Alternatives**

SCENARIO	REGIONAL VEHICLE MILES TRAVELED (VMT)	AVERAGE SPEED (MILES PER HOUR)
<b>EXISTING CONDITIONS</b>		
2020 No Build Alternative	9,220,000	21
2020 Alternative 2	9,210,000	21
2020 Alternative 3	9,200,000	21
2020 Alternative 3-Consolidated	9,190,000	21
Hybrid Alternative/LPA	9,200,000	21
<b>FUTURE YEAR BUILDOUT</b>		
2035 No Build Alternative	11,160,000	17
2035 Alternative 2	11,140,000	17
2035 Alternative 3	11,130,000	17
2035 Alternative 3-Consolidated	11,120,000	17
Hybrid Alternative/LPA	11,120,000	17

Source: SFCTA, March 2014

***Alternative 2: Side-Lane BRT***

Alternative 2 and all other build alternatives also include the replacement of current diesel buses with lower emissions diesel hybrid electric models.

By the year 2020, Alternative 2 would result in modest decreases in countywide emissions of PM but no measurable decrease in other criteria pollutants. However, GHG emissions would increase by less than 1 percent relative to existing conditions. The increase is likely due to a combination of factors, including the removal of left turns along the Geary corridor.

By 2035, both PM and criteria pollutants would drop modestly relative to the No Build Alternative. Moreover, GHG emissions would decrease by 1,816 metric TPY relative to the 2035 No Build Alternative. This is a result of increased ridership associated with a mature transit system and various cumulative projects that will feed riders into the system. Therefore, Alternative 2 would result in long-term benefits in reducing both criteria pollutants and GHG emissions.

***Alternative 3: Center-Lane BRT with Dual Medians and Passing Lanes***

Alternative 3 operational criteria pollutant and GHG emissions are shown in Table 4.10-6. Countywide near-term (2020) regional criteria pollutant emissions would decrease modestly for all criteria pollutants compared to the 2020 No Build Alternative. GHG emissions would decrease by approximately 1,300 metric TPY of CO<sub>2</sub>e compared to the No Build Alternative. These reductions in emissions would result in a beneficial effect under Alternative 3 by 2020.

Regarding far-term (2035), emissions for all of the analyzed pollutants would decrease when comparing Alternative 3 to the 2020 No Build Alternative. This is a result of increased ridership associated with a mature transit system and various cumulative projects that will feed riders into the system. Therefore, Alternative 3 would result in a beneficial effect related to operational criteria pollutant and GHG emissions by 2035.

***Alternative 3-Consolidated: Center-Lane BRT with Dual Medians and Consolidated Bus Service***

Alternative 3-Consolidated operational criteria pollutant and GHG emissions are shown in Table 4.10-6. Near-term (2020) countywide regional criteria air pollutant emissions would decrease modestly in 2020 compared to the No Build Alternative. Criteria pollutant emissions reduction would be greater under Alternative 3-Consolidated for reactive organic gases, nitrogen oxides, and PM<sub>10</sub> than under any of the other build alternatives. GHG emissions would decrease by approximately 2,500 metric TPY compared to the No Build Alternative. This is the greatest reduction in GHGs for any of the build alternatives. Therefore, Alternative 3-Consolidated would result in the greatest beneficial effect related to operational criteria pollutant and GHG emissions by 2020.

By 2035, both criteria air pollutant and GHG emissions would decrease further compared to the No Build Alternative. Therefore, Alternative 3-Consolidated would result in a beneficial effect related to operational criteria pollutant and GHG emissions by 2035.

***Hybrid Alternative/LPA***

Hybrid Alternative/LPA operational emissions are shown in Table 4.10-6. Countywide regional criteria pollutant and GHG emissions would decrease in 2020 and 2035 compared to the No Build Alternative. GHG emissions would decrease by 5,841 metric TPY by 2035, representing a greater reduction in GHGs compared to the No Build Alternative. Therefore, the Hybrid Alternative/LPA would result in a beneficial effect related to operational criteria pollutant and GHG emissions in both the near- and far-term.

**4.10.4.7.2 HEALTH RISK AND TOXIC AIR CONTAMINANTS - OPERATIONAL EFFECTS**

An analysis was completed to assess health risk associated with increased bus activity. Health risks were estimated on a local level in the portion of the Geary corridor where the build alternatives would generate the highest increase in bus emissions (Geary Boulevard between Masonic Avenue and Collins Street).<sup>21</sup>

The analysis indicated that Alternative 2 would result in a higher risk than the other build alternatives. This is because Alternative 2 would have fully side-running bus-only lanes; project-related emissions sources (buses) would be located closer to the sensitive receptors than the other build alternatives which include substantial components of center-running bus-only lanes, where emission sources would be in the center of the Geary corridor and thus would have somewhat greater opportunity to disperse prior to reaching any sensitive receptor. Table 4.10-8 therefore shows the risk associated with Alternative 2.

As shown in Table 4.10-8, the carcinogenic, chronic, and acute risks, along with the annual average PM<sub>2.5</sub> concentration would be less than the BAAQMD significance thresholds. Therefore, none of the project alternatives would result in an adverse effect related to health risk.

**Table 4.10-8 Operational Health Risk Assessment**

HEALTH RISK TYPE	UNIT OF MEASUREMENT	THRESHOLD	MAXIMUM HEALTH RISK
EXCESS CANCER RISK	PROBABILITY PER ONE MILLION POPULATION	10	2
CHRONIC HEALTH RISK	HEALTH INDEX	1.0	0.001
ACUTE HEALTH RISK	HEALTH INDEX	1.0	0.004
INCREASE IN PM <sub>2.5</sub> CONCENTRATION	AVERAGE ANNUAL (MG/M <sup>3</sup> )	0.3	0.005

Source: TAHA, 2014

**4.10.4.7.3 ODORS - OPERATIONAL EFFECTS**

Land uses and industrial operations that are associated with odor complaints include wastewater treatment plants, landfills, confined animal facilities, composting stations, food manufacturing plants, refineries, and chemical plants. None of the build alternatives include any land use or activity that typically generates adverse odors.

**4.10.4.8 | COMPARATIVE EFFECTS OF ALTERNATIVES**

As demonstrated in the preceding subsections, all build alternatives would conform to BAAQMD health risk thresholds. The Hybrid Alternative/LPA and Alternative 3-Consolidated would have the greatest beneficial air quality impacts in terms of reduced operational pollutants and emissions, followed by Alternative 3, then Alternative 2. The No Build Alternative would perform the worst in terms of short- and long-term operational GHG emissions. Each of the build alternatives would reduce GHG emissions at year 2035 by about 1,820 to over 5,840 metric tons of carbon dioxide equivalent per year (see Table 4.10-6). Moreover, the build alternatives would be projected to result in decreased emissions of criteria pollutants and TACs relative to the No Build Alternative. As also shown in Table 4.10-6, the No Build Alternative would result in year 2035 criteria pollutant and TAC emissions

<sup>21</sup> This analysis accounts only for the increase in number of bus trips; the precise increase in number of private vehicles on a given segment cannot be estimated.

ranging from about 85 metric tons per year for reactive organic gases (ROG) and small particulate matter (PM<sub>2.5</sub>) to about 195.4 metric tons per year of large particulate matter (PM<sub>10</sub>) and nearly 355 metric tons per year of nitrogen oxide (NO<sub>x</sub>). Each of the build alternatives would result in reduced levels of each of these criteria pollutants and TACs ranging from 0.1 to 0.8 metric tons per year.

#### **4.10.5 | Avoidance, Minimization, and/or Mitigation Measures**

##### **4.10.5.1 | CONSTRUCTION MEASURES**

With adherence to City ordinances and regulations regarding construction, such as the Construction Dust Control Ordinance, none of the alternatives would result in any adverse effects during construction related to emissions of air pollutants and GHGs. Therefore, no additional construction-period avoidance, minimization, or mitigation measures would be necessary.

##### **4.10.5.2 | OPERATIONAL MEASURES**

As described in Section 4.10.4.7, the build alternatives would generally decrease regional VMT and thus would be projected to result in decreased emissions of criteria pollutants, GHGs, and TACs relative to the No Build Alternative. Therefore, no operational avoidance, minimization, or mitigation measures would be required.