APPENDIX A – 5

Air Quality Conformity Analysis

MTC Resolution No. 4544

Draft Transportation-Air Quality Conformity Analysis for *Plan Bay Area 2050* and the 2023 Transportation Improvement Program

July 2022

METROPOLITAN TRANSPORTATION COMMISSION

Association of Bay Area Governments

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I. Introduction

The Metropolitan Transportation Commission (MTC) prepares a transportation-air quality conformity analysis ("conformity analysis") when it amends or adopts a new Regional Transportation Plan (RTP), adopts a new Transportation Improvement Program (TIP), or modifies the inclusion of regionally significant, non-exempt projects into the TIP.

The purpose of this conformity analysis is to conform the 2023 Transportation Improvement Program (TIP) and to reconform Plan Bay Area 2050in accordance with the latest U.S. Environmental Protection Agency (EPA) transportation conformity regulations and the Bay Area Conformity State Implementation Plan (Conformity SIP), which is also known as the Bay Area Air Quality Conformity Protocol (MTC Resolution No. 3757). This conformity analysis addresses the 2008 and 2015 national ambient air quality standard (NAAQS) for the 8-hour ozone and the 2006 national 24-hour fine particulate matter ($PM_{2.5}$) standards. This report also explains the basis for the conformity analysis and provides the results used by MTC to make a positive conformity finding for the 2023 TIP and the reconformed Plan Bay Area 2050.

Purpose of Conformity Analysis

The Federal Clean Air Act (CAAA), as amended in 1990, outlines requirements for ensuring that federal transportation plans, programs, and projects are consistent with ("conform to") 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 national ambient air quality standards (NAAQS). A conformity finding demonstrates that the total emissions projected for a transportation plan ("RTP") or program ("TIP") are within the emissions limits ("budgets") established by the SIP, and that transportation control measures (TCMs) are implemented in a timely fashion.

Conformity requirements apply in all non-attainment and maintenance areas for transportation-related criteria pollutants and related precursor emissions (see Figure 1 for a map of the non-attainment area for the San Francisco Bay Area). For the Bay Area, the criteria pollutants to be addressed are ground-level ozone, carbon monoxide, and $PM_{2.5}$; and the precursor pollutants to be addressed include volatile organic compounds (VOC) and oxides of nitrogen (NOx) for ozone and for $PM_{2.5}$. EPA's most recent revisions to its transportation conformity regulations to implement the 1990 Federal Clean Air Act section 176 were published in the Federal Register on March 14, 2012[1].

Metropolitan Planning Organizations (MPOs) such as MTC are required to follow these regulations, and any other procedures and criteria contained in the EPA-approved Conformity SIP (also referred to as "Transportation-Air Quality Conformity Protocol" or "Protocol") for the Bay Area. In the Bay Area, procedures were first adopted in September 1994 to comply with the 1990 CAAA. Five subsequent amendments to the transportation conformity procedures in August 1995, November 1995, August 1997, July 2006, and April 2020 have been adopted by the three co-lead agencies (MTC, Association of Bay Area Governments (ABAG), and Bay Area Air Quality Management District (BAAQMD)). MTC Resolution 3757 represents the latest San Francisco Bay Area Transportation-Air Quality Conformity Protocol adopted by the three agencies in April 2020. Acting on behalf of the three agencies, the BAAQMD submitted the amended transportation conformity procedures to the California Air Resources Board (CARB) as a revision to the Bay Area Conformity SIP, whereby CARB subsequently approved the amended procedures on May 2021 and transmitted the procedures to EPA for final action. These

[1] The current version of the regulations is available on EPA's Transportation Conformity website at: https://www.epa.gov/state-and-local-transportation/current-law-regulations-and-guidance-state-and-local-transportation

regulations and resolutions state, in part, that MTC cannot approve any transportation plan, program, or project unless these activities conform to the purpose of the federal air quality plan. In this context, "transportation plan" refers to the RTP (i.e., Plan Bay Area), and "Program" refers to the TIP (see following sections for more information). A "transportation project" is any highway or transit improvement, which is included in the RTP and TIP and requires funding or approval from the Federal Highway Administration (FHWA) or the Federal Transit Administration (FTA). Conformity regulations also affect regionally significant non-federally funded projects which must be included in a conforming transportation plan ("RTP") and program ("TIP"). Regionally significant project means a transportation project (other than an exempt project) that is on a facility which serves regional transportation needs and would normally be included in the modeling of a metropolitan area's regional transportation network, including all principal arterial highways and all fixed guideway transit facilities that offer an alternative to regional highway travel.

Figure 1: Map of the Non-Attainment Area for the San Francisco Bay Area

Air Pollution and Human Health

On-road mobile source emissions have historically contributed significantly to air pollution. Over time, much progress has been made to improve engines and fuels so that emissions from on-road mobile sources have declined steeply, even as on-road travel has been growing. Despite the progress that has been made in reducing emissions, projections of ambient air quality show concentrations of pollutants, like ground-level ozone and $PM_{2.5}$, will continue to contribute to public health and environmental risks and on-road mobile source emissions remain important to consider for further improvements in air quality and public health[2].

There is a great deal of literature documenting the negative impact of air pollution on public health. Researchers use a variety of methods, including epidemiological studies and clinical studies, to analyze the health effects of specific air pollutants and the biological mechanisms or pathways as to how pollutants harm the body. On-going research continually improves understanding of the range of health effects. The respiratory effects of exposure to air pollution (including emissions from on-road mobile sources) such as disease or damage to lungs in the form of asthma, bronchitis, and emphysema, have been documented for decades. But, as the science advances, researchers are finding new evidence that links air pollution to a much wider variety of health effects, including cardiovascular disease (heart attacks and strokes), diabetes and dementia. Vulnerable populations, such as children, pregnant women, seniors, and people with existing cardiovascular or respiratory conditions, are most at risk[3].

Prepared by BAAQMD, Figure 2 depicts the general relationship between air pollution and public health, which is further described in the subsequent section.

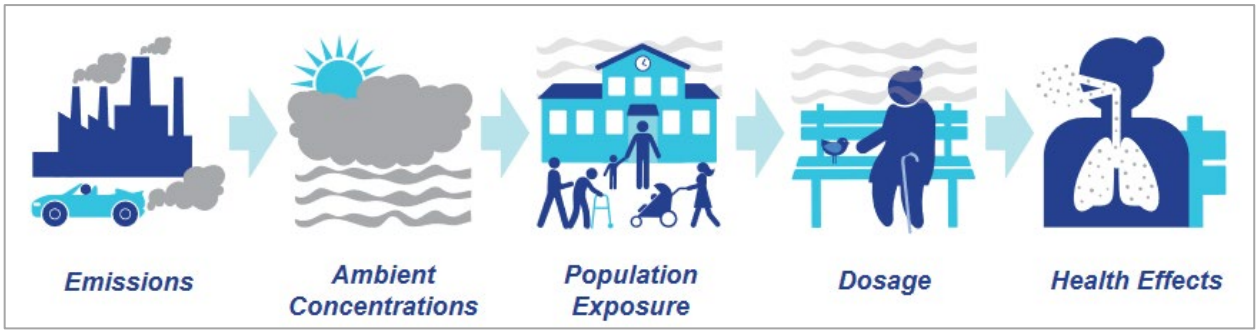

Figure 2: Relationship Between Air Pollution and Public Health

Source: BAAQMD

Emissions

Many different sources emit a wide variety of air pollutants, including PM, toxic air contaminants (TACs), and precursor compounds that react in the atmosphere to form ozone. Emission sources include stationary sources including factories, refineries, foundries, gas stations, and dry cleaners and mobile sources such as cars, trucks, locomotives, marine vessels, and farm and construction equipment. This transportation-air quality conformity analysis focuses solely on mobile source emissions.

[2] Atmospheric Environment, Mobile source contributions to ambient ozone and particulate matter in 2025, Volume 188, September 2018, Pages 129-141

[3] BAAQMD, 2017 Clean Air Plan: Spare the Air, Cool the Climate https://www.baaqmd.gov/~/media/files/planning-and-research/plans/2017-clean-air-plan/attachment-a_-proposed-final-cap-vol-1-pdf.pdf?la=en

Ambient Concentrations

Ambient concentrations refer to the level of pollutants that are measured in the air. The relationship between emissions and ambient concentrations is complex and depends upon many factors, including meteorological conditions (temperature, wind speed and direction, and vertical mixing) the ratio of precursor pollutants (e.g., the VOC to NOx ratio, in the case of ozone), and regional topography. Some pollutants such as ozone are regional in scale. In the case of particulate matter and toxic air contaminants, however, ambient concentrations can vary greatly within a small geographical area.

Population Exposure

Population exposure refers to the amount of pollution that a given individual, or population is exposed to, and the frequency and duration of that exposure. From the public health perspective, the key issue is not how much pollution is present in the air, but rather how many people are exposed to the pollution.

Dosage

Dosage refers to the actual amount of pollution that an individual takes into the body. The dosage from a given level of exposure will vary by individual depending upon age, activity, and metabolic rate.

Health Effects

Air pollution can cause or contribute to a wide range of health effects and illnesses, depending upon individual exposure and tolerance to air pollution. Just as individual exposure differs, so does the ability of our bodies to tolerate exposure to pollutants.

Exposure to air pollution can cause a wide range of health effects, including short-term (acute) effects and long-term (chronic) effects, including asthma, bronchitis, cancer, heart attacks and strokes.

Status of Transportation Improvement Program

The federally required transportation improvement program, or TIP, is a comprehensive listing of surface transportation projects for the San Francisco Bay Area that receive federal funds, are subject to a federally required action, or that are regionally significant. MTC, as the federally designated MPO, prepares and adopts the TIP at least once every four years. The TIP covers a four-year period and must be financially constrained by year, meaning that the amount of funding committed to the projects (also referred as “programmed”) must not exceed the amount of funding estimated to be available. As required by federal conformity regulations, MTC must demonstrate that the TIP is consistent with ("conforms to") the SIP and that all projects included in the TIP are consistent with the RTP, Plan Bay Area 2050.

The 2023 TIP covers four years of programming, starting with fiscal years 2022-23 through 2025-26. The 2023 TIP predominantly includes projects from the Amended 2021 TIP. However, it does add in new exempt and non-exempt projects and phases. Note that all projects included in the 2023 TIP are consistent with Plan Bay Area 2050 and meet all financial constraint requirements. This conformity analysis also serves to demonstrate that the 2023 TIP (as well as Plan Bay Area 2050) conform to the SIP. Refer to Appendix A1 for a detailed list of projects included in the 2023 TIP.

Status of Regional Transportation Plan

A regional transportation plan, or RTP, is a plan which includes both long-range and short-range strategies and actions that lead to the development of an integrated multimodal transportation system to facilitate the safe and efficient movement of people and goods in addressing current and future transportation demand. State law requires that RTPs include a Sustainable Communities Strategy (SCS)

to identify a forecasted land use development pattern that, when integrated with the future transportation system, will meet the region's greenhouse gas reduction target set by CARB. As required by federal and state planning regulations, the RTP covers a minimum planning horizon of 20 years and is updated every four years in areas which do not meet federal air quality standards ("non-attainment"). The RTP is financially constrained to ensure project costs do not exceed reasonably expected transportation revenues over the planning horizon. Once adopted, the RTP guides the development of the TIP for the region.

Plan Bay Area 2050 is the region's RTP/SCS, a 30-year regional plan that charts a course for a Bay Area that is affordable, connected, diverse, healthy and vibrant for all residents through 2050 and beyond. The Plan expands in scope, relative to prior plans, by examining the themes of economic development and environmental resilience. As a result, the proposed Plan focuses on four interrelated elements—housing, the economy, transportation, and the environment. The proposed Plan is comprised of 35 integrated strategies across the four elements that provide a blueprint for how the Bay Area can accommodate future growth and make the region more equitable and resilient in the face of unexpected challenges and achieve regional GHG emissions reduction targets established by CARB pursuant to SB 375. The final Implementation Plan for Plan Bay Area 2050 transitions the Plan Bay Area 2050 process from long-range planning to near-term action. It details over 80 concrete actions that MTC, ABAG and our partners can take to advance the plan's 35 strategies over a five-year period. [4].

As part of the periodic review of the transportation modeling network assumptions in consultation with the Air Quality Conformity Task Force (per MTC Resolution No. 3757), MTC revised baseline network assumptions based on new data received from project sponsors.Refer to Appendix B for a list of regionally significant transportation projects included in Plan Bay Area 2050.

II. Bay Area Air Pollutant Designations

Background

One of the original goals of the federal Clean Air Act was to set and achieve NAAQS in every state by 1975 in order to address the public health and welfare risks posed by certain widespread air pollutants. The setting of these pollutant standards was coupled with directing the states to develop state implementation plans (SIPs), applicable to appropriate industrial sources in the state, in order to achieve these standards. EPA has four transportation-related pollutants established standards[5]:

- ground level ozone formed by volatile organic compounds (VOCs) and oxides of nitrogen (NOx);
- carbon monoxide (CO);
- particulate matter (less than 10 microns (PM_{10}) and less than 2.5 microns ($PM_{2.5}$); and,
- nitrogen dioxide (NO_2).

The standards for these pollutants are based upon EPA's assessment of the health risks associated with each of the pollutants on at-risk populations. These assessments are based upon short- and long-term scientific studies by noted health professionals and medical research institutions. At-risk groups include children, the elderly, persons with respiratory illnesses, and even healthy people who exercise outdoors. Detailed descriptions of all the above NAAQS pollutants are contained in the Glossary in Appendix G.

[4] https://www.planbayarea.org/finalplan2050
[5] National Ambient Air Quality Standards (NAAQS)

National 1-Hour Ozone Standard

The Bay Area was initially designated as nonattainment for ozone on March 3, 1978. On November 6, 1991, the EPA designated the Bay Area as a moderate ozone non-attainment area. Based on "clean" air monitoring data from 1990 to 1992, the co-lead agencies—BAAQMD, MTC, and ABAG— determined that the Bay Area was attaining the 1-hour ozone standard and requested that CARB forward a re-designation request and an ozone maintenance plan to EPA.

On May 25, 1995, after evaluating 1990-1992 monitoring data and determining that the Bay Area had continued to attain the standard, the EPA re-designated the Bay Area as an ozone maintenance area. Shortly thereafter, the area began violating the standard again and on July 10, 1998, the EPA published a Notice of Final Rulemaking re-designating the Bay Area back to an ozone non-attainment area. This action became effective on August 10, 1998.

The re-designation to nonattainment triggered an obligation for the State to submit a SIP revision designed to provide for attainment of the 1-hour ozone NAAQS by November 15, 2000. This revision (the San Francisco Bay Area Ozone Attainment Plan for the 1-hour National Ozone Standard – June 1999 or "1999 Plan") was partially approved and partially disapproved by EPA on September 20, 2001, in conjunction with a determination that the area had failed to attain by the November 2000 deadline. The attainment demonstration and its associated motor vehicle emissions budgets were among the plan elements that were disapproved.

As a result of the EPA's finding of failure to attain and partial disapproval of the 1999 Plan, the State was required to submit a SIP revision for the Bay Area to EPA by September 20, 2002, that included an updated volatile organic compounds (VOC) and nitrogen oxides (NOx) emissions inventory, new transportation conformity budgets, and provided for attainment of the 1-hour ozone standard no later than September 20, 2006. On November 1, 2001, CARB approved the San Francisco Bay Area 2001 Ozone Attainment Plan for the 1-Hour National Ozone Standard (2001 Plan) as a revision to the SIP. The BAAQMD and its co-lead agencies, (MTC and ABAG) adopted the 2001 Plan on October 26, 2001.

The 2001 Plan contains a control strategy with seven stationary source measures, five transportation control measures (TCMs), and eleven further-study measures. In the 2001 Plan, the District also committed to strengthening the then existing Smog Check program by requesting the State Bureau of Automotive Repair to implement two VOC-reducing program elements. The new measures and on-going programs provided 271 tons per day of combined VOC and NOx emission reductions between 2000 and 2006. The 2001 Plan also included an attainment assessment based on Bay Area data.

On November 30, 2001, ARB submitted the 2001 Plan, which included VOC and NOx motor vehicle emissions budgets (164.0 tons per day [tpd] and 270.3 tpd, respectively) for the 2006 attainment year, to EPA for approval as a revision to the California SIP. To support the on-road motor vehicle emission inventory and transportation conformity budgets in the Plan, CARB also transmitted the San Francisco Bay Area-EMFAC2000 model to EPA for approval for the Bay Area ozone non-attainment area. On February 14, 2002, the EPA found the motor vehicle emissions budgets in the 2001 Plan adequate for transportation conformity purposes, based on its preliminary determination that the plan provided for timely attainment of the 1-hour ozone standard.

On April 22, 2004, based on air quality monitoring data from the 2001, 2002, and 2003 ozone season, EPA determined that Bay Area had attained the national 1-hour ozone standard. Because of this determination, requirements for some of the elements of the 2001 Ozone Attainment Plan, submitted

to EPA to demonstrate attainment of the 1-hour standard, were suspended. The determination of attainment did not mean the Bay Area had been re-designated as an attainment area for the 1-hour standard. To be re-designated, the region would have had to submit a formal re-designation request to EPA, along with a maintenance plan showing how the region would continue to attain the standard for ten years. However, this re-designation request was no longer necessary upon the establishment of the new national 8-hour ozone standard.

National 8-Hour Ozone Standard

In July 1997, EPA revised the ozone standard, setting it to 80 parts per billion (ppb) in concentration based specifically on the 3-year average of the annual 4th highest daily maximum 8-hour ozone concentrations. In April 2004, EPA issued final designations for attainment and non-attainment areas. In June 2004, EPA formally designated the Bay Area as a non-attainment area for national 8-hour ozone and classified the region as "marginal" based on five classes of non-attainment areas for ozone, ranging from marginal to extreme.

In March 2008, EPA lowered the national 8-hour ozone standard from 80 ppb to 75 ppb. On March 12, 2009, CARB submitted its recommendations for area designations for the revised national 8-hour ozone standard. These recommendations were based on ozone air quality data collected during 2006 through 2008. The CARB recommended that the Bay Area be designated as non-attainment for the national 8-hour ozone standard. EPA had one year to review the recommendations and were to notify states by November 12, 2009 if they planned to modify the state-recommended areas. EPA issued final designations by March 12, 2010, based on more up to date monitoring data.

On October 1, 2015, EPA strengthened the NAAQS for ground-level ozone to 70 ppb, based on extensive scientific evidence about ozone's effects on public health and welfare. The updated standards will improve public health protection, particularly for at-risk groups including children, older adults, people of all ages who have lung diseases such as asthma, and people who are active outdoors, especially outdoor workers. They also will improve the health of trees, plants, and ecosystems. The proposed implementation rule for the 2015 ozone standard was published November 17, 2016, and proposed a framework for nonattainment area classifications and SIP requirements. In addition, the proposed rule follows the approach adopted for the previous Classifications Rule and SIP Requirements Rule (SRR) for the 2008 ozone NAAQS.

In September 2016, CARB recommended to EPA that the San Francisco Bay Area be designated in nonattainment for the 70 ppb 2015 ozone NAAQS. EPA concurred with CARB's recommendation and on April 30, 2018, EPA completed area designations for most of the United States (including the San Francisco Bay Area). On June 4, 2018, EPA published a final rule that designated 51 areas as nonattainment for the 2015 ozone NAAQS. These final designations took effect on August 3, 2018, 60 days after the notice was published in the *Federal Register*. Nonattainment areas must demonstration conformity of transportation plans and transportation improvement programs (TIPs) to the 2015 ozone NAAQS by August 3, 2019[6], the end of the grace period.

In addition, because marginal 8-hour ozone areas are not required to submit an attainment demonstration SIP (containing on-road motor vehicle emission budgets required to demonstrate

[6] Transportation Conformity Guidance for 2015 Ozone Nonattainment Areas at: https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100UN3X.pdf

conformity), the conformity finding in this report is based on the approved 1-hour ozone on-road motor vehicle emission budgets contained in the Bay Area's 2001 Plan.

National $PM_{2.5}$ Standard

In 1987, the EPA established a standard for particle pollution equal to or smaller than 10 micrometers in diameter. A decade later, the 1997 revision to the standard set the stage for change, when a separate standard was set for fine particulate matter (particles that are 2.5 micrometers in diameter and smaller). Citing the link between serious health problems and premature death in people with heart or lung disease, the 1997 revision ultimately distinguished and set forth regulation on particle pollutants known as particulate matter 2.5 ($PM_{2.5}$) and particulate matter 10 (PM_{10}). Based on air quality monitoring data, the Bay Area was found to be attaining the 1997 $PM_{2.5}$ standards.

In 2006, the EPA revised the air quality standards for particle pollution. The 24-hour $PM_{2.5}$ standard was strengthened by lowering the level from 65 micrograms per cubic meter ($\mu g/m^3$) to 35 $\mu g/ m^3$. The annual fine particle standard at 15 $\mu g/ m^3$ remained the same. Also, in 2006, the EPA published a final rule that established transportation conformity criteria and procedures to determine transportation projects that required analysis for local air quality impacts for $PM_{2.5}$ in non-attainment and maintenance areas. The established criteria and procedures require that those areas designated as nonattainment areas must undergo a regional conformity analysis for $PM_{2.5}$. Furthermore, the procedures also mandate areas designated as non-attainment must complete an additional project-level $PM_{2.5}$ hot-spot analysis of localized impacts for transportation projects of air quality concern.

On December 14, 2009, EPA designated the Bay Area as non-attainment for the national 24-hour $PM_{2.5}$ standard based upon violations of the standard over the three-year period from 2007 through 2009. Pursuant to the Clean Air Act, the Bay Area and MTC were subject to the requirement (beginning on December 14, 2010) to demonstrate that the RTP and TIP conformed to the SIP. In addition, beginning on December 14, 2010, certain roadway and transit projects that involve significant levels of diesel vehicle traffic needed to prepare $PM_{2.5}$ hot-spot analyses.

National 8-Hour Carbon Monoxide Standard

In April 1998, the Bay Area became a "maintenance area" for the national 8-hour carbon monoxide (CO) standard, having demonstrated attainment of the standards. As a maintenance area, the region must assure continued attainment of the CO standard.

Under 40 CFR 93.102(b)(4) of EPA's regulations, transportation conformity applies to maintenance areas through the 20-year maintenance planning period, unless the maintenance plan specifies that the transportation conformity requirements apply for a longer time period. Pursuant to the CAAA's section 176(c)(5) and as explained in the preamble of the 1993 final rule, conformity applies to areas that are designated nonattainment or are subject to a maintenance plan approved under the CAAA section 175A. The section 175A maintenance planning period is 20 years unless the applicable implementation plan specifies a longer maintenance period[7]. The EPA further clarified this conformity provision in its January 24, 2008, final rule[8].

The approved maintenance plan for the San Francisco-Oakland-San Jose Carbon Monoxide nonattainment area did not extend the maintenance plan period beyond 20 years from re-designation.

[7] See 58 FR 62188, 62206 (November 24, 1993)
[8] See 73 FR 4420, at 4434-5 (January 24, 2008)

Consequently, transportation conformity requirements for CO ceased to apply after June 1, 2018 (i.e., 20 years after the effective date of the EPA's approval of the first 10-year maintenance plan and re-designation of the area to attainment for CO NAAQS). As a result, as of June 1, 2018, transportation conformity requirements no longer apply for the CO NAAQS in the San Francisco-Oakland-San Jose CO nonattainment area for Federal Highway Administration/Federal Transit Association projects as defined in 40 CFR 93.101.

Approved Motor Vehicle Emissions Budgets and Conformity Tests

The Bay Area has conformity requirements for national ozone and $PM_{2.5}$ standards. Under the ozone standard, the Bay Area must meet an on-road motor vehicle emission "budget" test. Because the Bay Area does not have on-road motor vehicle emission budgets for $PM_{2.5}$ that have been determined to be adequate by EPA, it must meet an emission interim test for the $PM_{2.5}$ standard. To make a positive conformity finding for ozone MTC must demonstrate that the calculated on-road motor vehicle emissions in the region are lower than the approved budgets. To make a positive "interim" conformity finding for $PM_{2.5}$, MTC must meet "build not greater than no build" or "build not greater than baseline year" tests based on $PM_{2.5}$ exhaust, tire wear, and brake wear, and NO_X as a $PM_{2.5}$ precursor emissions.

On-road motor vehicle emissions budgets for VOC and NO_X, which are ozone precursors, were developed for the 2006 attainment year as part of the 2001 1-hour Ozone Attainment Plan. The VOC and NO_X budgets were found to be adequate by EPA on February 14, 2002 (67 FR 8017) and were subsequently approved by EPA on April 22, 2004 (69 FR 21717). Note that under EPA's conformity rule for the national 8-hour ozone standard, the existing 1-hour on-road motor vehicle emission budgets are to be used for conformity analyses until they are replaced.

The on-road motor vehicle emission budgets are listed below:

- VOC: 164 tons per day (2006 and beyond)
- NO_X: 270.3 tons per day (2006 and beyond)

For $PM_{2.5}$, initially the Bay Area was required to prepare a SIP by December 2012 to show how the region would attain the standard by December 2014. In addition, although the Bay Area was designated as non-attainment for the national 24-hour $PM_{2.5}$ standard based on monitoring data for the 2006-2008 period, the region exceeded the standard by only a slight margin.

Monitoring data shows that the Bay Area currently meets the national standards for both annual and 24-hour $PM_{2.5}$ levels. However, because the health effects of PM are serious and far-reaching, and no safe threshold of exposure to PM has yet been identified, it is important efforts continue to further reduce PM emissions and concentrations.[9]

Under US EPA guidelines, a region with monitoring data showing that it currently attains an air quality standard can submit a "re-designation request" and a "maintenance plan" in lieu of a SIP attainment plan. However, the BAAQMD believes that it would be premature to submit a $PM_{2.5}$ re-designation request for the Bay Area at this time. Instead, the BAAQMD has pursued another option provided by US EPA guidelines for areas with monitoring data showing that they currently meet the $PM_{2.5}$ standard. In December 2011, CARB submitted a "clean data finding" request on behalf of the Bay Area. On January 9,

[9] See BAAQMD's *2017 Clean Air Plan: Spare the Air, Cool the Climate* 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

2013, EPA took final action to determine that the Bay Area attained the 2006 24-hour $PM_{2.5}$ standard. EPA's determination was based on complete, quality-assured, and certified ambient air monitoring data showing that the area monitored attainment based on the 2009-2011 monitoring period. Based on EPA's determination, the requirements for the Bay Area to submit an attainment demonstration, together with reasonably available control measures (RACMs), an RFP plan, and contingency measures for failure to meet RFP and attainment deadlines are suspended for so long as the region continues to attain the 2006 24-hour $PM_{2.5}$ standard.

Since an approved on-road motor vehicle emissions budget for $PM_{2.5}$ is not available for use in this conformity analysis, MTC must complete one of the two interim emissions tests:

- the build-no-greater-than-no-build test ("build/no-build test") found at 40 CFR 93.119(e)(1), or
- the no-greater-than-baseline year emissions test ("baseline year test"), described at 40 CFR 93.119(e)(2).

Per the interagency consultation via the Air Quality Conformity Task Force meeting dated May 28, 2015, MTC elected to use the "baseline year test". In this test, conformity is demonstrated if in each analysis year, the RTP or TIP (the "build" scenarios) on-road motor vehicle emissions are less than or equal to emissions in the "baseline year" emission inventory. The "baseline year" for the 2006 24-hour $PM_{2.5}$ standard is the year 2008[10].

Under a determination of conformity, the following criteria are applied:

1. The latest planning assumptions and emission models are used.
2. The transportation plan ("RTP") and program ("TIP") pass an emissions budget test using a budget that has been found adequate by EPA or an interim emissions test when budgets have not been established.
3. The transportation plan ("RTP") and program ("TIP") provide for the timely implementation of TCMs.
4. Interagency and public consultation is part of the process.

III. Conformity Analysis & Results

Approach to Conformity Analysis

The latest planning assumptions were used when preparing this conformity analysis. Regional estimates of future travel data were estimated using MTC's land use model (referred to as "*Bay Area UrbanSim 2, hereby referred to as BAUS2"*[11]) and MTC's activity-based travel model (referred to as "*Travel Model 1.5*" [12]). This integrated model framework allows for analysis of how transportation strategies affect the surrounding land use pattern, as well as how changes to residential and commercial activity affect transportation demand. *Travel Model 1.5* was developed for the Horizon initiative (the predecessor to Plan Bay Area 2050) and added representation for transportation demand management initiatives, commute trip reduction programs at major employers, ride-hailing (or Transportation Network

[10] Additional information is available here: https://www.epa.gov/state-and-local-transportation/baseline-year-baseline-year-test-40-cfr-93119

[11] Additional information is available here: https://github.com/BayAreaMetro/bayarea_urbansim

[12] Additional information is available here: https://www.planbayarea.org/sites/default/files/documents/Plan_Bay_Area_2050_Forecasting_Modeling_Report_October_2021.pdf

Companies – TNC) and taxi modes and estimation of autonomous vehicle travel. The model forecasts travel activity on the Bay Area transportation network for a typical weekday across all modes.

This Conformity Analysis for the 2023 TIP and Plan Bay Area 2050 involves a sequence of modeling tools used together to create and study regional transportation investment impacts. The Regional Growth Forecast is the first step, identifying how much the Bay Area might grow between the plan baseline year (2015) and the plan horizon year (2050), including population, jobs, households, and associated housing units. The location of these households and jobs are then projected on a more localized level throughout the Bay Area by Land Use Model (BAUS2, which represents the potential effects of land use strategies and infrastructure investments. These first two models each represent the entire sequence of years in five-year increments, starting with the plan baseline year and ending at the plan horizon year. Finally, the Travel Model is used to analyze an average weekday for a single given model year, simulating a day's worth of travel for each Bay Area resident given their daily activities and enabling staff to understand the effects of transportation strategies on daily vehicle miles traveled, transit ridership and active transportation.

BAUS2 and Travel Model 1.5 work as a system to capture the interaction between transportation and land use. Accessibility to a variety of destinations and amenities is a key driver in both household and business location choice. For instance, households often prefer locations near employment, retail, and similar households but avoid other features such as industrial land use. Business preferences vary by sector with some firms looking for locations popular with similar firms (e.g., Silicon Valley) while others desire locations near an airport or university. In all cases, the accessibility between a given location in the region (defined as a transportation analysis zone or TAZ) and all other locations/TAZs is provided to BAUS2 by the Travel Model. This data represents overall regional accessibility for future years considering changing infrastructure and policy.

Moving in the other direction, BAUS2 provides the travel model with a projected land use pattern and spatial distribution of activities for each year into the future. This pattern includes the location of housing, jobs, and other activities that serve as the start and end locations for trips predicted by the travel model. This information is provided to the travel model at a TAZ level aggregation for each future year examined. Overall, the linkages between the two models allow land use patterns to evolve in relation to changes in the transportation system and for future travel patterns to reflect dynamic shifts in land use, thus representing long-term induced demand.

Travel Model 1.5 generates spatially- and temporally- specific estimates of travel data—roadway usage and speed. This travel data is input into CARB's latest EMission FACtors (EMFAC2017) model to estimate on-road motor vehicle emissions.

The EMFAC2017 model shows how California on-road motor vehicle emissions have changed over time and are projected to change in the future. This information helps CARB evaluate prospective control programs and determine the most effective, science-based proposals for protecting the environment. EMFAC2017 includes the latest data on California's car and truck fleets and travel activity. The model also reflects the emissions benefits of CARB's recent rulemakings, including on-road diesel fleet rules, Advanced Clean Car Standards, and the Smartway/Phase I Heavy Duty Vehicle Greenhouse Gas Regulation. The model includes updates to truck emission factors based on the latest test data. More

details about the updates in emissions calculation methodologies and data are available in the EMFAC2017 Technical Support Document.[13]

On September 18, 2019, the Trump Administration announced that it would enact the Safer Affordable Fuel Efficient (SAFE) Vehicle Rule. When finalized, the rule revoked California's authority to implement the Advanced Clean Cars (I and II) and zero emission vehicles (ZEV) mandates. Consequently, it also invalidated California's tool to estimate mobile source emissions—commonly known as "EMFAC"—which assumes the clean car mandates are implemented. Planning agencies across California use EMFAC to estimate mobile source emissions to demonstrate their respective plans conform to the SIP and meet federal clean air standards. In response, CARB staff developed off-model adjustment factors to account for the impacts of this rule. On March 12, 2020, the EPA confirmed these adjustment factors to be acceptable for use in transportation conformity determinations. [14]

Under the Biden Administration in 2021, EPA[15] and National Highway Traffic Safety Administration (NHTSA) [16] issued separate notices questioning the Trump administration's legal reasoning to withdraw the waiver. In its April 2021 notice, EPA explained "there are significant issues" with the Trump administration's Part I Rule, including the time elapsed since EPA's 2013 waiver decision, the novel interpretations set forth in the Part I Rule, and the consideration of environmental conditions in California and consequences of the waiver's withdrawal. [17] In its proposal, NHTSA asserted that it does not, in fact, have authority to adopt legislative rules implementing express preemption under the Energy Policy and Conservation Act (EPCA).

On March 14, 2022, EPA issued a notice of decision to reinstate California's Clean Air Act waiver for its Advanced Clean Car program[18], restoring the state's authority to set and enforce more stringent standards than the federal government, including California's greenhouse gas emission standards and zero emission vehicle mandate. In addition, other states can legally follow and enforce California's standards again.

As a result, this conformity determination will employ EMFAC2017 and will apply the EPA approved CARB off-model adjustment factors – reporting both factored and non-factored emission inventory values.

Analysis Years

The analysis years for the budget and baseline year tests are to be within five years from the date the analysis is done, the horizon year of the RTP and intermediate years as necessary so that analysis years are not more than ten years apart. For this conformity analysis, the analysis years are 2025, 2030, 2040

[13] Additional information is available here: https://ww3.arb.ca.gov/msei/downloads/emfac2017-volume-iii-technical-documentation.pdf

[14] Additional information is available here: https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/final-safe-rule-frquently-asked-questions-a11y.pdff

[15] California State Motor Vehicle Pollution Control Standards; Advanced Clean Car Program; Reconsideration of a Previous Withdrawal of a Waiver of Preemption; Opportunity for Public Comment, 86 Fed. Reg. 22,421 (notice issued Apr. 28, 2021).

[16] Corporate Average Fuel Economy (CAFE) Preemption, 86 Fed. Reg. 25,980 (proposed May 12, 2021)

[17] California State Motor Vehicle Pollution Control Standards; Advanced Clean Car Program; Reconsideration of a Previous Withdrawal of a Waiver of Preemption; Opportunity for Public Comment, 86 Fed. Reg. at 22,422.

[18] California State Motor Vehicle Pollution Control Standards; Advanced Clean Car Program; Reconsideration of a Previous Withdrawal of a Waiver of Preemption; Notice of Decision, 87 Fed. Reg. 14,332 (Mar. 14, 2022), https://www.federalregister.gov/documents/2022/03/14/2022-05227/california-state-motor-vehicle-pollution-control-standards-advanced-clean-car-program

and 2050 for the 2008 and 2015 ozone and 2006 $PM_{2.5}$ standards. MTC used *Travel Model 1.5* to forecast travel data for the 2025, 2030, 2040 and 2050 analysis years. The forecasted travel data for each analysis year were then input into the EMFAC2017 model to calculate on-road motor vehicle emissions.

Consultation Process

MTC has consulted on the preparation of this conformity analysis with the Bay Area's Air Quality Conformity Task Force. The Conformity Task Force is composed of representatives of EPA, CARB, FHWA, FTA, Caltrans, MTC, BAAQMD, ABAG, the nine county Congestion Management Agencies, and Bay Area transit operators. The Conformity Task Force reviews the analysis assumptions, consults on TCM implementation issues, and reviews the results of the conformity analysis. The task force meetings are open to the public. Consultation with the Air Quality Conformity Task Force related to the preparation of this conformity analysis included discussions on the following meeting dates:

April 2022

- $PM_{2.5}$ Project-Level Conformity Interagency Consultations
- Discussions on Projects with Regional Air Quality Conformity Concerns
- Approach to Conformity Analysis for the 2023 Transportation Improvement

May 2022

- $PM_{2.5}$ Project-Level Conformity Interagency Consultations
- Discussions on Projects with Regional Air Quality Conformity Concerns
  Note: 2023 TIP Conformity Analysis being conducted during this month

June/July 2022

- $PM_{2.5}$ Project-Level Conformity Interagency Consultations
- Discussions on Projects with Regional Air Quality Conformity Concerns
- Air Quality Conformity Task Force Briefing on Comment Responses to the 2023 TIP Conformity Analysis and Review Final Version

Comparison of Motor Vehicle Emissions to Budgets

As explained earlier in "Approved Motor Vehicle Emissions Budgets and Conformity Tests," on-road motor vehicle emissions budgets are established in the SIP for VOCs and NO_X. To make a positive conformity finding, the regional on-road motor vehicle emissions must be equal to or less than these budgets. The results of the vehicle activity forecasts and on-road motor vehicle emission calculations are described in the following section.

Ozone Motor Vehicle Emission Budgets

For VOC and NO_X, the on-road motor vehicle emission budgets also reflect emission reductions from five Transportation Control Measures (TCMs) incorporated in the 2001 Ozone Attainment Plan (Table 1).

Table 1: VOC and NO_X Emissions Budgets from 2001 Ozone Attainment Plan (tons/day)

VOC	
2006 On Road Motor Vehicle Emissions	168.5
2006 Mobile Source Control Measure Benefits	(4.0)
2006 TCM Benefits	(0.5)
2006 Emissions Budget	164.0

NO_X	
2006 On Road Motor Vehicle Emissions	271.0
2006 TCM Benefits	(0.7)
2006 Emissions Budget	270.3

The vehicle activity forecasts by analysis year for the 2023 TIP and Plan Bay Area 2050 (the "build" scenarios) are shown in Table 2. The regional growth forecast has the most significant effect on transportation trends over the Plan horizon. The 1.4 million new households and 1.4 million new jobs forecasted between 2015 and 2050 lead to more demand on the region's transportation systems and increases to vehicles in use, daily VMT, and daily engine starts (as reflected in Table 2).

To assist in addressing housing affordability and growth estimation uncertainty, the regional growth forecast is a more policy-conscious effort which focuses on these uncertainties, in addition to the policy linkages. The development estimation methodology for the region adopted by the ABAG Executive Board in September 2019 enables the regional growth forecast to incorporate changes in strategies affecting the level of growth in the region, while also affecting affordability, equity, economic mobility, and other critical outcomes.

Daily VMT is forecasted to increase from 2015, albeit at a rate slower than forecasted population growth. As a result, daily VMT per capita is forecasted to decrease over time because of the Plan's strategies. Travel data (from MTC's *Travel Model 1.5*) was input into CARB's EMFAC2017 emissions model, thereby generating regional vehicle activity and emissions estimates.

In addition, MTC will use the 1-hour motor vehicle emissions budget from the 2001 Ozone Attainment Plan as the 8-hour motor vehicle emissions budget to demonstrate conformity to both the 2008 and 2015 8-hour ozone standards. The ozone budgets for VOCs and NOx were compared to quantified emissions for analysis years 2025, 2030, 2040, and 2050.

Table 2: Vehicle Activity Forecasts

	2025	*2030*	*2040*	2050
Vehicles in use	5,034,656	5,344,360	6,230,804	7,057,977
Daily VMT (1000s)	171,322	172,349	187,591	202,444
Daily Engine Starts	25,093,896	26,585,277	30,861,508	34,931,373

Comparison of Estimated Regional On-Road Motor Vehicle Emissions to the Ozone Precursor Budgets

The vehicle activity forecasts for the 2023 TIP and Plan Bay Area 2050, Table 2, are converted to emission estimates by MTC using EMFAC2017. Tables 3 compare the results of the various analyses with the applicable budgets. The analyses indicate that the on-road motor vehicle emissions are substantially below the budget, due in large part to the following regulatory actions and policies:

Senate Bill 1 (SB 1). The Road Repair and Accountability Act of 2017 is intended to address the funding deficit for transportation infrastructure, and the backlog of California transportation system maintenance and rehabilitation projects. Besides addressing the funding deficit, the bill requires the Department of Motor Vehicles (DMV), starting January 1, 2020, to verify that a medium-duty or heavy-duty vehicle is compliant with or exempt from CARB's Truck and Bus Regulation (Section 2025 of Title 13 of the California Code of Regulations) before allowing registration. Following this bill, the compliance assumptions in EMFAC2017 model were updated to ensure that full compliance will be achieved by January 1, 2023.

Advanced Clean Cars (ACC). EMFAC2017 incorporates updates to assumptions on Advanced Clean Cars (ACC) regulation based on the 2017 Midterm review of ACC. These updates include:

- Updates to Zero Emission Vehicle sales forecast
- Updated CO_2 emission rate and fuel efficiency forecasts
- Updated criteria technology penetration (i.e., SULEV30, ULEV125)
- Updated in-use emission factors for vehicles certified to 3 and 1 mg/mi PM emission standards

Table 3: Emissions Budget Comparisons for Ozone Precursors – Summertime Conditions (tons/day)

Year	*VOC Budget*[1]	*On-Road Motor Vehicles Net VOC Emissions*[2]	*On-Road Motor Vehicles Net VOC Emissions with CARB Adjustment Factors*[3]
2025	164.0	26.23	25.77
2030	164.0	22.09	21.69
2040	164.0	17.98	17.73
2050	164.0	17.94	17.81
Year	*NO_X Budget*[1]	*On-Road Motor Vehicles Net NO_X*[2]	*On-Road Motor Vehicles Net NO_X Emissions with CARB Adjustment Factors*[3]
2025	270.3	37.12	36.48
2030	270.3	32.45	31.90
2040	270.3	32.21	31.86
2050	270.3	35.77	35.53

[1] 2001 Ozone Attainment Plan

[2] The transit services for TCM A Regional Express Bus Program were modeled. The emission benefits from TCM A are therefore included in the On-Road Motor Vehicles VOC and NO_X emission inventories for 2006 and beyond.

[3] TCM Reduction Benefits of (0.5) tons/day of ROG and (0.7) tons/day of NOx applied to all On-Road Motor Vehicles emission inventories in the Table 3 above

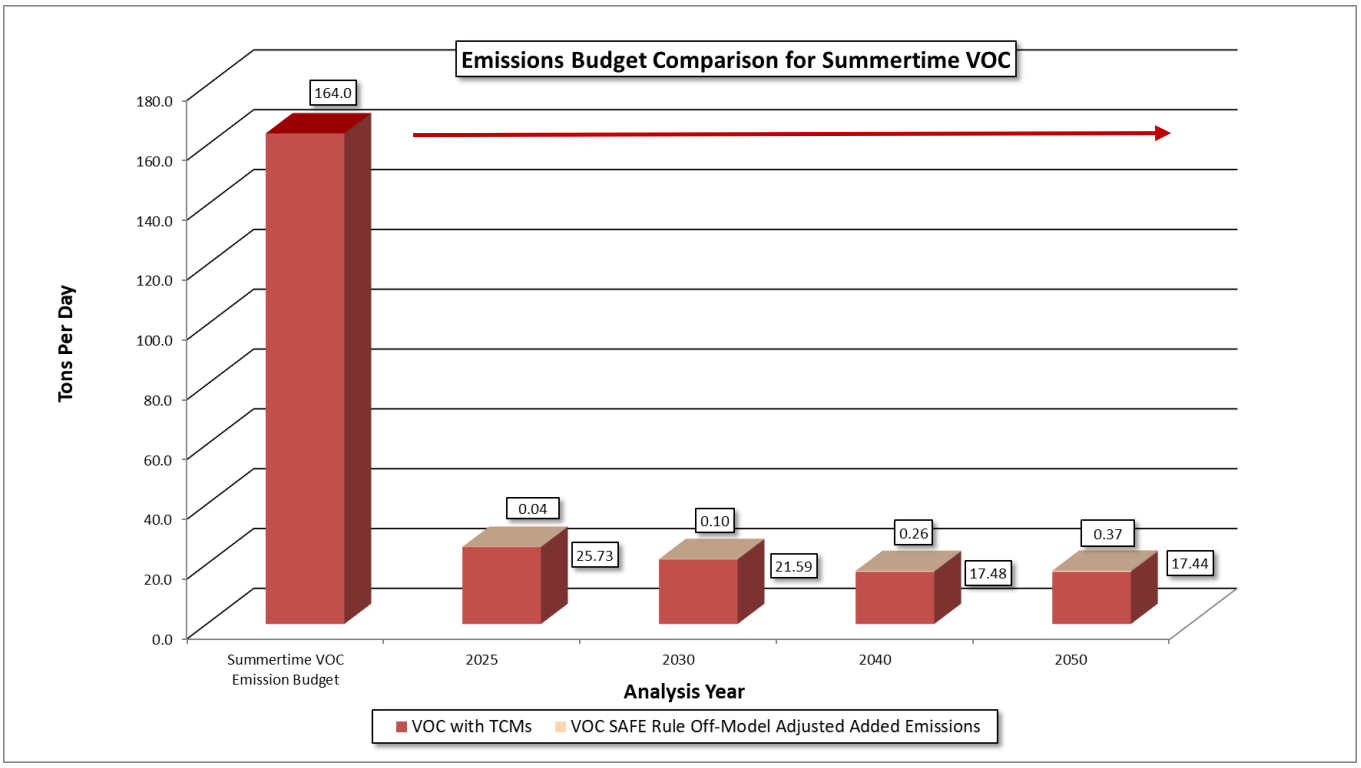

Figure 3: Emissions Budget Comparisons for Ozone Precursors (VOC)

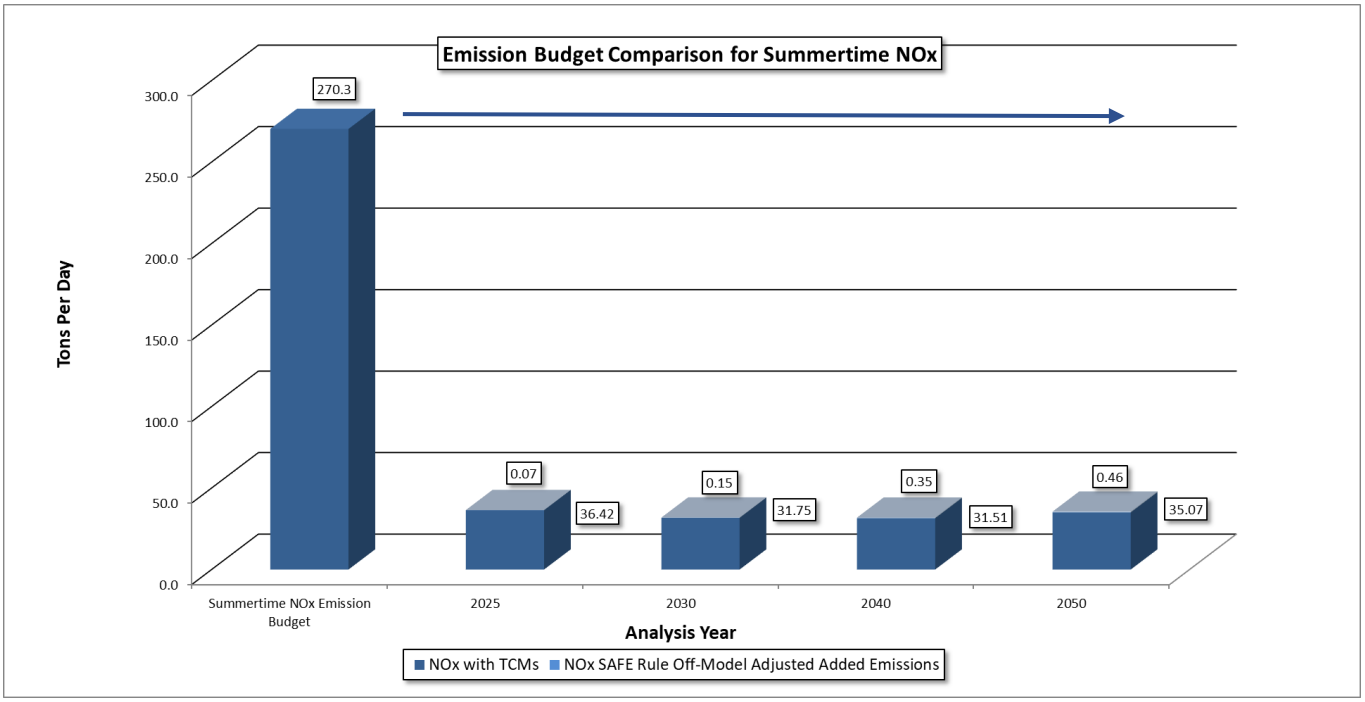

Figure 4: Emissions Budget Comparisons for Ozone Precursors (NOx)

The estimated effectiveness of the various TCMs, given their current implementation status, is shown in Table 4. TCMs A through E are fully implemented. They have achieved the required cumulative total emission reductions of 0.5 tons per day of VOC and 0.7 tons per day of NO_X by 2006.

Table 4: Emission Reductions for Transportation Control Measures A – E in State Implementation Plan (tons/day)

TCM	*VOC Emission Reductions through December 2006*	*NO_X Emission Reductions through December 2006*
TCM A: Regional Express Bus Program	0.20	0.20
TCM B: Bicycle/Pedestrian Program	0.04	0.03
TCM C: Transportation for Livable Communities	0.08	0.12
TCM D: Expansion of Freeway Service Patrol	0.10	0.25
TCM E: Transit Access to Airports	0.09	0.13
Total Reductions	**0.5**	**0.7**

Baseline Year Emissions Test for $PM_{2.5}$

For the baseline year test, emissions for both directly emitted $PM_{2.5}$ and NO_X (as the precursor to $PM_{2.5}$ emissions) were compared to the analysis years of 2025, 2030, 2040 and 2050. The Bay Area generally experiences its highest particulate matter concentrations in the winter and exceedances of the 24-hour national $PM_{2.5}$ standard almost always occur between November and February. Therefore, the inputs used for the baseline year test in the analysis for $PM_{2.5}$ and NOx were for the winter season. Note, particulate matter levels in the Bay Area can experience occasional spikes in response to wildfires that occur either within the region or in adjacent regions. [19]

The vehicle activity forecasts by analysis year for the 2023 TIP and Plan Bay Area 2050 the "build" scenarios) are shown in Table 5. Travel data (from MTC's *Travel Model 1.5*) was input into CARB's EMFAC2017 emissions model, thereby generating regional vehicle activity and emissions estimates.

Table 6 presents the results of the Baseline Year test for the $PM_{2.5}$ emissions and the NO_X precursor for the 2006 24-hour $PM_{2.5}$ standard. Regional conformity analyses must be completed for directly emitted $PM_{2.5}$ (40 CFR 93.102(b)(1)). Directly emitted $PM_{2.5}$ includes exhaust, brake and tire wear emissions.

Table 5: Vehicle Activity Forecasts for the $PM_{2.5}$ Baseline Year Test

	2008 Baseline Year	*2025*	*2030*	*2040*	*2050*
Vehicles in Use	4,503,765	5,034,656	5,344,360	6,230,804	7,057,977
Daily VMT (1000s)	154,100	171,322	172,349	187,591	202,444
Engine Starts	22,756,344	25,093,896	26,585,277	30,861,508	34,931,373

[19] See BAAQMD's *2017 Clean Air Plan: Spare the Air, Cool the Climate* 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

Table 6: Emissions Comparison for the $PM_{2.5}$ Baseline Year Test[1]

	2008 Baseline Year	*2025*	***2025***[2]	*2030*	***2030***[2]	*2040*	***2040***[2]	*2050*	***2050***[2]
$PM_{2.5}$	8.21	4.16	**4.19**	4.12	**4.18**	4.41	**4.53**	4.75	**4.90**
NO_X	227.71	41.21	**41.29**	35.74	**35.91**	35.31	**35.70**	39.19	**39.70**

[1] Emissions for wintertime only

[2] **CARB Adjustment Factors** applied to years 2025 thru 2050

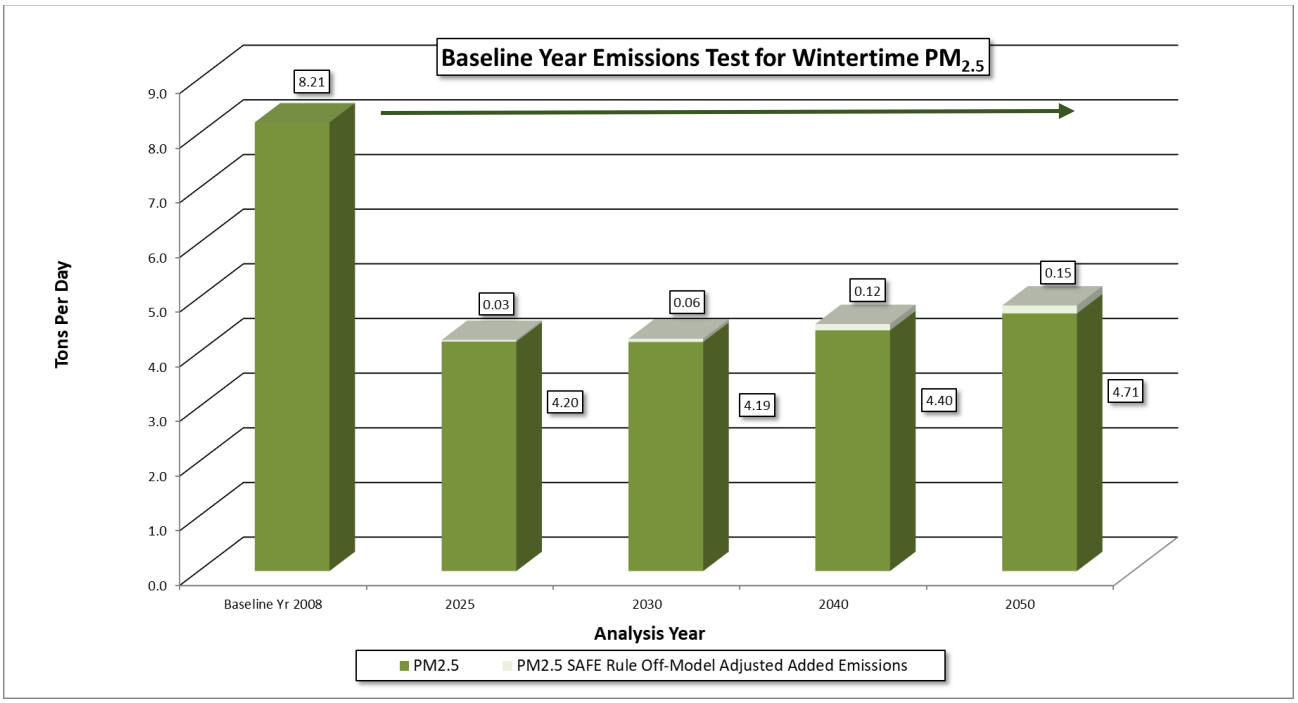

Figure 5: Baseline Year Emissions Test for $PM_{2.5}$

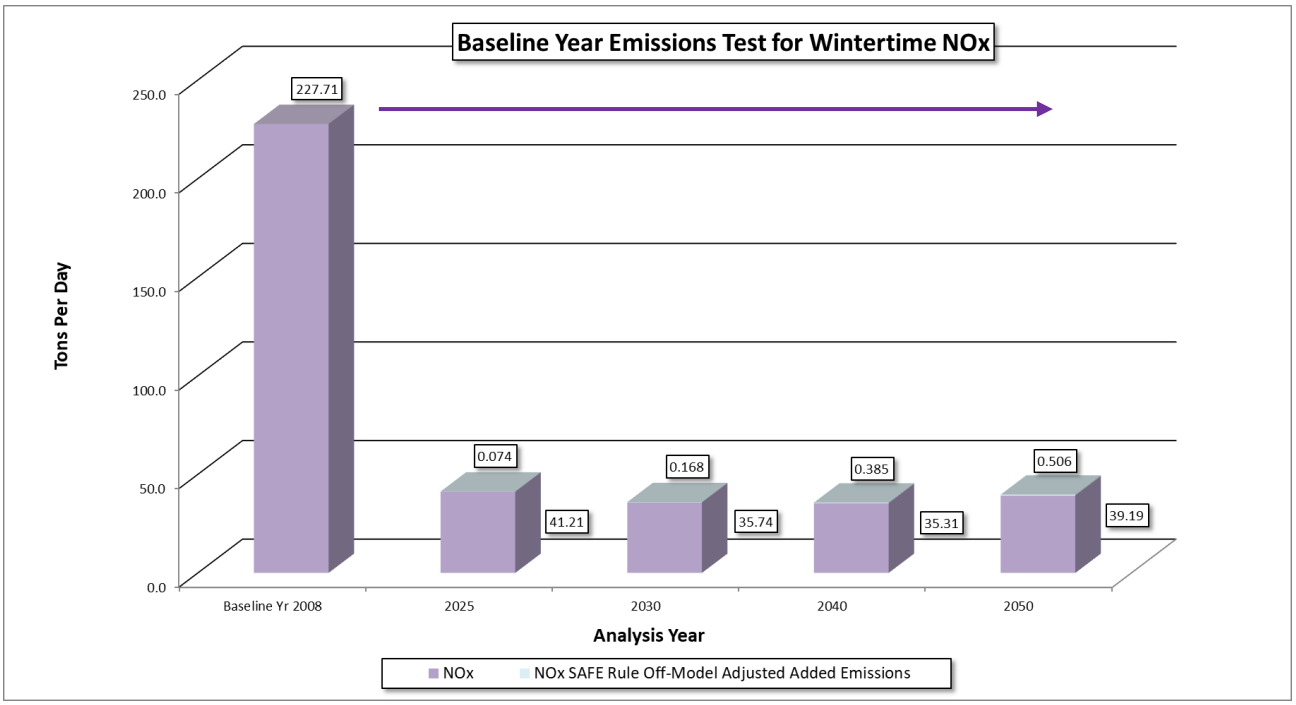

Figure 6: Baseline Year Emissions Test for Wintertime NOx

IV. Transportation Control Measures

History of Transportation Control Measures

TCMs are strategies to reduce vehicle emissions. They include such strategies as improved transit service and transit coordination, ridesharing services and new carpool lanes, signal timing, freeway incident management, and increased gas taxes and bridge tolls to encourage use of alternative modes, etc. The original set of TCMs plus the five most recent TCMs (A-E) have been fully implemented. The TCMs were added over successive revisions to the SIP (see Table 7). For more information on TCMs 1-28, which are completed, see the *Transportation-Air Quality Conformity Analysis for the 2001 Regional Transportation Plan and FY 2001 Transportation Improvement Program Amendment 01-32 (February 2002)*. This report can be found in the MTC/ABAG Library.

- Twelve (12) ozone measures were originally listed in the 1982 Bay Area Air Quality Plan.
- In response to a 1990 lawsuit in the federal District Court, sixteen (16) additional TCMs were subsequently adopted by MTC in February 1990 as contingency measures to bring the region back on the "Reasonable Further Progress" (RFP) line. The Federal District order issued on May 11, 1992, found that these contingency TCMs were sufficient to bring the region back on the RFP track anticipated in the SIP. These measures became part of the SIP when EPA approved the 1994 Ozone Maintenance Plan.
- Two (2) transportation control measures from the 1982 Bay Area Air Quality Plan apply to carbon monoxide control strategies, for which the region is in attainment with the federal standard, and primarily targeted downtown San Jose (which had the most significant CO problem at that time.) MTC also adopted a set of TCM enhancements in November 1991 to eliminate a shortfall in regional carbon monoxide emissions identified in the District Court's April 19, 1991 order. Carbon monoxide standards have been achieved primarily through the use of oxygenated/reformulated fuels in motor vehicles and with improvements in the Smog Check program.
- As part of EPA's partial approval/partial disapproval of the 1999 Ozone Attainment Plan, four (4) TCMs were deleted from the ozone plan (but two (2) of these remain in the Carbon Monoxide Maintenance Plan).
- Five (5) new TCMs were adopted as part of the new 2001 1-Hour Ozone Attainment Plan and were fully funded in the 2001 TIP and 2001 Regional Transportation Plan.

With respect to TCM 2 from the 1982 SIP, there was a protracted debate, leading to a citizen's lawsuit in federal court, about the obligations associated with this TCM. On April 6, 2004, MTC prevailed in the U.S. Court of Appeals for the Ninth Circuit which concluded that TCM 2 does not impose any additional enforceable obligation on MTC to increase ridership on public transit ridership by 15 percent over 1982-83 levels by November 2006 (Bayview Hunters Point Community Advocates v. Metropolitan Transportation Commission, (2004 WL 728247, 4 Cal. Daily Op. Serv. 2919, 2004 Daily Journal D.A.R. 4209, 9th Cir.(Cal.), Apr 06, 2004)). Thus TCM 2 has been resolved, and there are no further implementation issues to address in this TCM.

Table 7: Transportation Control Measure in the State Implementation Plan

TCM	*Description*
Original TCMs from 1982 Bay Area Air Quality Plan	
TCM 1	Reaffirm Commitment to 28 percent Transit Ridership Increase Between 1978 and 1983
TCM 2	Support Post-1983 Improvements in the Operators' Five-Year Plans and, After Consultation with the Operators, Adopt Ridership Increase Target for the Period 1983 through 1987
TCM 3	Seek to Expand and Improve Public Transit Beyond Committed Levels
TCM 4	High Occupancy Vehicle (HOV) Lanes and Ramp Metering
TCM 5	Support RIDES Efforts
TCM 6[1]	Continue Efforts to Obtain Funding to Support Long Range Transit Improvements
TCM 7	Preferential Parking
TCM 8	Shared Use Park and Ride Lots
TCM 9	Expand Commute Alternatives Program
TCM 10	Information Program for Local Governments
TCM 11[2]	Gasoline Conservation Awareness Program (GasCAP)
TCM 12[2]	Santa Clara County Commuter Transportation Program
Contingency Plan TCMs Adopted by MTC in February 1990 (MTC Resolution 2131)	
TCM 13	Increase Bridge Tolls to $1.00 on All Bridges
TCM 14	Bay Bridge Surcharge of $1.00
TCM 15	Increase State Gas Tax by 9 Cents
TCM 16[1]	Implement MTC Resolution 1876, Revised — New Rail Starts
TCM 17	Continue Post-Earthquake Transit Services
TCM 18	Sacramento-Bay Area Amtrak Service
TCM 19	Upgrade Caltrain Service
TCM 20	Regional HOV System Plan
TCM 21	Regional Transit Coordination
TCM 22	Expand Regional Transit Connection Ticket Distribution
TCM 23	Employer Audits
TCM 24	Expand Signal Timing Program to New Cities
TCM 25	Maintain Existing Signal Timing Programs
TCM 26	Incident Management on Bay Area Freeways
TCM 27	Update MTC Guidance on Development of Local TSM Programs
TCM 28	Local Transportation Systems Management (TSM) Initiatives
New TCMs in 2001 Ozone Attainment Plan	
TCM A	Regional Express Bus Program
TCM B	Bicycle/Pedestrian Program
TCM C	Transportation for Livable Communities
TCM D	Expansion of Freeway Service Patrol
TCM E	Transit Access to Airports

[1] Deleted by EPA action from ozone plan

[2] Deleted by EPA action from ozone plan but retained in Carbon Monoxide Maintenance Plan.

Source: Bay Area Air Quality Management District, Metropolitan Transportation Commission, 2001.

Status of Transportation Control Measures

TCMs A-E were approved into the SIP as part of EPA's Finding of Attainment for the San Francisco Bay Area (April 2004). The conformity analysis must demonstrate that TCMs are being implemented on schedule (40 CFR 93.113). TCMs A-E have specific implementation steps which are used to determine progress in advancing these TCMs (see Table 8). TCMs A-E are now fully implemented.

Table 8: Implementation Status of Federal Transportation Control Measures for Ozone (A – E)

#	TCM	Description	Ozone Attainment Plan Implementation Schedule	Implementation Status
A	Regional Express Bus Program	Program includes purchase of approximately 90 low emission buses to operate new or enhanced express bus services. Buses will meet all applicable CARB standards, and will include particulate traps or filters. MTC will approve $40 million in funding to various transit operators for bus acquisition. Program assumes transit operators can sustain service for a five-year period. Actual emission reductions will be determined based on routes selected by MTC.	FY 2003. Complete once $40 million in funding pursuant to Government Code Section 14556.40 is approved by the California Transportation Commission and obligated by bus operators	$40 million for this program was allocated by the CTC in August 2001. The participating transit operators have ordered and received a total of 94 buses. All buses are currently in operations. TCM A is fully implemented.
B	Bicycle / Pedestrian Program	Fund high priority projects in countywide plans consistent with TDA funding availability. MTC would fund only projects that are exempt from CEQA, have no significant environmental impacts, or adequately mitigate any adverse environmental impacts. Actual emission reductions will be determined based on the projects funded.	FY 2004 – 2006. Complete once $15 million in TDA Article 3 is allocated by MTC.	MTC allocated over $20 million in TDA Article 3 funds during FY2004, FY2005, and FY2006. TCM B is fully implemented.
C	Transportation for Livable Communities (TLC)	Program provides planning grants, technical assistance, and capital grants to help cities and nonprofit agencies link transportation projects with community plans. MTC would fund only projects that are exempt from CEQA, have no significant environmental impacts, or adequately mitigate any adverse	FY 2004 – 2006. Complete once $27 million in TLC grant funding is approved by MTC	In December 2003, the Commission reaffirmed its commitment of $27 million annually over 25 years for the TLC program as part of Phase 1 of the Transportation 2030 Plan. MTC and the county Congestion Management Agencies (CMAs) have approved over $27 million in TLC grant funding by FY 2006. In November

		environmental impacts. Actual emission reductions will be based on the projects funded.		2004, MTC approved $500,000 for regional TLC Community Design Planning Program, and in December 2004, MTC approved $18.4 million in TLC funding for the regional TLC Capital program. As of December 2006, CMAs in Alameda, Marin and Sonoma counties approved an additional $12.4 million in their county-level TLC Capital programs for a regional total of $31.2 million. TCM C is fully implemented.
D	Additional Freeway Service Patrol	Operation of 55 lane miles of new roving tow truck patrols beyond routes which existed in 2000. TCM commitment would be satisfied by any combination for routes adding 55 miles. Tow trucks used in service are new vehicles meeting all applicable CARB standards.	FY 2001. Complete by maintaining increase in FSP mileage through December 2006	FSP continues to maintain the operation of the 55 lane miles of new roving tow truck coverage. This level of service was maintained through 2006. FSP continues to expand its service areas. TCM D is fully implemented.
E	Transit Access to Airports	Take credit for emission reductions from air passengers who use BART to SFO, as these reductions are not included in the Baseline.	BART – SFO service to start in FY 2003. Complete by maintaining service through December 2006	Service began June 2003. Service adjustments have been made since start of revenue service. The BART to SFO service has been maintained through 2006 and is continued. TCM E is fully implemented.

V. Response to Public Comments

The 30-day public comment period for the Draft Transportation-Air Quality Conformity Analysis for Plan Bay Area 2050 and the 2023 Transportation Improvement Program begins on July 5, 2022 and ends on August 3, 2022. Any comments received during this period will be addressed in the final draft version of this conformity analysis.

VI. Conformity Findings

Based on the analysis, the following conformity findings are made:

- This conformity assessment was conducted consistent with EPA's transportation conformity regulations and with the Bay Area Air Quality Conformity Protocol adopted by MTC as Resolution No. 3757.
- The 2023 Transportation Improvement Program and Plan Bay Area 2050 provide for implementation of TCMs pursuant to the following federal regulation:

  (1) An examination of the specific steps and funding source(s) needed to fully implement each TCM indicates that TCMs which are eligible for funding under title 23 U.S.C. or the Federal Transit Laws are on or ahead of the schedule established in the applicable implementation plan, or, if such TCMs are behind the schedule established in the applicable implementation plan, the MPO and DOT have determined that past obstacles to implementation of the TCMs have been identified and have been or are being overcome, and that all State and local agencies with influence over approvals or funding for TCMs are given maximum priority to approval or funding to TCMs over other projects within their control, including projects in locations outside the non-attainment or maintenance area.

  (2) If TCMs in the applicable implementation plan have previously been programmed for Federal funding but the funds have not been obligated and the TCMs are behind the schedule in the implementation plan, then the TIP cannot be found to conform if the funds intended for those TCMs are reallocated to projects in the TIP other than TCMs, or if there are no other TCMs in the TIP, if the funds are reallocated to projects in the TIP other than projects which are eligible for Federal funding intended for air quality improvements projects, e.g., the Congestion Mitigation and Air Quality Improvement Program.

  (3) Nothing in the TIP may interfere with the implementation of any TCM in the applicable implementation plan. (40 CFR Part 93.113(c)).

- For the two ground-level ozone precursors (VOC and NOx), motor vehicle emissions in the 2023 Transportation Improvement Program and Plan Bay Area 2050 are lower than the applicable motor vehicle emission budgets for the 2008 and 2015 national 8- hour ozone standards.
- For $PM_{2.5}$ and NOx, the Baseline Year test shows that the motor vehicle emissions are lower under the Build scenario for the various analysis years when compared to the baseline year emissions scenario.

Appendix A

List of 2023 TIP Projects by County

County	Sponsor	Project Name	Project Descripion	TIP ID	RTP ID	Air Quality Descripion	Conformity Analysis Year
Non-Exempt Projects							
Alameda	AC Transit	AC Transit: Quick Builds Transit Lanes	Berkeley: Durant Ave between Ellsworth and College; Oakland: MacArthur Blvd between Alma Ave and 13th Ave: Design and construct bus lanes and minor bus improvements.	ALA210018	21-T10-065	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
Alameda	ACE	ACE Platform Extensions	ACE System: At Fremont, Pleasanton, Livermore, Vasco, Tracy, and Manteca stations: Extend existing ACE platforms to accommodate longer train sets	ALA170042	21-T11-105	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
Alameda	ACTC	7th Street Grade Separation West	Oakland: Within the Port: Implement road and rail improvements, realign and grade separate 7th St and Maritime intersection, reconstruct and widen multi-use path; Between Joint Intermodal Terminal and	ALA170086	21-T07-055	NON-EXEMPT	2030
Alameda	ACTC	East Bay Greenway Phase 2	Alameda County: Generally along the BART alignment from Fruitvale BART station to South Hayward BART station: Install a trail facility consisting of Class I & Class IV bikeway facilities. Includes 2 road diet	ALA150008	21-T08-060	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
Alameda	ACTC	I-580/680 Interchange HOV/HOT Widening	Alameda County: On I-580 between Hacienda Dr. and San Ramon/Foothill Road and on I-680 between Stoneridge Dr. and Amado: Widen to add one HOV/HOT lane for WB 580 to SB 680 and NB 680 to EB	ALA170008	21-T12-116	NON-EXEMPT	2040
Alameda	ACTC	I-680 Express Lanes from SR84 to Alcosta Boulevard	Alameda and Contra Costa Counties: SB I-680 from SR-84 to north of Alcosta Blvd: express lane improvements (Phase 1); NB and SB I-680 from SR-84 to north of Alcosta Blvd: Widen for express lanes	ALA170009	21-T12-116	NON-EXEMPT	2030
Alameda	ACTC	I-680 NB HOV/HOT Lane	Route I-680: from South of Auto Mall Parkway to State Route 84 in Alameda County: Construct NB HOV/HOT Lane.	ALA130034	21-T12-116	NON-EXEMPT	2025
Alameda	ACTC	I-880 NB HOV/HOT: North of Hacienda to Hegenberger	Alameda County: I-880 in the northbound direction from north of Hacienda Ave to Hegenberger Road: Widen to provide one HOV/express lane	ALA170010	21-T12-116	NON-EXEMPT	2040
Alameda	ACTC	I-880 North Safety Improvements	Oakland: I-880 between 23rd Ave to 29th Ave: Reconfigure Interchange, including new ramps.	ALA050019	21-T06-024	NON-EXEMPT	2025
Alameda	ACTC	I-880/Whipple Rd Industrial Pkwy SW I/C Imps	Union City/Hayward: at I-880/Whipple Rd Interchange: Implement interchange improvements including widening & reconfiguration of ramps, surface street and intersection improvements, and bike/ped	ALA170005	21-T06-024	NON-EXEMPT	2030
Alameda	ACTC	Oakland/Alameda Access Project	Oakland and Alameda: Between Fallon Street and Washington Street: Reconfigure interchanges & intersections to improve connections between I-880, the Posey & Webster tubes & downtown Oakland;	ALA070009	21-T06-024	NON-EXEMPT	2030
Alameda	ACTC	Rte 84 Widening, south of Ruby Hill Dr to I-680	Alameda County: On State Route 84 from south of Ruby Hill Drive to I-680: Upgrade from 2-lane conventional highway to 4-lane expressway, make operational improvements to SR84/I-680 I/C and	ALA150001	21-T06-037	NON-EXEMPT	2025
Alameda	BART	Bay Fair Connection	BART: At and near Bay Fair Station: Modify station and approaches to add one or more additional tracks and one or more passenger platforms for improved train service and operational flexibility	ALA170044	21-T11-106	NON-EXEMPT	2030
Alameda	Dublin	Dublin Blvd. - North Canyons Pkwy Extension	Alameda County, Dublin and Livermore: Dublin Blvd-North Canyons Parkway from Fallon Rd to Croak Rd: Construct six lane extension; Dublin Blvd-North Canyons Parkway from Croak Rd to Doolan Rd:	ALA150003	21-T07-056	NON-EXEMPT	2030
Alameda	Dublin	I-580 Interchange Imps at Hacienda/Fallon Rd, Ph 2	Dublin: I580/Fallon Rd IC: Ph 2 - Reconstruct overcrossing to widen to 4 lanes in each direction, reconstruct and widen ramps, add bike/ped imps; I580 Hacienda Dr IC: Reconstruct overcrossing to add NB	ALA170045	21-T06-019	NON-EXEMPT	2040
Alameda	Dublin	Tassajara Road Widening	Dublin: Tassajara Road between North Dublin Ranch Drive and Quarry Lane School Road: Widen the existing roadway from two to four travel lanes, buffered bike lanes with an added landscaped median,	ALA210026	21-T07-056	NON-EXEMPT	2030
Alameda	Fremont	Irvington BART Station	Fremont: Along the BART corridor in the Irvington District: Construct a new BART station	ALA230004	21-T11-104	NON-EXEMPT	2030

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Alameda	Fremont	State Route 262 (Mission Blvd) Improvements	In Fremont: Mission Blvd/I-680 IC: Implement interchange improvements at I-680 and new freeway lanes between I-680 and I-880	ALA170001	21-T06-046	NON-EXEMPT	2050
Alameda	Hayward	I-880 Auxiliary lanes at Industrial Parkway	Hayward: I-880 NB between Industrial Pkwy and Alameda Creek; I-808 SB between Industrial Pkwy and Whipple Rd: Construct auxiliary lanes	ALA090020	21-T06-024	NON-EXEMPT	2030
Alameda	Hayward	I-880 I/C Improvements (Winton Ave and A St)	Hayward: I-880 from Winton Ave & A St: Reconfigure interchanges providing NB & SB auxiliary lanes between the A St and Winton Ave interchanges, complete streets features for bicyclists & pedestrians,	ALA170046	21-T06-024	NON-EXEMPT	2030
Alameda	Hayward	I-880/Industrial Parkway West Interchange	In Hayward: At I-880/Industrial Parkway West: Reconstruct interchange, replace overcrossing structure, reconfigure on/off-ramps, provide HOV bypass lanes, widen & reconfigure local streets &	ALA110002	21-T06-024	NON-EXEMPT	2030
Alameda	Hayward	Rt 92/Clawiter/Whitesell Interchange Improvements	Hayward: Rt 92/Clawiter Rd: Upgrade existing Clawiter interchange. Add ramps and overcrossing for Whitesell St. extension. Signalize ramp intersections.	ALA090016	21-T06-041	NON-EXEMPT	2030
Alameda	MTC	Bay Bridge Forward: Alameda I-580 WB HOV Lane Ext	Alameda County: On I-580 westbound approach to the San Francisco-Oakland Bay Bridge toll plaza from the SR 24/I-980 interchange to I-80: Convert one general purpose lane to an HOV lane.	ALA190018	21-T06-049	NON-EXEMPT	2025
Alameda	MTC	BBF: I-80 WB Bus Only Lane Extension	Alameda County: On I-80 westbound between SFOBB Toll Plaza and Powell Street interchange: Construct a bus only or HOV lane.	ALA210028	21-T06-049	NON-EXEMPT	2030
Alameda	Oakland	Oakland Grand Avenue Roadway Improvements	Oakland: Grand Ave between MacArthur and Mandela: Implement improvements to bus operations, walking, and biking including a bus only lane and road diet (from four lanes to two lanes)	ALA210024	21-T08-060	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
Alameda	Oakland	Oakland: Telegraph Avenue Complete Streets	Oakland: on Telegraph Avenue between 20th St and 41st St: Implement complete street project inc. road diet, buffered bike lanes, ped crossing improvements, bulbouts, bus boarding islands, traffic signal	ALA150047	21-T08-060	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
Alameda	Oakland	West Oakland Howard Terminal Downtown Connectivity	Oakland: Between West Oakland, Howard Terminal, and Jack London District: Provide connectivity with improvements including railroad crossings, intersection improvements, transit only lanes and a new	ALA210023	21-T08-060	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
Alameda	Union City	East-West Connector: Decoto and Quarry Lakes Pkwy	Union City and Fremont: Decoto Rd from I-880 to SR-238 (Mission Blvd): Widen roadway and implement complete streets improvements; Quarry Lakes Pkwy alignment between Paseo Padre Pkwy and SR-	ALA978004	21-T07-056	NON-EXEMPT	2040
Contra Costa	Brentwood	Brentwood Boulevard Widening - North (Phase I)	Brentwood: Brentwood Boulevard from Havenwood Avenue to Homecoming Way: Phase I-Widen from 2 to 4 lanes including a new parallel bridge over Marsh Creek, traffic signal modifications, and utilities	CC-070011	21-T07-056	NON-EXEMPT	2030
Contra Costa	Brentwood	Brentwood Boulevard Widening - North (Phase II)	Brentwood: Brentwood Blvd. between Homecoming Way and Lone Tree Way: Widen existing roadway from 2 to 4 lanes	CC-170015	21-T07-056	NON-EXEMPT	2030
Contra Costa	CC County	Byron Highway - Vasco Road Connection	Contra Costa County: between Byron Highway and Vasco Road: Construct an east-west connection road	CC-070081	21-T06-047	NON-EXEMPT	2040
Contra Costa	CC County	Camino Tassajara Realignment, S of Windemere Pkwy	Contra Costa County: Camino Tassajara between Windemere Parkway and the City of Dublin: Realign curves and widen road to four lanes	CC-170016	21-T07-056	NON-EXEMPT	2030
Contra Costa	CCTA	CCTA - Carshare 4 All	Contra Costa County: Various locations: Expand carshare access at transit locations and conduct outreach	CC-150009	21-EN09-132	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
Contra Costa	CCTA	I-680 NB Express Lane Completion	CC County: I680 NB from Livorna to SR-242: Widen to extend managed Lane; from SR-242 to Benicia-Martinez Bridge: Convert HOV to Express Lane; from N Main to Treat: Operational improvements;	CC-170017	21-T12-116	NON-EXEMPT	2030
Contra Costa	CCTA	I-680 Part Time Transit Lane	In Contra Costa County: On I-680 between Ygnacio Valley Rd and Alcosta Blvd: Increase bus service efficiency by implementing bus operations on shoulder (BOS)	CC-170061	21-T12-122	NON-EXEMPT	2030

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Contra Costa	CCTA	I-680/SR 4 I/C Reconstruction - Ph 1,2a,4	CContra Costa County: I680/SR4 I/C: Ph1 construct a 2-lane flyover direct connector fr NB680 to WB SR4 and remove NB680 to WB SR4 loop, construct aux lanes, a slip ramp, Ph 2A extend the SB680 CD	CC-010023	21-T06-022	NON-EXEMPT	2030
Contra Costa	CCTA	Reconstruct I-80/San Pablo Dam Rd Interchange	San Pablo: I-80/San Pablo Dam Rd I/C: Reconstruct I/C-relocating WB El Portal on-ramp to the full I/C northwards, providing access to McBryde through a new road from SPDR I/C, and replacing Riverside	CC-070035	21-T06-013	NON-EXEMPT	2030
Contra Costa	CCTA	SR 4 Integrated Corridor Management	Contra Costa County: Along SR 4 between I-80 in Hercules to the SR 4/SR 160 Interchange in the City of Antioch: Implement Integrated Corridor Management along corridor.	CC-150013	21-T07-057	NON-EXEMPT	2040
Contra Costa	CCTA	SR-4 Operational Improvements - Initial Phases	Contra Costa County: On SR-4 between I-680 and Bailey Road: Implement operational improvements including adding general purpose and auxiliary lanes at various locations	CC-170018	21-T06-031	NON-EXEMPT	2030
Contra Costa	Concord	SR 242 / Clayton Road Interchange Improvements	Concord: At the SR242/Clayton Rd Interchange: Construct NB on-ramp and SB off-ramp	CC-070024	21-T06-045	NON-EXEMPT	2040
Contra Costa	El Cerrito	El Cerrito del Norte Area TOD Complete Street Imps	El Cerrito: On roadways surrounding Del Norte BART: Improve access, circulation and safety for bicyclists, pedestrians, transit users, and motorists traveling to BART and TOD/PDA	CC-070046	21-T08-060	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
Contra Costa	Hercules	Hercules Intercity Rail Station	Hercules: At future train station: Install multi-use trails, utility relocation, track improvements, construct rail station, and parking facility.	CC-030002	21-T11-115	NON-EXEMPT	2030
Contra Costa	MTC	RSR Forward: ORT and I-580 WB HOV Lane	Contra Costa County: On westbound I-580 approaching RSR Bridge beginning at Regatta Ave: Convert one of three general-purpose lanes to an HOV lane and replace existing tolling structure with toll	CC-210010	21-T06-020	NON-EXEMPT	2030
Contra Costa	Oakley	Civic Center Railroad Platform Park n Ride Complex	Oakley: Main Street between 2nd Street and O'Hara Avenue: Build 2 parking lots for multi-modal park, ride, and transit activities. Lots will serve train riders for a future train platform which includes	CC-170019	21-T11-105	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
Contra Costa	Richmond	I-80/Central Avenue - Local Portion	Richmond: I-80/Central Ave Interchange: Connect Pierce St to San Mateo and relocate signal at Pierce/Central to San Mateo/Central intersection.	CC-050076	21-T06-013	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
Contra Costa	San Ramon	Crow Canyon Road (Alcosta to Indian Rice) Widening	San Ramon: Crow Canyon Rd from Alcosta Blvd to Indian Rice Rd: Widen to three lanes in each direction. Work will be completed in two phases.	CC-190001	21-T07-056	NON-EXEMPT	2030
Contra Costa	SJRC	Oakley Station Platform	Oakley: North of Main Street between 2nd St and O'Hara Ave: Construct a new train station platform for the Amtrak San Joaquins inter-city rail service.	CC-190002	21-T11-115	NON-EXEMPT	2025
Marin	GGBHTD	Golden Gate Ferry: New Vessel	GGBHTD: 1 vehicle: Purchase a new, 500-passenger, high-speed ferry vessel to continue to provide expanded commute service from Larkspur and Tiburon to San Francisco.	MRN190001	21-T11-094	NON-EXEMPT	2030
Marin	MTC	Richmond-San Rafael Bridge Access Improvements	Contra Costa and Marin Counties: On I-580/Richmond-San Rafael Bridge: Convert existing shoulders to an automobile travel lane (EB) and a bike/ped path, construct bike/ped path in Contra Costa County	MRN150009	21-T06-020	NON-EXEMPT	Baseline
Marin	Novato	Novato Boulevard Widening, Diablo to Grant	Novato: Novato Blvd between Diablo and Grant Ave.: Improvements to roadway including including widening existing two/three lanes to four lanes and adding turn lanes, bike lanes, curbs, and sidewalks.	MRN070006	21-T07-056	NON-EXEMPT	2025
Marin	San Anselmo	San Anselmo - Center Blvd Bridge Replace (27C0079)	San Anselmo: Center Blvd Bridge over San Anselmo Creek, at Sycamore Ave: Replace existing 2 lane bridge with 3 lane bridge	MRN110032	21-T01-004	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
Marin	TAM	US 101 HOV Lanes - Marin-Sonoma Narrows (Marin)	Marin and Sonoma Counties: From SR 37 in Novato to Old Redwood Highway in Petaluma; Convert expressway to freeway and widen to 6 lanes for HOV lanes.	MRN050034	21-T06-026	NON-EXEMPT	2025
Napa	American Canyon	Devlin Road and Vine Trail Extension	American Canyon: Devlin Road from the southern terminus 2,500 feet south to Green Island Road: Construct roadway extension and Class I multipurpose path	NAP130006	21-T08-060	NON-EXEMPT - Not Regionally Significant Project	Not Modeled

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Napa	American Canyon	Eucalyptus Drive Realignment Complete Streets	American Canyon: Eucalyptus Dr. from Theresa Rd to Hwy 29: Extend roadway and reconfigure intersection of Eucalyptus Dr and Hwy 29 and Eucalyptus Drive and Theresa Road. Create complete street	NAP110029	21-T08-060	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
Napa	NVTA	NVTA- Vine Transit Bus Maintenance Facility	Napa County: At an 8 acre site in south Napa County: Construct a new transit maintenance facility for Vine Transit operations to improve reliability, service and charge electric vehicles, provide for service	NAP170003	21-T01-002	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
Napa	NVTA	SR 12/29/221 Soscol Junction Interchange Imps.	In Napa County: At SR-221/SR-29 Soscol Ferry Road: Construct improvements	NAP090003	21-T06-034	NON-EXEMPT	2025
Regional/ Multi-County	BAIFA	ALA/CC-80 and Bay Bridge Approach Express Lanes	In Alameda/Contra Costa counties: On I-80 from the Carquinez Bridge to Powell and the Bay Bridge Approaches: Convert HOV lanes to express lanes. Project also references RTP ID 17-10-0045.	VAR170003	21-T12-116	NON-EXEMPT	2030
Regional/ Multi-County	BART	BART Transbay Core Capacity Improvements	BART: Systemwide: Implement communication-based train control (CBTC) system, expand rail car fleet by 306 vehicles, add traction power substations (5); At Hayward Maintenance Complex; Expand	REG170017	21-T11-106	NON-EXEMPT	2030
Regional/ Multi-County	BART	BART: Railcar Procurement Program	BART: Procure 790 Railcars (includes the replacement of 669 Railcars)	REG090037	21-T01-002	NON-EXEMPT	2040
Regional/ Multi-County	MTC	Freeway Performance Initiative (FPI)	SF Bay Area: Regionwide: Design, implement and maintain ramp metering, Traffic Operation Systems (TOS), and other Freeway Performance Initiative (FPI) projects on major congested freeways throughout	REG090003	21-T06-048	NON-EXEMPT	Multiple Years
Regional/ Multi-County	MTC	Freeway Performance Program: SR-84	Alameda and San Mateo Co: Along the Dumbarton Corridor: Deliver operational strategies including adaptive ramp metering, advanced technologies, arterial/transit priority signal upgrades, higher vehicle	VAR170023	21-T06-049	NON-EXEMPT	2030
Regional/ Multi-County	MTC	SR 37 Interim Project - Sears Point to Mare Island	Solano and Sonoma Counties: SR-37 between the Sears Point/SR 121, and Mare Island: Implement a high occupancy vehicle (HOV) lane, implement tolling.	VAR210004	21-T06-035	NON-EXEMPT	2030
Regional/ Multi-County	SMART	SMART Rail and Pathway (Phase 2)	Marin and Sonoma Counties: Sonoma County Airport Station to Windsor: Extend rail and pathway; Petaluma North at Corona Rd: Construct infill station; Various locations along SMART corridor: Construct	VAR210005	21-T11-113	NON-EXEMPT	2030
Regional/ Multi-County	WETA	Ferry Service - Berkeley	WETA: Berkeley: Provide ferry service from Berkeley to San Francisco.	MTC050027	21-T11-096	NON-EXEMPT	2030
San Francisco	Port of SF	Mission Bay Ferry Terminal	San Francisco: At the eastern terminus of 16th St: Construct new ferry landing to service San Francisco Mission Bay and Central Waterfront as a part of the Bay area ferry transit system. Project includes RTP-	SF-170001	21-T11-097	NON-EXEMPT	2030
San Francisco	SF County TA	HOV/HOT Lanes on U.S.101 and I-280 in SF	San Francisco: On US 101 from SF/SM County line to I-280 interchange and on I-280 from US 101 interchange to 6th Street offramp: Convert an existing mixed traffic lane and/or shoulder/excess ROW in	SF-130008	21-T12-116	NON-EXEMPT	2030
San Francisco	SF County TA	Quint-Jerrold Connector Road	San Francisco: From Oakdale Ave to Jerrold Ave: Provide an alternate access route between Oakdale and Jerrold Avenues and across the Caltrain tracks, to be coordinated with Caltrain's Quint Street Bridge	SF-150008	21-T07-056	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
San Francisco	SF County TA	SF Downtown Congestion Pricing	San Francisco: In the downtown area: Implement a demonstration value pricing (tolls and incentives) program	SF-130017	21-T10-091	NON-EXEMPT	2030
San Francisco	SF County TA	Treasure Island Congestion Pricing Program	San Francisco: Treasure Island: Implement Congestion Pricing Program. project is phased	SF-110049	21-T10-092	NON-EXEMPT	2040
San Francisco	SF County TA	Treasure Island Pricing Mobility Improvements	San Francisco: On Treasure Island: Pricing Program Mobility Improvements including Transit Capital and maintenance improvements. The project is phased	SF-130005	21-T10-092	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
San Francisco	SF County TA	US 101 Doyle Drive Availability Payments	San Francisco: US 101 (Doyle Drive) from Lombard Street/Richardson Avenue to Route 1 Interchange: Availability payments for roadway replacement/rehabilitation project SF-991030	SF-190011	21-T01-006	NON-EXEMPT - Not Regionally Significant Project	Not Modeled

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San Francisco	SF DPW	Harney Way Roadway Widening	San Francisco: Harney Way from US 101 to Jamestown: Improvements including right-of-way engineering, land acquisition for future widening of roadway, design, landscaping and sidewalk improvements,	SF-090004	21-T07-056	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
San Francisco	SF DPW	HOPE SF Street Network - Sunnydale and Potrero	San Francisco: Sunnydale and Potrero neighborhoods: Construct new and realigned street networks throughout the two remaining HOPE SF sites, including traffic calming pedestrian and bike network, and	SF-170013	21-T07-056	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
San Francisco	SF DPW	Hunters Pt Shipyard and Candlestick Pt Local Roads	In San Francisco: Hunters Point Shipyard and Candlestick Point: Implement new local streets to support multi-modal mixed use development. The project is phased.	SF-110006	21-T10-063	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
San Francisco	SF DPW	SF- Better Market Street Transportation Elements	In San Francisco: Market St from Steuart St to Octavia Blvd: improve roadway, including resurfacing, sidewalk and transit boarding improvements, transit connections, traffic signals, transportation	SF-130001	21-T08-060	NON-EXEMPT	2020
San Francisco	SFMTA	Geary Bus Rapid Transit	San Francisco: Along the Geary corridor between 34th Avenue and Market Street: Design and implement transit performance and safety improvements	SF-070004	21-T10-079	NON-EXEMPT	2030
San Francisco	SFMTA	Geneva Harney BRT Infrastructure - Eastern Segment	SFMTA: Bayview and Hunters Point: from Executive Park/Harney Way to Hunters Point Transit Center via Candlestick/Hunters Pt. Shipyard development: Construct extension of Geneva Harney BRT	SF-090023	21-T10-080	NON-EXEMPT	2030
San Francisco	SFMTA	Geneva Harney BRT Infrastructure: Central Segment	SFMTA: From Executive Park/Harney Way under US 101 to SF/Daly City line on Geneva Avenue: Construct bus rapid transit facilities	SF-090020	21-T10-080	NON-EXEMPT	2030
San Francisco	SFMTA	Historic Streetcar Extension to Fort Mason	San Francisco: From Fisherman''s Wharf through National Park Service lands in Aquatic Park to Fort Mason: Extend the E-line or the current F-line service.	SF-070003	21-T10-082	NON-EXEMPT	2030
San Francisco	SFMTA	Light Rail Vehicle Procurement	SFMTA: Fleet-wide: Procure 219 light rail vehicles with an option for an additional 45 vehicles to replace existing fleet and expand service	SF-090012	21-T01-002	NON-EXEMPT	2040
San Francisco	SFMTA	SF Muni Third St LRT Phase 2 - New Central Subway	San Francisco: North-south alignment under 4th St. to Market, then under Geary to Stockton & under Stockton to Clay St; Extend the Light Rail line project includes procurement of four LRVs.	SF-010037	21-T10-083	NON-EXEMPT	2025
San Francisco	SFMTA	SFMTA - Core Capacity Program	SFMTA: Along the K, J and M-Line Corridors: Implement high priority route improvements from the Muni Forward Program	SF-190012	21-T10-084	NON-EXEMPT	2030
San Francisco	SFMTA	Transit Center in Hunters Point	Muni:Transit Center in Hunters Point; Construct 10 bays, Low-level platform, Operator restroom, bus shelters,Electrical ductbank for MUNI power,etc	SF-090016	21-T10-063	NON-EXEMPT	2040
San Francisco	SFMTA	Van Ness Avenue Bus Rapid Transit	San Francisco: On Van Ness Avenue from Mission to Lombard: Design and implement a BRT project. Project is phased. Project also references RTP IDs 240745 and 240471	SF-070005	21-T10-081	NON-EXEMPT	2025
San Francisco	TBJPA	Transbay Terminal/Caltrain Downtown Ext: Ph. 2	San Francisco: From Fourth/Townsend to Salesforce Transit Center: Extend Caltrain commuter rail service	SF-050002	21-T11-110	NON-EXEMPT	2030
San Francisco	WETA	WETA: Electric Vessels and Related Infrastructure	WETA: Fleetwide: Support the purchase/construction of all-electric vessels and related charging infrastructure.	SF-190008	21-T01-002	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
San Mateo	Brisbane	US 101/Candlestick I/C Reconfiguration	In San Mateo County: U.S. 101/Candlestick Point Interchange: Planning and environmental studies for interchange reconfiguration to allow for safer and better flow of traffic	SM-090004	21-T06-027	NON-EXEMPT	Not Modeled
San Mateo	Caltrain	Peninsula Corridor Electrification Expansion	Caltrain: Electric Multiple Unit (EMU) fleet: Expand fleet through procurement of an additional 40 vehicles.	SM-190002	21-T11-107	NON-EXEMPT	2040
San Mateo	CCAG	Improve US 101 operations near Rte 92	City of San Mateo: On US 101 near Route 92: Operational improvements. SMCTA is the co-sponsor for this project.	SM-090014	21-T06-027	NON-EXEMPT	2030
San Mateo	CCAG	US-101 Managed Lanes North of I-380	San Mateo County: On US-101 from I-380 to logical termini near SF/SM County line: Install managed lane in each direction. SMCTA is co-sponsoring the project.	SM-190009	21-T12-116	NON-EXEMPT	2030
San Mateo	CCAG	US101 Managed Lanes: Santa Clara Co-S of Grand Ave	San Mateo County: On US101 from 2 mi. S. of the Santa Clara County Line to 0.3 mi. S. of Grand Ave I/C: Install Express Lanes. Use existing aux lanes where possible and add aux lanes where needed for	SM-150017	21-T12-116	NON-EXEMPT	2025

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San Mateo	Millbrae	Widen Millbrae Avenue	Millbrae: Millbrae Avenue between Rollins Road and US101 Southbound On Ramp: Widen roadway and resurface the intersection of Millbrae Avenue and Rollins Road.	SM-210001	21-T07-056	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
San Mateo	Pacifica	Manor Drive Overcrossing and Milagra On Ramp	In Pacifica: Hwy 1 and Manor Drive I/C: Widen the existing overcrossing; Hwy 1 and Milagra: Construct a new on-ramp; Both intersections: install signals	SM-170004	21-T06-030	NON-EXEMPT	2030
San Mateo	Redwood City	Blomquist Street Extension	Redwood City: On Blomquist Street from Maple Street to Bair Island Road: Extend roadway across Redwood Creek.	SM-090007	21-T07-056	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
San Mateo	Redwood City	Redwood City Ferry Service	SF Bay Area: Between Redwood City and San Francisco/Oakland: Environmental clearance and design of ferry transit service	SM-110002	21-T11-098	NON-EXEMPT	2030
San Mateo	SamTrans	SamTrans Express Bus Service	San Mateo, San Francisco and Santa Clara Counties: On the US-101 Corridor: Implement a network of four express bus routes	SM-190003	21-T12-119	NON-EXEMPT	2030
San Mateo	San Carlos	US101/Holly St I/C Mod and Bike/Ped Overcrossing	San Carlos: At Holly St/ US-101 Interchange: Widen east bound to north bound ramp to two lanes and eliminate north bound to west bound loop and construct a grade-separated multipurpose path that	SM-090008	21-T06-027	NON-EXEMPT	2030
San Mateo	San Mateo	US 101/Peninsula Avenue Interchange Improvements	San Mateo: US-101 at Peninsula Ave and East Poplar Ave: Convert a partial interchange to a full interchange by adding new southbound on- and off-ramps and closing the southbound on- and off-ramps	SM-170011	21-T06-027	NON-EXEMPT	2030
San Mateo	SMCTA	US 101 Aux lanes from Sierra Point to SF Co. Line	San Mateo County: On US 101 from Sierra Point to SF County Line: Construct auxiliary lanes or managed lanes.	SM-090009	21-T12-116	NON-EXEMPT	2030
San Mateo	SSF	US 101/Produce Avenue New Interchange	South San Francisco: On US Highway 101 from Utah Avenue on the east side to the vicinity of Produce Avenue on the west side: Construct a local interchange	SM-110003	21-T06-027	NON-EXEMPT	2030
Santa Clara	Caltrans	SCL-SM I-280 Pavement Preserv. and HOV Extension	Santa Clara and San Mateo Counties: On I-280 from Foothill Blvd(SCL County PM 11.5) to 0.5 mile north of Sand Hill Rd(SM County PM R2.1): Pavement rehabilitation; On SB I-280 from near Magdelena Ave	SCL190034	21-T06-016	NON-EXEMPT	2025
Santa Clara	Milpitas	South Milpitas Blvd Extension and Bridge	Milpitas: S. Milpitas Blvd over Penitencia Creek connecting to Tarob Ct: Extend roadway and construct bridge	SCL210035	21-T07-056	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
Santa Clara	San Jose	Julian and St. James Couplet Conversion	San Jose: Along Julian St from Coleman Ave to 3rd St and St James from Market St to 4th St: Convert 1-way to 2-way traffic	SCL210026	21-T08-060	NON-EXEMPT - Not Regionally Significant Project	2030
Santa Clara	San Jose	San Jose - Autumn Street Extension	In San Jose: Autumn St between Julian Street and San Carlos Street: Widen, partially realign, and extend Autumn Street to adequately accommodate projected traffic demand.	SCL110006	21-T07-056	NON-EXEMPT	2050
Santa Clara	Santa Clara Co	Montague Expwy Widening - Trade Zone-Great Mall	Santa Clara County: Montague Expressway between Trade Zone and Great Mall Blvd: Widen roadway to 8 lanes	SCL090017	21-T07-056	NON-EXEMPT	2030
Santa Clara	VTA	US 101/Buena Vista Avenue Interchange Improvement	Gilroy: At Buena Vista Ave. overcrossing at US 101: Construct a complete interchange by widening the overcrossing structure and adding new northbound and southbound on and off ramps.	SCL190010	21-T06-028	NON-EXEMPT	2030
Santa Clara	VTA	BART - Berryessa to San Jose Extension	San Jose: From Berryessa Station to San Jose and Santa Clara: Extend BART line	BRT030001	21-T11-109	NON-EXEMPT	2030
Santa Clara	VTA	Calaveras Boulevard Improvements	Milpitas: Calaveras Blvd. overpass at UPRR tracks from Abel St to Town Center Blvd: Widen from 4 to 6 lanes and modify signing, striping and signals	SCL190009	21-T07-056	NON-EXEMPT	2040
Santa Clara	VTA	Eastridge to BART Regional Connector	San Jose: At the Eastridge Transit Center: Ph I (completed) ¿ Improve and expand transit center; Capitol Expwy Light Rail from Alum Rock Transit Center to Eastridge Transit Center: Ph II - Extend light rail,	SCL050009	21-T10-087	NON-EXEMPT	2030
Santa Clara	VTA	LRT Extension to Vasona Junction and Double Track	Campbell and San Jose: From the existing Winchester Station to a new Vasona Junction Station, near Route 85: Extend the light-rail line and double-track single-track sections of the Vasona line	SCL090040	21-T10-089	NON-EXEMPT	2040
Santa Clara	VTA	Santa Clara County - US 101 Express Lanes	In Santa Clara County: From Cochrane Rd. in Morgan Hill to San Mateo County line in Palo Alto: Implement roadway pricing on US 101 carpool lane	SCL110002	21-T12-116	NON-EXEMPT	2025
Santa Clara	VTA	SR 152 New Trade Corridor	Santa Clara/ San Benito counties: SR152 between US101 and SR156: Complete PA&ED for new alignment the highway.	SCL090016	21-T06-042	NON-EXEMPT	Not Modeled

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List of 2023 TIP Projects by County

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Santa Clara	VTA	SR 17 Congestion Relief in Los Gatos	Los Gatos: On both directions of SR 17 from Lark Ave to south of SR 9 IC: Construct aux lanes including modifications to on-ramps and off-ramps to improve operations and relieve congestion; Along SR-	SCL190014	21-T06-032	NON-EXEMPT	2030
Santa Clara	VTA	SR 85 Express Lanes	Santa Clara County: On SR 85 carpool lane from US 101 in San Jose to US 101 in Mountain View including the US 101/SR 85 HOV direct connectors and approaches: Install ETS and implement roadway	SCL090030	21-T12-116	NON-EXEMPT	2030
Santa Clara	VTA	US 101/Zanker Road-Skyport Drive-N. Fourth St. Imp	San Jose: US101 at Zanker Rd/Skyport Dr./N. 4th St: Construct a new overcrossing over US 101 connecting Zanker Rd to Skyport Dr-N. Fourth St to create a new north-south corridor parallel to N. First St	SCL190007	21-T06-028	NON-EXEMPT	2030
Solano	Dixon	Parkway Blvd/UPRR Grade Separation	Dixon: Parkway Blvd from Valley Glen Dr. to Pitt School Rd: Construct new 4 lane roadway and overcrossing of UPRR & Porter Rd with bicycle and pedestrian access	SOL050009	21-T07-056	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
Solano	Fairfield	Fairfield Transportation Center - Phase 3	In Fairfield: Fairfield Transportation Center: Construct second parking structure with approximately 600 automobile parking spaces and access improvements.	SOL110007	21-T10-093	NON-EXEMPT - Not Regionally Significant Project	Not Modeled
Solano	Fairfield	Fairfield/Vacaville Hannigan Station Improvements	Fairfield: Capitol Corridor: Construct train station with passenger platforms, pedestrian undercrossing, highway overcrossing, park and ride lot,bike and other station facilities. Project is phased.	SOL030002	21-T11-115	NON-EXEMPT	2025
Solano	MTC	Solano I-80 Managed Lanes	Solano County: I-80 from Red Top Rd to I-505: Convert existing HOV to Managed Lane; I-80 from Air Base Parkway to I-505: Construct new Managed Lanes. Project also references RTP IDs 17-10-0059	SOL110001	21-T12-116	NON-EXEMPT	2025
Solano	Solano County	Redwood-Fairgrounds Dr Interchange Imps	Solano County: I-80 Redwood St. I/C and SR-37/Fairgrounds Dr. I/C: Implement I/C and safety improvements; Fairgrounds Dr. from Redwood St. to SR-37: Remove left turn lane and widen to add one lane	SOL090015	21-T06-015	NON-EXEMPT	2030
Solano	STA	I-80/I-680/SR 12 Interchange Improvements	Fairfield: I-80/I-680/Route 12 IC: Ph-1 Improve IC, including connecting I-80 to SR 12 W, I-680 NB to SR 12W (Jameson Canyon), I-80 to I-680 (+ Express Lane Direct connectors), build local IC and build	SOL070020	21-T06-015	NON-EXEMPT	2040
Solano	STA	Jepson: Leisure Town Road from Vanden to Commerce	Jepson Parkway segment: Leisure Town Road from Vanden Road to Commerce. Project is phased	SOL110005	21-T07-056	NON-EXEMPT	2030
Solano	STA	Jepson: Leisure Town Road Phase 1B and 1C	Vacaville: (Phase 1B) Leisure Town Rd from Elmira Rd to Sequoia and (Phase 1C) from Sequoia Dr to Horse Creek: Widen to 4 lanes with multiuse sidewalk and safety improvements	SOL110006	21-T07-056	NON-EXEMPT	2030
Solano	STA	Jepson: Walters Rd Ext - Peabody Rd Widening	Solano County: Jepson Parkway segment: Walters Road Extension, Peabody Widening.	SOL110004	21-T07-056	NON-EXEMPT	2030
Sonoma	Son Co TA	US 101 Marin/Sonoma Narrows (Sonoma)	Marin and Sonoma Counties (Sonoma County Portion): From SR37 in Novato to Old Redwood Highway in Petaluma: convert expressway to freeway; Between Lakeville Highway and East Washigton Street:	SON070004	21-T06-029	NON-EXEMPT	2040

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Exempt Projects							
Alameda	AC Transit	AC Transit Replacement of Transbay Buses	AC Transit: Transbay Fleet: Purchase replacement buses	ALA210007	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Alameda	AC Transit	AC Transit: COVID-19 Emergency Transit Operations	AC Transit: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and	ALA190023	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
Alameda	AC Transit	AC Transit: Paratransit Van Replacement	AC Transit: Paratransit fleet: Amortized cost of replacing vans used for paratransit service. Vans are operated and replaced by paratransit contractor. FTA funds programmed annually in lieu of	ALA990052	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of support vehicles	Not Modeled
Alameda	AC Transit	AC Transit: Purchase (10) 40' Buses-Fuel Cell ZEB	AC Transit: 10 vehicles: Replace 10 40ft urban diesel buses with Zero-emission fuel cell buses	ALA150039	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Alameda	AC Transit	AC Transit: Replace 30-ft Diesel Buses	AC Transit: 30-ft Diesel Buses: Purchase replacement vehicles	ALA210010	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Alameda	AC Transit	AC Transit: Replace 40-ft Diesel Buses	AC Transit: Diesel bus fleet: Purchase replacement buses	ALA210012	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Alameda	AC Transit	AC Transit: Replace Articulated Buses	AC Transit: Articulated Bus Fleet: Replace diesel-powered buses with fuel cell-powered buses	ALA210011	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Alameda	AC Transit	AC Transit:AC Transit: Replace 50 40-ft Diesels	AC Transit: 50 40-ft Diesel Buses: Purchase replacement vehicles	ALA170081	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Alameda	AC Transit	Tempo Quick Build Transit Lane Delineation	Oakland: On International Blvd between 14th Ave and Durant Ave: Add warning features to an existing median bus lane.	ALA210017	21-T10-073	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Alameda	ACE	ACE Capital Access Fee	ACE: Along ACE Corridor: Capital Lease payments required to operate along Union Pacific corridor	ALA210008	21-T01-001	EXEMPT (40 CFR 93.126) - Operating assistance to transit agencies	Not Modeled
Alameda	ACE	ACE Fixed Guideway (Capitalized Maintenance)	ACE: Along ACE Corridor: Capitalized Maintenance with Union Pacific Railroad for track/signal maintenance.	ALA170048	21-T01-002	EXEMPT (40 CFR 93.126) - Operating assistance to transit agencies	Not Modeled
Alameda	ACE	ACE Revenue Vehicle Communication Equipment	ACE: Fleetwide: Replace and upgrade on-board communications equipment for the ACE service	ALA210009	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of operating equipment for vehicles (e.g., radios, fareboxes, lifts,	Not Modeled
Alameda	ACE	ACE Track Improvements.	ACE: From Stockton to San Jose: Corridor improvements for signaling, grade crossing, track and other cost associated	ALA010056	21-T01-002	EXEMPT (40 CFR 93.126) - Rehabilitation or reconstruction of track structures, track, and trackbed in	Not Modeled
Alameda	ACE	ACE: Railcar Midlife Overhaul	ACE: System-wide: Perform midlife overhaul of existing ACE railcars to extend useful life.	ALA170079	21-T01-002	EXEMPT (40 CFR 93.126) - Rehabilitation of transit vehicles	Not Modeled
Alameda	ACTC	7th Street Grade Separation East	Oakland: 7th St and rail tracks between I880 and Maritime St in the Port of Oakland: Reconstruct the existing 7th St underpass on an adjacent alignment, rail tracks, and other rail infrastructure. No through	ALA170085	21-T07-055	EXEMPT (40 CFR 93.127) - Changes in vertical and horizontal alignment	Not Modeled
Alameda	ACTC	Alameda County Rail Safety Enhancement Program	Alameda County: Various at-grade rail crossings: Implement safety improvements	ALA210022	21-T07-055	EXEMPT (40 CFR 93.126) - Railroad/highway crossing	Not Modeled
Alameda	ACTC	Alameda County Safe Routes to School	Alameda County: Countywide: SR2S Program including education & outreach in various K-12 schools, ridesharing, & project development.	ALA110033	21-EN09-132	EXEMPT (40 CFR 93.126) - Grants for training and research programs	Not Modeled
Alameda	ACTC	Alameda CTC: San Pablo Avenue Bus/Bike Lanes	Oakland, Emeryville, and Berkeley: Along San Pablo Avenue from 16th Street in Downtown Oakland to Heinz Street: Install pedestrian crossing improvements and dedicated bus lanes and bike lanes	ALA230008	21-T10-077	EXEMPT (40 CFR 93.126) - Traffic control devices and operating assistance other than signalization	Not Modeled
Alameda	ACTC	East Bay Greenway Multimodal (Phase 1)	Alameda County: Along the BART alignment following parallel arterial roadways from Lake Merritt BART Station to S. Hayward BART Station: Install Class I & Class IV bikeway facilities. Includes road diet	ALA230007	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Alameda	ACTC	Freight Intelligent Transportation System (FITS)	Oakland: In the Port of Oakland and surrounding areas: Implement ITS improvements, signal systems, and other technologies to cost-effectively manage truck arrivals and improve incident response	ALA170087	21-T07-055	EXEMPT (40 CFR 93.127) - Intersection signalization projects at individual intersections	Not Modeled
Alameda	ACTC	I-80 Gilman Interchange Improvements	Berkeley: On Gilman Ave at I-80: Reconfigure interchange providing dual roundabout at the entrance & exits from I-80 as well as the Eastshore Hwy & West Frontage Rd and bike/ped overcrossing. Project	ALA050079	21-T09-061	EXEMPT (40 CFR 93.127) - Changes in vertical and horizontal alignment	Not Modeled

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Alameda	ACTC	I-80/Ashby Avenue Interchange Improvements	Alameda County: I-80/Ashby IC: Reconstruct the interchange including constructing new bridge, stand-alone bike/ped overcrossing and other bike/ped improvements, and ramp metering.	ALA170002	21-T09-061	EXEMPT (40 CFR 93.127) - Interchange reconfiguration projects	Not Modeled
Alameda	ACTC	San Pablo Ave Parallel Bike Improvements	Berkeley and Albany: Various locations along bicycle boulevard/neighborhood bikeway routes parallel to San Pablo Avenue: Install bicycle improvements including crossing safety, speed/volume control	ALA230010	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Alameda	ACTC	San Pablo Ave Safety and Bus Bulb Improvements	Berkeley and Albany: San Pablo Avenue in Berkeley and Albany from Heinz St to the Contra Costa County line: Install bus bulbs and pedestrian/bicycle crossing improvements	ALA230009	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Alameda	Alameda	Alameda Grand St Pavement Rehab and Safety Imps	Alameda: Along Grand St: Resurface and rehabilitate pavement, implement bicycle and pedestrian improvements and other complete streets improvements	ALA170074	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Alameda	Alameda	Central Avenue Safety Improvements	Alameda: On Central Ave from Main St to Sherman St: construct multimodal street improvements including reduction from 4 to 3 lanes, center turn lane, bike lanes, 2-way separated bikeway, roundabouts	ALA170049	21-T07-056	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Alameda	Alameda	Clement Avenue Complete Streets	Alameda: On Clement Avenue between Broadway and Grand St: Complete street improvements including Class IV bikeway, curb extensions, flashing beacons, sidewalk/curb ramp improvements, railroad	ALA170073	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Alameda	Alameda County	Alameda County Complete Street Improvements	Alameda County: Various locations: Bicyle and ped safety improvements	ALA190019	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Alameda	Alameda County	Alameda Co-Various Streets and Roads Preservation	Unincorporated Alameda County: Various roadways: Rehabilitate pavement	ALA130018	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Alameda	Alameda County	E14th St/Mission Blvd Corridor Improvements	Alameda County: Along E14th St/Mission Blvd between I-238 and Hayward City limits: Construct streetscape improvements for continuity along corridor	ALA190022	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Alameda	Alameda County	Estuary Bridges Seismic Retrofit and Repairs	Oakland: 3 Oakland Estuary bridges: Seismic retrofit and repairs	ALA090022	21-T01-004	EXEMPT (40 CFR 93.126) - Widening narrow pavements or reconstructing bridges (no additional travel	Not Modeled
Alameda	Alameda County	Fruitvale Ave Roadway Bridge Lifeline	Alameda County: Fruitvale Roadway Bridge: Retrofit bridge to a lifeline facility	ALA090023	21-T01-004	EXEMPT (40 CFR 93.126) - Widening narrow pavements or reconstructing bridges (no additional travel	Not Modeled
Alameda	Alameda County	Niles Canyon Trail, Phase I	Alameda County: In the vicinity of SR-84 between Niles District and Palomares Road (Phase I): Construct multi-Use trail	ALA190021	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Alameda	Albany	Ohlone Greenway Trail Safety Improvements	Albany: Various locations along the Ohlone Greenway: Install safety improvements including new protected left turn phase which would eliminate potential conflicts between trail users and vehicles turning	ALA190016	21-T09-061	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Alameda	Albany	San Pablo Ave and Buchanan St Pedestrian Imps.	Albany: Various Locations on Buchanan St and San Pablo Ave: Streetscape improvements including medians, bulb outs, signal modifications, striping of high visibility crosswalks. Project delivery is phased.	ALA170088	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Alameda	BART	19th Street BART Station Modernization-GO Uptown	In Oakland: At the 19th Street BART Station and adjacent public realm: Implement station and streetscape improvements	ALA170055	21-T01-002	EXEMPT (40 CFR 93.126) - Reconstruction or renovation of transit buildings and structures (e.g., rail	Not Modeled
Alameda	BART	BART: COVID-19 Emergency Transit Operations	BART: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and supplies,	ALA190025	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
Alameda	BART	BART: Fare Collection Equipment	BART: Systemwide: Acquire and install fare collection equipment.	ALA090065	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of operating equipment for vehicles (e.g., radios, fareboxes, lifts,	Not Modeled
Alameda	BART	BART-Elevator Renovation program	BART: Various locations system-wide: Renovate or rehabilitate elevators	ALA190014	21-T01-002	EXEMPT (40 CFR 93.126) - Reconstruction or renovation of transit buildings and structures (e.g., rail	Not Modeled
Alameda	BART	DT Berkeley BART Station Elevator Modernization	Berkeley: At the Downtown Berkeley BART Station: Modernize station elevators	ALA230001	21-T01-002	EXEMPT (40 CFR 93.126) - Reconstruction or renovation of transit buildings and structures (e.g., rail	Not Modeled

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Alameda	BART	East Bay Greenway Segment II	Oakland: Along San Leandro St from Seminary Ave to 69th Ave: Construct a protected multi-use pathway. BART is the project sponsor and will pass through federal funds to the City of Oakland, which will	ALA210013	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Alameda	BART	Hayward Fleet Maintenance Facilities	BART: At the Hayward Maintenance Complex: Expand complex to accommodate additional rail vehicles; tire fleet maintenance; and support additional rail cars and new fleet preventative maintenance for	ALA230005	21-T01-002	EXEMPT (40 CFR 93.126) - Reconstruction or renovation of transit buildings and structures (e.g., rail	Not Modeled
Alameda	BART	Macarthur Station Mobility Hub Improvements	BART: At the MacArthur BART Station: Construct a suite of mobility hub amenities aimed at enhancing transit connectivity, promoting transit universal design, and utilizing low-carbon and renewable	ALA210030	21-T03-009	EXEMPT (40 CFR 93.126) - Directional and informational signs	Not Modeled
Alameda	Berkeley	Southside Complete Streets and Transit Improvement	Berkeley: Various locations south of UC Berkeley: Construct two-way cycle tracks, signal modifications, transit improvements, loading zone modifications, pedestrian safety improvements, and repaving	ALA170067	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Alameda	Caltrans	GL: Alameda and Marin Counties - TOS-Mobility	Alameda and Marin Counties: Various Locations: Projects are consistent with 40 CFR Part 93.126 Exempt Tables 2 and 40 CFR Part 93.127 Table 3 categories	ALA170060	21-T06-048	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Alameda	CCJPA	CCJPA SR84 Intermodal Bus Facility	Fremont: On SR84 near the Ardenwood Park-n-Ride: Construct an intermodal bus facility	ALA210033	21-T11-111	EXEMPT (40 CFR 93.127) - Bus terminals and transfer points	Not Modeled
Alameda	Dublin	Dublin Blvd Rehabilitation	Dublin: Segments of Dublin Boulevard from Scarlet Drive to Hacienda Drive: Rehabilitate pavement	ALA170062	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Alameda	EB Reg Park Dis	Doolittle Drive Bay Trail	Oakland: Along Doolittle Dr. from the MLK Regional Shoreline Center near Langley Street 2,300 feet to the north end of the existing SF Bay Trail at the fishing dock, north of Swan Way: Construct SF Bay	ALA170077	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Alameda	Emeryville	40th Street Transit and Multi-Modal Enhancements	Emeryville: On 40th Street between IKEA Entrance signal and Adeline Street: Enhance and construct transit-only lanes, transit islands, transit hub, pedestrian enhancements, and a two-way class IV bike	ALA210029	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Alameda	Fremont	Centerville Complete Streets of Relinquished SR84	Fremont: Thornton Ave (Blacow Rd to Fremont Blvd), Fremont Blvd (Alder Ave to Mattos Dr) and Peralta Blvd (Fremont Blvd to Sequoia Rd): Implement complete streets improvements; On Peralta Blvd	ALA170076	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Alameda	Fremont	Fremont Blvd/Walnut Ave Protected Intersection	Fremont: At the intersection of Fremont Boulevard and Walnut Avenue: Construct a new protected intersection.	ALA210014	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Alameda	Fremont	Fremont Blvd-Grimmer Blvd Protected Intersection	Fremont: At the Fremont/Grimmer and Fremont/Eugene intersections: Construct protected intersections, as well as elevated bikeway between the two intersections along Fremont Boulevard.	ALA210015	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Alameda	Fremont	I-680/Mission Boulevard Interchange Modernization	Fremont: I-680/Mission Blvd: Redesign the interchange to reduce the steep grade of the southbound off-ramp onto Mission Boulevard and incorporate a separated bicycle and pedestrian path along	ALA230003	21-T08-060	EXEMPT (40 CFR 93.127) - Interchange reconfiguration projects	Not Modeled
Alameda	Fremont	I880 Innovation Bridge and Trail (EBGW Reach 6)	Fremont: Along Fremont Blvd and Kato Rd, along Agua Caliente Creek and over I-880: Construct Class 1 multi-use trail and overcrossing	ALA210020	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Alameda	Fremont	I-880/Decoto Road Interchange Modernization	Fremont: At the I-880/Decoto Road interchange: Reconstruct the existing interchange to include a new Class I trail and a dedicated bus lane in both directions of travel through the interchange.	ALA230002	21-T07-056	EXEMPT (40 CFR 93.127) - Interchange reconfiguration projects	Not Modeled
Alameda	Fremont	Kato Rd Complete Sts - Warren Ave to Milmont Dr	Fremont: Kato Road from Agua Caliente Creek to Milmont Drive: Widen to provide median turn lane or raised median island, bike/pedestrian trail on the west side of the roadway, and modify traffic signal	ALA130001	21-T07-056	EXEMPT (40 CFR 93.127) - Intersection channelization projects	Not Modeled
Alameda	Fremont	Sabercat Trail: Irvington BART to Ohlone College	Fremont: Starting at Blacow Rd, crossing Osgood Rd, across I-680 to Sabercat Historical Park: Create a safe and convenient Class 1 multi-use bicycle and pedestrian path	ALA210019	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled

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Alameda	Hayward	Hayward - Main Street Complete Street	Hayward: Main St from Mc Keever to D St: Reduce roadway from 4 to 2 lanes, construct bike lanes, widen sidewalks and add complete street elements	ALA170065	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Alameda	LAVTA	LAVTA Passenger Facilities Enhancements	LAVTA: At high-ridership stops in the Rapid network: Improve passenger amenities	ALA210016	21-T01-007	EXEMPT (40 CFR 93.126) - Construction of small passenger shelters and information kiosks	Not Modeled
Alameda	LAVTA	LAVTA: COVID-19 Emergency Transit Operations	LAVTA: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and supplies,	ALA190026	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
Alameda	MTC	Bay Bridge Forward I-80/ Powell I/C Transit Access	Emeryville: At the I-80/Powell Street interchange: Providing bus queue jump lanes, exclusive bus-only turn lanes, transit signal priorities, new and/or improved bus stops in the interchange vicinity. Project	ALA210027	21-T06-049	EXEMPT (40 CFR 93.127) - Interchange reconfiguration projects	Not Modeled
Alameda	MTC	I-880 Integrated Corridor Management - Central	Alameda County: I-880 Corridor from Davis St in San Leandro to Whipple Rd in Union City: Identify how existing and planned incident management strategies and operations can be better coordinated and	ALA170057	21-T07-057	EXEMPT (40 CFR 93.126) - Traffic control devices and operating assistance other than signalization	Not Modeled
Alameda	MTC	Improved Bike/Ped Access to East Span of SFOBB	In Oakland: In the vicinity of the East Span of the San Francisco-Oakland Bay Bridge: Construct improved bicycle and pedestrian access. Project is phased.	ALA130030	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Alameda	MTC	Regional Planning Activities and PPM - Alameda	Alameda: Regional Planning Activities and Planning, Programming and Monitoring (PPM)	ALA170007	21-T07-058	EXEMPT (40 CFR 93.126) - Planning and technical studies	Not Modeled
Alameda	MTC	Regional Planning Activities and PPM - Alameda	Alameda: Regional Planning Activities and Planning, Programming and Monitoring (PPM)	ALA210031	21-T07-058	EXEMPT (40 CFR 93.126) - Planning activities conducted pursuant to titles 23 and 49 U.S.C	Not Modeled
Alameda	Oakland	East Oakland Active Connections to Transit	Oakland: On 73rd Ave between MacArthur and Coliseum BART (Hawley Street) and on Hegenberger between International and Coliseum BART: Implement transportation safety improvements	ALA210025	21-T09-061	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Alameda	Oakland	East Oakland Neighborhood Bike Routes	Oakland: Various Streets and Roads in East Oakland: Construction bicycle improvements	ALA210002	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Alameda	Oakland	Fruitvale Alive Bike/Ped Gap Closure	In Oakland: On Fruitvale Ave between Alameda Ave and E. 12th: Install class 4 cycle tracks and landscaped buffers, widen sidewalks, improve ped crossings, add ped scale lighting, reconfigure conflicting	ALA170051	21-T08-060	EXEMPT (40 CFR 93.127) - Intersection channelization projects	Not Modeled
Alameda	Oakland	Lake Merritt to Bay Trail Bike/Ped Bridge	Oakland: Over Embarcadero and UPRR tracks under I880 between the Estuary and Lake Merritt along the Channel: Construct ADA accessible bicycle pedestrian bridge to link Bay Trail to Lake Merritt.	ALA130003	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Alameda	Oakland	Lakeside Family Streets	Oakland: On Harrison St from 20th to 27th, and along Grand Ave from Harrison to Bay Place: Install cycle track, parking protected bikeways and protected intersection; On Harrison from Grand to 27th:	ALA170063	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Alameda	Oakland	Oakland - 14th Street Safe Routes in the City	Oakland: On 14th St between Brush St and Oak St: Reduce travel lanes from 4 to 2, add paved Class IV protected bicycle lanes; transit boarding islands; improve ped facilities including refuges, crossings,	ALA170043	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Alameda	Oakland	Oakland 7th Street Connection Improvements	Oakland: 7th St from Mandela Pkwy to Martin Luther King Jr Way: Complete streets improvements including road diet, protected bike lanes, intersection/signal improvements, curb ramps, sidewalk repairs,	ALA210001	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Alameda	Oakland	Oakland Various Streets Improvements	Oakland: Citywide: Implement paving Improvements including pavement resurfacing, bicycle transportation, curb, gutter, drainage, sidewalks, pedestrian safety, and ADA compliant curb ramps	ALA170064	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Alameda	Oakland	Reconnecting the Town (RAISE)	Oakland: On Broadway between Embarcadero West and 11th Street and Martin Luther King Jr. Way between 2nd and 7th: Implement bus reliability, pedestrian and bike way improvements	ALA230006	21-T10-073	EXEMPT (40 CFR 93.126) - Traffic control devices and operating assistance other than signalization	Not Modeled
Alameda	Piedmont	Piedmont - Oakland Avenue Improvements	Piedmont: Oakland Ave between Grand Ave and western city limits: Pavement rehabilitation and installation of bicycle and pedestrian safety improvements	ALA170084	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled

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List of 2023 TIP Projects by County

County	Sponsor	Project Name	Project Descripion	TIP ID	RTP ID	Air Quality Descripion	Conformity Analysis Year
Alameda	Pleasanton	I-680/Sunol Interchange Improvements	Pleasanton: At the I-680/Sunol Blvd Interchange: Widen the SB ramp to add two lanes (1 general purpose, 1 HOV bypass) and add intersection and bike/ped improvements. Project also references RTP ID	ALA190020	21-T06-048	EXEMPT (40 CFR 93.127) - Interchange reconfiguration projects	Not Modeled
Alameda	Pleasanton	W Las Positas Repair and Separated Bike Lanes	Pleasanton: Along West Las Positas: Reconstruct the roadway and contruct new separated bike lanes that would be protected from vehicle traffic	ALA210032	21-T09-061	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Alameda	San Leandro	San Leandro Washington Avenue Rehabilitation	San Leandro: Washington Ave from W. Juana Ave to Castro St: Reconstruct roadway	ALA170075	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Alameda	San Leandro	SR 185- E. 14th St/ Hesperian Blvd/150th Ave	San Leandro: 150th/E. 14th/Hesperian: Construct NB left turn Ln from Hesperian to E.14th, EB left turn Ln from E.14th to 150th Av & SB Ln from Hesperian to 150th and other traffic circulation	ALA050002	21-T07-056	EXEMPT (40 CFR 93.127) - Intersection channelization projects	Not Modeled
Alameda	SJRC	ACE: COVID-19 Emergency Transit Operations	ACE: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and supplies, and	ALA190024	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
Alameda	Union C Transit	Union City Transit Electric Bus Procurement	Union City Transit: Fleet: Replace existing buses with zero-emission battery-electric buses.	ALA190029	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Alameda	Union C Transit	Union City Transit: COVID-19 Emergency Transit Ops	Union City Transit: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE	ALA190027	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
Contra Costa	Antioch	Antioch - L Street Pathway to Transit	Antioch: On L Street from Hwy 4 to Antioch Marina: Widen street in various locations and restripe to provide continuous bike lanes and sidewalks, upgrade existing traffic signals, install new bus shelters	CC-170035	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Contra Costa	BART	Concord BART Station Modernization	Concord: In and around the Concord BART Station: Make capacity, access, placemaking, and state-of-good repair, improvements based on BART's 2016 Station Modernization Plan.	CC-170060	21-T11-115	EXEMPT (40 CFR 93.126) - Reconstruction or renovation of transit buildings and structures (e.g., rail	Not Modeled
Contra Costa	BART	Lafayette Town Center Pathway and Bike Station	Lafayette: Between the BART station and downtown: Construct bicycle and pedestrian improvements	CC-210004	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Contra Costa	BART	Pittsburg/Bay Point BART Station Bike-Ped Imps	Contra Costa County: In and around the Pittsburg/Bay Point BART Station: Improve walking, ADA, and biking access to this regional transit station.	CC-210005	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Contra Costa	BART	Walnut Creek BART TOD Access Improvements	Walnut Creek: In the vicinity of the Walnut Creek BART Station: construct public access improvements that are part of the proposed transit-oriented development	CC-110082	21-T08-060	EXEMPT (40 CFR 93.126) - Transportation enhancement activities (except rehabilitation and operation	Not Modeled
Contra Costa	Brentwood	Brentwood Various Streets and Roads Preservation	Brentwood: Various locations: Pavement preservation	CC-170034	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Contra Costa	Brentwood	Lone Tree Way Undercrossing	Brentwood: On Lone Tree Way at the UPRR track: Construct 4-lane grade separation undercrossing.	CC-070013	21-T07-056	EXEMPT (40 CFR 93.126) - Railroad/highway crossing	Not Modeled
Contra Costa	Caltrans	Central Ave I-80 Undercrossing Ped/Bike Improve	Richmond: On Central Ave crossing I-80 between San Joaquin St/Jacuzzi St and San Luis St/Pierce St: Improve ped/bicycle access with wider sidewalks, new sidewalk-level bikeways, crossing improvements,	CC-210011	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Contra Costa	CC County	Bailey Road Bike and Pedestrian Improvements	Bay Point: Bailey Rd from Willow Pass Rd to SR 4: Improve bicycle and pedestrian accessibility. Improvements will expand sidewalks and construct uniform bike lanes to create a corridor conducive to all	CC-130003	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Contra Costa	CC County	Fred Jackson Way First Mile/Last Mile Connection	In Richmond: On Fred Jackson Way from Grove Avenue to Wildcat Creek Trail: Construct ADA accessible sidewalks with street trees; and from Wildcat Creek to Brookside Dr: Construct pedestrian path and	CC-170020	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Contra Costa	CC County	North Bailey Road Active Transportation Corridor	Bay Point: On Bailey Road between Willow Pass and Canal Roads: Reconfigure travel lanes and construct two-way cycle track, ADA-compliant curb ramps, ADA-accessible sidewalks, and traffic signal	CC-210001	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Contra Costa	CC County	Treat Boulevard Corridor Improvements	Contra Costa County: Along Treat Blvd between N Main St and Jones Rd: Implement bicycle infrastructure and pedestrian enhancements	CC-190012	21-T08-060	EXEMPT (40 CFR 93.127) - Intersection channelization projects	Not Modeled

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Contra Costa	CC County	Vasco Road Safety Improvements	Contra Costa County: Vasco Road from Walnut Blvd to the Alameda/Contra Costa County line: widen road and place concrete median barrier for 2.5 miles. Phase 1 completed a 1 mile widening segment.	CC-050030	21-T07-056	EXEMPT (40 CFR 93.126) - Truck climbing lanes outside the urbanized area	Not Modeled
Contra Costa	CCCTA	CCCTA: ADA Paratransit Assistance	CCCTA: Systemwide: ADA Paratransit Assistance to transit agency.	CC-99T001	21-T01-001	EXEMPT (40 CFR 93.126) - Operating assistance to transit agencies	Not Modeled
Contra Costa	CCCTA	CCCTA: COVID-19 Emergency Transit Operations	CCCTA: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and supplies,	CC-190013	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
Contra Costa	CCTA	Bay Area MOD	CCTA: In the I680 Corridor and surrounding communities: Develop an integrated and scalable platform & application (app) aimed at reducing traffic congestion	CC-190018	21-T03-009	EXEMPT (40 CFR 93.126) - Grants for training and research programs	Not Modeled
Contra Costa	CCTA	CCTA Automated Driving System	Contra Costa County: Various Locations: Implement 3 demonstration projects that will provide mobility choices to transportation-challenged and underserved communities, while guiding and advancing	CC-190017	21-T07-057	EXEMPT (40 CFR 93.126) - Grants for training and research programs	Not Modeled
Contra Costa	CCTA	East Bay Integrated Transit Plan	Contra Costa County: Countywide: Undertake a study to identify Contra Costa County transit routes and services suited for potential regional classification and operations.	CC-210012	21-T10-093	EXEMPT (40 CFR 93.126) - Planning and technical studies	Not Modeled
Contra Costa	CCTA	Innovate680:Coordinated Adaptive Ramp Metering Ph1	Contra Costa County: on NB I-680 between Alcosta Blvd to Olympic Blvd: Implement Coordinated Adaptive Ramp Metering	CC-170062	21-T07-057	EXEMPT (40 CFR 93.126) - Traffic control devices and operating assistance other than signalization	Not Modeled
Contra Costa	CCTA	SR 239 - New State Highway Study	Contra Costa County: SR 239 between SR4 in Brentwood and I-205 in Tracy: Conduct environmental and design studies to create a new alignment for SR239 and develop corridor improvements from	CC-110066	21-T06-044	EXEMPT (40 CFR 93.126) - Planning activities conducted pursuant to titles 23 and 49 U.S.C	Not Modeled
Contra Costa	Clayton	Clayton Neighborhood Street Rehab	Clayton: On various neighborhood streets: Pavement maintenance and rehabilitation including replacing pavement markings	CC-170047	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Contra Costa	Concord	Concord Willow Pass Road Repaving SR2T	Concord: On Willow Pass Rd from Galindo St to Landana Drive: Implement complete streets improvements	CC-170037	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Contra Costa	Concord	Downtown Corridors Bike/Pedestrian Improvements	Concord: Various locations: Implement bicycle and pedestrian safety improvements to multiple corridors connecting Downtown Concord to regional transit, senior housing, and low income communities.	CC-170050	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Contra Costa	Concord	East Downtown Concord PDA Access and SR2T	Concord: Various locations in and around the Downtown Concord area: Construct new sidewalks and class 3 bicycle routes	CC-210003	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Contra Costa	Concord	Monument Boulevard Class I Path	In Concord: Monument Blvd from Systron Dr to Cowell Rd and Cowell Rd from Monument Blvd to Mesa St: Install a Class I path and related improvements at signalized intersections	CC-170039	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Contra Costa	Danville	Camino Ramon Improvements	Danville: On Camino Ramon between Kelley Lane and Fostoria Way: Rehabilitate roadway	CC-170058	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Contra Costa	Danville	San Ramon Valley Blvd Improvements	Danville: San Ramon Valley Blvd between Hartz Ave and Southern Town Limits: Pavement preservation and striping	CC-170001	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Contra Costa	EB Reg Park Dis	Martinez Bay Trail Gap Closure	East Bay Regional Parks District: Along the Carquinez Loop Trail and SF Bay Trail in the vicinity of Berrellesa St: Close a 0.5 mile gap by constructing a shared-use path along with crossing improvements	CC-230001	21-T01-003	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Contra Costa	EB Reg Park Dis	SF Bay Trail Point Molate	EBRPD: Along the shoreline connecting the bike/pedestrian trail over the Richmond-San Rafael bridge to the Point Molate Beach Park in the City of Richmond: Construct SF Bay Trail segment	CC-190019	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Contra Costa	ECCTA	ECCTA Hydrogen Fueling Maint Infrastructure Upgrad	ECCTA: Maintenance facility: Upgrade infrastructure needed for the safe maintenance of fuel cell electric buses in the same facility as diesel buses.	CC-210008	21-EN08-131	EXEMPT (40 CFR 93.126) - Reconstruction or renovation of transit buildings and structures (e.g., rail	Not Modeled
Contra Costa	ECCTA	ECCTA: COVID-19 Emergency Transit Operations	ECCTA: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and supplies,	CC-190014	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
Contra Costa	ECCTA	ECCTA: Hydrogen Fueling Station	ECCTA: At the ECCTA maintenance facility: Design and construction of a hydrogen fueling station	CC-210017	21-EN08-131	EXEMPT (40 CFR 93.126) - Purchase of office, shop, and operating equipment for existing facilities	Not Modeled
Contra Costa	ECCTA	ECCTA: Transit Bus Replacements	Tri-Delta Transit: Fleetwide: Replacement Revenue Vehicles and associated farebox equipment	CC-070092	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled

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Contra Costa	Hercules	Hercules -Sycamore Pavement Rehabilitation	Hercules: Sycamore Ave from Civic Dr to Willow/Palm Ave: Pavement preservation	CC-170043	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Contra Costa	Martinez	Alhambra Avenue Downtown Resurfacing	Martinez: Alhambra Avenue from Marina Vista Avenue to Jones Street in the Downtown PDA: Resurface pavement	CC-170059	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Contra Costa	MTC	Regional Planning Activities and PPM - CC County	Contra Costa: Regional Planning Activities and Planning, Programming and Monitoring (PPM)	CC-170004	21-T07-058	EXEMPT (40 CFR 93.126) - Planning activities conducted pursuant to titles 23 and 49 U.S.C	Not Modeled
Contra Costa	MTC	Regional Planning Activities and PPM - CC County	Contra Costa: Regional Planning Activities and Planning, Programming and Monitoring (PPM)	CC-210014	21-T07-058	EXEMPT (40 CFR 93.126) - Planning activities conducted pursuant to titles 23 and 49 U.S.C	Not Modeled
Contra Costa	Pinole	Pinole - San Pablo Avenue Rehabilitation	In Pinole: On San Pablo Avenue from City Limits to Pinole Shores Dr: Rehabilitate roadway and make accessibility upgrades as warranted	CC-170048	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Contra Costa	Pinole	Safety Improvements at Appian Way and Marlesta Rd.	Pinole: On Appian Way and Marlesta Road: Intersection improvements including signalization of the intersection to provide protected crossing of roadway for pedestrians and cyclists.	CC-210009	21-T08-060	EXEMPT (40 CFR 93.127) - Intersection signalization projects at individual intersections	Not Modeled
Contra Costa	Pittsburg	City of Pittsburg Pavement Improvements	Pittsburg: On West Leland Rd from Woodhill Rd to Railroad Ave and on Loveridge Rd from Buchanan Rd to Pittsburg-Antioch Highway: Rehabilitate roadway	CC-170042	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Contra Costa	Pittsburg	Pittsburg BART Pedestrian and Bicycle Connectivity	Pittsburg: On California Ave, Bliss Ave, and Railroad Ave in the vicinity of the Pittsburg Center eBART station: Construct Class I and IV bikeways and associated improvements	CC-170040	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Contra Costa	Richmond	Lincoln Elementary SRTS Pedestrian Enhancements	Richmond: Along Chanslor, 5th St and 6th St near Lincoln School and at Chanslor Ave and 4th St: Pedestrian enhancements to improve the safety for school children by adding median refuges, curb	CC-170056	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Contra Costa	Richmond	Richmond 13th Street Complete Streets Imps	Richmond: Along 13th Street from Harbour Way to Costa Avenue: Implement complete streets improvements including a road diet	CC-210007	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Contra Costa	San Pablo	Giant Road Cycletrack and Pavement Rehabilitation	San Pablo: Giant Rd between Brookside Drive and Miner Avenue: Install Class IV Cycletrack, with targeted roadway and sidewalk preservation and improvements, as well as ADA curb ramp repairs.	CC-170031	21-T08-060	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Contra Costa	San Ramon	Iron Horse Trail Bike and Pedestrian Overcrossing	San Ramon: At the intersections of Bollinger Canyon Road and the Iron Horse Trail: Construct bicycle/pedestrian overcrossing. Project is phased	CC-170014	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Contra Costa	San Ramon	San Ramon Transit Center - Shared Mobility Hub	San Ramon: At San Ramon Transit Center/Bishop Ranch Business Park: Implement multi-modal mobility improvements	CC-210013	21-EN09-132	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Contra Costa	Walnut Creek	Ygancio Valley Road Rehabilitation	Walnut Creek: Ygnacio Valley Rd from Civic Dr to San Carlos Dr: Rehab pavement, striping, adjust covers, ADA upgrades and install video detection at select intersections.	CC-170038	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Contra Costa	WCCTA	WCCTA: COVID-19 Emergency Transit Operations	WCCTA: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and supplies,	CC-190015	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
Contra Costa	WCCTA	WestCat 45-foot Over the Road Coach Replacement	WestCAT: 45-foot over the road coach subfleet: Replace vehicles past their useful life	CC-210015	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Contra Costa	WCCTA	WestCAT Purchase Double Decker Vehicles	WestCAT: Fleet: Purchase double decker buses to replace vehicles past their useful life	CC-210016	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Contra Costa	WCCTA	WestCAT: Paratransit Revenue Vehicle Replacement	WestCAT: Fleet: Replace paratransit vehicles that are at or beyond there useful life and are due to be replaced	CC-210002	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Marin	GGBHTD	GGBHTD - Transit Systems Enhancements	GGBHTD: Systemwide: systems, technology and communication enhancements to transit fleet and facilites.	MRN130015	21-T01-002	EXEMPT (40 CFR 93.126) - Transportation enhancement activities (except rehabilitation and operation	Not Modeled
Marin	GGBHTD	GGBHTD Ferry Major Components Rehab	GGBHTD: Systemwide: Ferry Rehab, replace major ferry components such as navigation systems, dry-dock, hull, interior, life saving equipment, propulsion and other ferry components.	MRN150014	21-T01-002	EXEMPT (40 CFR 93.126) - Rehabilitation of transit vehicles	Not Modeled
Marin	GGBHTD	GGBHTD Ferry Propulsion Systems Replacement	GGBHTD: Systemwide: Ferry propulsion systems- replacement of power distribution systems, propellers, engines, generators, gear boxes, etc. for Golden Gate Ferry vessels.	MRN150015	21-T01-002	EXEMPT (40 CFR 93.126) - Rehabilitation of transit vehicles	Not Modeled

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Marin	GGBHTD	GGBHTD: COVID-19 Emergency Transit Operations	GGBHTD: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and	MRN190014	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
Marin	GGBHTD	GGBHTD: Facilities Rehabilitation	GGBHTD: Systemwide: Rehabilitate agency's maintenance and operating facilities and replace heavy duty operating and maintenance equipment.	MRN050025	21-T01-002	EXEMPT (40 CFR 93.126) - Reconstruction or renovation of transit buildings and structures (e.g., rail	Not Modeled
Marin	GGBHTD	GGBHTD: Ferry Channel and Berth Dredging	Golden Gate Ferry: From San Francisco to Marin County: Dredge ferry channel and berth.	MRN990017	21-T01-002	EXEMPT (40 CFR 93.126) - Reconstruction or renovation of transit buildings and structures (e.g., rail	Not Modeled
Marin	GGBHTD	GGBHTD: Fixed Guideway Connectors	Golden Gate Ferry: Systemwide: Replace/rehab fixed guideway connectors such as floats, floating barges, ramps, and gangways	MRN030010	21-T01-002	EXEMPT (40 CFR 93.126) - Reconstruction or renovation of transit buildings and structures (e.g., rail	Not Modeled
Marin	GGBHTD	Golden Gate Bridge Seismic Retrofit, Ph: 1-3A	San Francisco /Marin Counties: Golden Gate Bridge; Seismic retrofit of the Golden Gate Bridge - construction on north and south approach viaducts, and Ft. Point Arch.	MRN970016	21-T01-005	EXEMPT (40 CFR 93.126) - Widening narrow pavements or reconstructing bridges (no additional travel	Not Modeled
Marin	GGBHTD	Golden Gate Bridge Seismic Retrofit, Phase 3B	SF/Marin County: Golden Gate Bridge; Seismic retrofit of the Golden Gate Bridge - construction of suspension span, south pier and fender.	MRN050018	21-T01-005	EXEMPT (40 CFR 93.126) - Widening narrow pavements or reconstructing bridges (no additional travel	Not Modeled
Marin	GGBHTD	Golden Gate Bridge-Suicide Deterrent SafetyBarrier	Golden Gate Bridge: Build suicide deterrent system. Including design & Environmental analysis, plus analysis of alternatives & wind tunnel tests to ensure the feasibility of designs and build deterrent	MRN050019	21-T01-007	EXEMPT (40 CFR 93.126) - Safer non-Federal-aid system roads	Not Modeled
Marin	GGBHTD	San Rafael Transit Center Relocation	San Rafael: San Rafael Transit Center: Relocate the existing San Rafael Transit Center (SRTC) to accommodate the extension of SMART service to Larkspur	MRN170013	21-T01-002	EXEMPT (40 CFR 93.127) - Bus terminals and transfer points	Not Modeled
Marin	Larkspur	Old Redwood Highway Multi-Use Path	Larkspur: Along Old Redwood Highway from the Greenbrae Pedestrian Overcrossing up to the southern terminus of the pathway in state right-of way: Construct a multi-use pathway	MRN190011	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Marin	Marin County	Hicks Valley/MarshallPetaluma/Wilson Hill Rd Rehab	Marin County: Hicks Valley Rd from Point Reyes-Petaluma Rd to Marshall-Petaluma Rd, Wilson Hill Rd from Marshall-Petaluma Rd to Chileno Valley Rd, Marshall-Petaluma Rd from Hicks Valley Rd (milepost	MRN170027	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Marin	Marin County	Marin City Pedestrian Crossing Improvements	Marin County: In the Marin City area of unincorporated Marin County: Improve pedestrian accessibility and safety	MRN190015	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Marin	Marin County	Mountain View Rd Bridge Replacement - 27C0154	Marin County: On Mountain View Rd. over San Geronimo Creek (Bridge No. 27C0154) near the intersection with Sir Francis Drake Blvd: Replace existing one-lane bridge with a new two-lane bridge. Toll	MRN110035	21-T01-004	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Marin	MCTD	Marin Transit: COVID-19 Emergency Transit Ops	Marin Transit: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and	MRN190013	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
Marin	MCTD	MCTD - Relocate Transit Maintenance Facility	In North Eastern Marin County: Relocate contractor maintenance facilities in a centralized location, including bus parking and three maintenance bays.	MRN150010	21-T01-002	EXEMPT (40 CFR 93.126) - Construction of new bus or rail storage/maintenance facilities categorically	Not Modeled
Marin	MCTD	MCTD- Replace Shuttle Vehicles	MCTD: 13 shuttle buses: Purchase buses to replace ones that are beyond their useful life	MRN150011	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Marin	MCTD	MCTD: Replace 35ft Hybrid Vehicles	MCTD: 35ft Hybrid Transit buses: Replace buses	MRN210005	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Marin	MCTD	MCTD: Replace Demand Response Vans	MCTD: Demand response vans: Replace vehicles that are beyond their useful life	MRN210007	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Marin	MCTD	MCTD: Replace Paratransit Vehicles	MCTD: 24 Paratransit Vehicles: Replace vehicles	MRN170003	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Marin	MCTD	MCTD: Replace Paratransit Vehicles	MCTD: Paratransit fleet: Replace parantransit vehicle with vans	MRN210004	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Marin	MCTD	MCTD: Replace Paratransit Vehicles with Vans	MCTD: 6 vehicles: Replace five Paratransit Vehicles with Vans and purchase a third vehicle as a non-revenue support vehicle	MRN170004	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Marin	MCTD	MCTD: Replace Rural Cutaway Vehicles	MCTD: Six (6) Rural Cutaway Vehicles: Purchase replacement vehicles	MRN170005	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled

Note: Projects with a conformity analysis year of 2050 reference programmatic projects or projects with a completion date after 2040 in Plan Bay Area 2050.

County	Sponsor	Project Name	Project Descripion	TIP ID	RTP ID	Air Quality Descripion	Conformity Analysis Year
Marin	MTC	Regional Planning Activities and PPM - Marin	Marin: Regional Planning Activities and Planning, Programming and Monitoring (PPM)	MRN170001	21-T07-058	EXEMPT (40 CFR 93.126) - Planning activities conducted pursuant to titles 23 and 49 U.S.C	Not Modeled
Marin	MTC	Regional Planning Activities and PPM - Marin	Marin: Regional Planning Activities and Planning, Programming and Monitoring (PPM)	MRN210003	21-T07-058	EXEMPT (40 CFR 93.126) - Planning activities conducted pursuant to titles 23 and 49 U.S.C	Not Modeled
Marin	Natl Park Svc	Fort Baker's Vista Point Trail	Golden Gate National Recreation Area: Between the Dana Bowers Vista Point Parking Area and both Fort Baker and Sausalito: Construct the Vista Point Trail, a new multi-use segment of the Bay Trail.	MRN170028	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Marin	Various	GL: Marin County - TOS-Mobility	Marin County: Various Locations: Projects are consistent with 40 CFR Part 93.126 Exempt Tables 2 and 40 CFR Part 93.127 Table 3 categories	MRN170018	21-T06-048	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Napa	American Canyon	Green Island Road Class I	American Canyon: Green Island Road in the Green Island Industrial District (GRID): Construct new Class 1 multi-use trail.	NAP170006	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Napa	MTC	Napa Valley Forward: Safety and Operational Impv	Napa: SR-29 Up Valley Corridor: Provide safety and operational improvements for multimodal corridor.	NAP190007	21-T07-056	EXEMPT (40 CFR 93.127) - Intersection channelization projects	Not Modeled
Napa	MTC	Regional Planning Activities and PPM - Napa	Napa: Countywide: Regional Planning Activities and Planning, Programming and Monitoring (PPM)	NAP170001	21-T07-058	EXEMPT (40 CFR 93.126) - Planning activities conducted pursuant to titles 23 and 49 U.S.C	Not Modeled
Napa	MTC	Regional Planning Activities and PPM - Napa	Napa: Countywide: Regional Planning Activities and Planning, Programming and Monitoring (PPM)	NAP210001	21-T07-058	EXEMPT (40 CFR 93.126) - Planning activities conducted pursuant to titles 23 and 49 U.S.C	Not Modeled
Napa	Napa	Silverado Trail Five-Way Intersection Improvements	City of Napa: At the intersection of Silverado Trail, Third St, Coombsville Rd, and East Ave: Construct roundabout. Project will be constructed in phases.	NAP170009	21-T07-056	EXEMPT (40 CFR 93.127) - Intersection channelization projects	Not Modeled
Napa	Napa	SR-29 Bicycle and Pedestrian Undercrossing	Napa: On the North side of Napa Creek under Highway 29: Construct a Class 1 bicycle and pedestrian path	NAP130004	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Napa	Napa County	Hardin Rd Bridge Replacement - 21C0058	Napa County: On Harding Rd at Maxwell Creek, 1.6M SE of Pope Cyn Rd: Replace existing one lane bridge with new 2-lane bridge to meet standards. Toll credits are used in lieu of match for all phases.	NAP110026	21-T01-004	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Napa	Napa County	Loma Vista Dr Bridge Replacement - 21C0080	Napa County: Loma Vista Dr over Soda Creek, 1.4 miles north of Silverado Trail: replace existing one lane bridge with new two lane bridge to meet standards. Toll credits are used in lieu of match for all	NAP110027	21-T01-004	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Napa	NVTA	Imola Park n Ride and Express Bus Stop Improvement	Napa County: At park and ride at SR 29 and Imola Ave: Make improvements including in-line passenger loading and alighting at the Imola Ave on/off ramps, improved pedestrian facilities, and safety	NAP190006	21-T12-118	EXEMPT (40 CFR 93.127) - Interchange reconfiguration projects	Not Modeled
Napa	NVTA	Napa County Safe Routes to Schools	Napa County: County-wide: Safe Routes to Schools Program, Non-Infrastructure	NAP170004	21-EN09-132	EXEMPT (40 CFR 93.126) - Grants for training and research programs	Not Modeled
Napa	NVTA	Napa Valley Vine Trail Calistoga-St. Helena Seg.	In Napa County: From Calistoga to St. Helena: Construct multi-use trail	NAP150003	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Napa	NVTA	NVTA Equipment Replacement and Upgrades	NVTA: Napa Vine service area: Replacement and upgrades to transit equipment	NAP090008	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of office, shop, and operating equipment for existing facilities	Not Modeled
Napa	NVTA	NVTA: COVID-19 Emergency Transit Operations	NVTA: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and supplies,	NAP190005	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
Napa	NVTA	NVTA: Replace Rolling Stock	NVTA: Fleetwide: Replace rolling stock for fixed-route, paratransit, and community shuttle fleet.	NAP090005	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Napa	Saint Helena	Main Street St. Helena Pedestrian Improvements	Saint Helena: Along Main Street (SR29) from Adams Street to Pine Street: Replace and upgrade pedestrian facilities	NAP170005	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Regional/ Multi-County	ACE	ACE Positive Train Control	ACE: System-wide: Install an advanced train control system that allows for automated collision prevention, improved manual collision prevention, and improved headways.	REG110044	21-T01-002	EXEMPT (40 CFR 93.126) - Construction or renovation of power, signal, and communications systems	Not Modeled
Regional/ Multi-County	BART	BART Car Exchange (Preventive Maintenance)	BART: Systemwide: Preventive maintenance program, including maintenance of rail cars and other system components in exchange for local funds to the BART car replacement reserve.	REG050020	21-T01-002	EXEMPT (40 CFR 93.126) - Rehabilitation of transit vehicles	Not Modeled
Regional/ Multi-County	BART	BART Train Control Renovation	BART: Systemwide: Replace obsolete elements and subsystems of the train control system.	BRT030004	21-T01-002	EXEMPT (40 CFR 93.126) - Reconstruction or renovation of transit buildings and structures (e.g., rail	Not Modeled

Note: Projects with a conformity analysis year of 2050 reference programmatic projects or projects with a completion date after 2040 in Plan Bay Area 2050.

County	Sponsor	Project Name	Project Descripion	TIP ID	RTP ID	Air Quality Descripion	Conformity Analysis Year
Regional/ Multi-County	BART	BART: Rail, Way and Structures Program	BART: Systemwide: Replace worn out mainline rail and make other timely reinvestments in way.	BRT97100B	21-T01-002	EXEMPT (40 CFR 93.126) - Rehabilitation or reconstruction of track structures, track, and trackbed in	Not Modeled
Regional/ Multi-County	BART	BART: TOD Implementation	Alameda, Contra Costa, San Francisco Counties: On BART property in BART station areas: Planning assistance to support transit oriented development	VAR190002	21-T07-058	EXEMPT (40 CFR 93.126) - Planning and technical studies	Not Modeled
Regional/ Multi-County	BART	BART: Traction Power System Renovation	BART: Systemwide: Replace obsolete elements and subsystems of the traction power system to maintain and improve reliability and safety	BRT030005	21-T01-002	EXEMPT (40 CFR 93.126) - Reconstruction or renovation of transit buildings and structures (e.g., rail	Not Modeled
Regional/ Multi-County	Caltrain	Caltrain Positive Train Control System	Caltrain: Systemwide: Implement PTC, an advanced train control system that allows for automated collision prevention, and improved manual collision prevention.	REG110030	21-T01-002	EXEMPT (40 CFR 93.126) - Construction or renovation of power, signal, and communications systems	Not Modeled
Regional/ Multi-County	Caltrain	Caltrain: Revenue Vehicle Rehab Program	Caltrain: Systemwide: Provide overhauls and repairs/replacements to key components of the Caltrain rolling stock to maintain it in a state of good repair.	REG090051	21-T01-002	EXEMPT (40 CFR 93.126) - Rehabilitation of transit vehicles	Not Modeled
Regional/ Multi-County	Caltrain	Caltrain: Signal/Communication Rehab. & Upgrades	Caltrain: Systemwide: Rehabilitate existing signal system and upgrade/replace communication equipment.	SM-050041	21-T01-002	EXEMPT (40 CFR 93.126) - Construction or renovation of power, signal, and communications systems	Not Modeled
Regional/ Multi-County	Caltrans	GL: Bridge Rehab and Reconstruction - SHOPP	Regionwide: Various Locations: Projects are consistent with 40 CFR Part 93.126 Exempt Tables 2 categories - Widening narrow pavements or reconstructing bridges (no additional travel lanes).	VAR170010	21-T01-004	EXEMPT (40 CFR 93.126) - Widening narrow pavements or reconstructing bridges (no additional travel	Not Modeled
Regional/ Multi-County	Caltrans	GL: Bridge Rehab/Recon. - Local Hwy Bridge Program	GL: Local Bridge Rehab/Recon. - Local Highway Bridge Program(HBP) or Highway Bridge Replacement and Rehabilitation (HBRR). Projects are consistent with 40 CFR Part 93.126 Exempt Tables 2 categories.	VAR170012	21-T01-004	EXEMPT (40 CFR 93.126) - Widening narrow pavements or reconstructing bridges (no additional travel	Not Modeled
Regional/ Multi-County	Caltrans	GL: Emergency Repair - SHOPP Emergency Response	Regionwide: Various Locations: Projects are consistent with 40 CFR Part 93.126 Exempt Tables 2 categories	VAR170008	21-T01-006	EXEMPT (40 CFR 93.126) - Repair of damage caused by natural disasters, civil unrest, or terrorist acts,	Not Modeled
Regional/ Multi-County	Caltrans	GL: Fed Lands Highways Pgm-Tribal Transport Pgm	SF Bay Area: Various locations on federal and tribal land: Projects are consistent with 40 CFR Part 93.126 Exempt Tables 2 categories	VAR210002	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Regional/ Multi-County	Caltrans	GL: Highway Safety Improvement Program	GL: Safety Imprv - Highway Safety Improvement Program: Projects are consistent with 40 CFR Part 93.126 Exempt Tables 2 and Table 3 categories.	VAR170002	21-T01-007	EXEMPT (40 CFR 93.126) - Highway Safety Improvement Program implementation	Not Modeled
Regional/ Multi-County	Caltrans	GL: Pavement Resurf./Rehab - SHOPP Roadway Presv.	Regionwide: Various Locations: Projects consistent with 40CFR93.126 Exempt Tables 2 categories - Pavement resurfacing and/or rehabilitation, Emergency relief (23 U.S.C. 125), Widening narrow	VAR170006	21-T01-006	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Regional/ Multi-County	Caltrans	GL: Pavement Resurfacing/Rehab SHS - Highway Maint	GL: Pavement Resurf/Rehab State Highway System - Highway Maintenance. Projects are consistent with 40 CFR Part 93.126 Exempt Tables 2 and Table 3 categories - Pavement resurfacing and/or	VAR170004	21-T01-006	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Regional/ Multi-County	Caltrans	GL: Pvmt Resurf/Rehab State Hwy Sys - SHOPP Minor	GL: Pavement Resurf/Rehab State Hwy System - SHOPP Minor. Projects are consistent with 40 CFR Part 93.126 Exempt Tables 2 and Table 3 categories	VAR190001	21-T01-006	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Regional/ Multi-County	Caltrans	GL: Railroad-Highway Crossing	GL: Railroad/Highway Crossings. Projects are consistent with 40 CFR 93.126 Exempt Tables 2 categories - Railroad/highway crossing	VAR170017	21-T01-006	EXEMPT (40 CFR 93.126) - Railroad/highway crossing	Not Modeled
Regional/ Multi-County	Caltrans	GL: Recreational Trails Program	Grouped Listing: Regionwide: Projects with US Recreational Grant Program Funds. Projects are consistent with 40 CFR Part 93.126, 127, 128, Exempt Tables 2 & 3	VAR190009	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Regional/ Multi-County	Caltrans	GL: Safety Improvements - SHOPP Mandates	Regionwide: Various Locations: Projects are consistent with 40 CFR Part 93.126 Exempt Tables 2 and Table 3 categories	VAR170009	21-T01-006	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Regional/ Multi-County	Caltrans	GL: Safety Improvements - SHOPP Mobility Program	SF Bay Area: Various Locations: Projects are consistent with 40 CFR Part 93.126 Exempt Tables 2 and Table 3 categories	VAR170005	21-T01-006	EXEMPT (40 CFR 93.126) - Traffic control devices and operating assistance other than signalization	Not Modeled
Regional/ Multi-County	Caltrans	GL: Safety Imprv. - SHOPP Collision Reduction	Regionwide: Various Locations: Projects are consistent with 40 CFR Part 93.126 Exempt Tables 2 and Table 3 categories	VAR170007	21-T01-007	EXEMPT (40 CFR 93.126) - Guardrails, median barriers, crash cushions	Not Modeled
Regional/ Multi-County	Caltrans	GL: Shoulder Imprv - SHOPP Roadside Preservation	Regionwide: Various Locations: Projects are consistent with 40 CFR Part 93.126 Exempt Tables 2 categories - Fencing,Safety roadside rest areas	VAR170011	21-T01-006	EXEMPT (40 CFR 93.126) - Plantings, landscaping, etc	Not Modeled

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County	Sponsor	Project Name	Project Descripion	TIP ID	RTP ID	Air Quality Descripion	Conformity Analysis Year
Regional/ Multi-County	MTC	511 Carpool and Vanpool Programs	SF Bay Area: Regionwide: Operate Carpool and Vanpool Programs. Toll credits applied in lieu of match; non-federal funds are non-participating	REG170003	21-EN09-132	EXEMPT (40 CFR 93.126) - Continuation of ride-sharing and van-pooling promotion activities at	Not Modeled
Regional/ Multi-County	MTC	511 Next Gen	SF Bay Area: Regionwide: Provide free multi-modal traveler information via multiple media. Given the public's increasing reliance on private sector services, 511 will focus on data and wayfinding products	REG170013	21-T07-050	EXEMPT (40 CFR 93.126) - Directional and informational signs	Not Modeled
Regional/ Multi-County	MTC	Active Operations Management	SF Bay Area: Regionwide: Planning and design assessments of various multi-modal operational projects and policies.	REG170014	21-T07-057	EXEMPT (40 CFR 93.126) - Traffic control devices and operating assistance other than signalization	Not Modeled
Regional/ Multi-County	MTC	Bay Area Commuter Benefits Program	San Francisco Bay Area: Region wide: Implement the Bay Area Commuter Benefits Program. Toll credits applied in lieu of match	MTC050001	21-EN09-132	EXEMPT (40 CFR 93.126) - Continuation of ride-sharing and van-pooling promotion activities at	Not Modeled
Regional/ Multi-County	MTC	Bay Bridge Forward Preliminary Engineering	Bay Area: Various bridge corridors and approaches: PE and studies to advance BBF projects into delivery including transit priority, corridor operations, transit routing, active transportation, other multi-	VAR210007	21-T06-049	EXEMPT (40 CFR 93.126) - Planning and technical studies	Not Modeled
Regional/ Multi-County	MTC	Bike Share Capital Program	SF Bay Area: Regionwide: Coordinate planning, outreach, policy and information sharing for bikeshare and micromobility programs. Fremont, Richmond, and Marin and Sonoma Counties, along the SMART	VAR170024	21-EN09-132	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Regional/ Multi-County	MTC	Climate Initiatives Education and Outreach	Bay Area: Regionwide: Program designed to reduce greenhouse gas emissions and vehicle miles traveled through education and encouragement programs	REG170006	21-EN09-132	EXEMPT (40 CFR 93.126) - Grants for training and research programs	Not Modeled
Regional/ Multi-County	MTC	Clipper® 2.0 Fare Payment System	SF Bay Area: Regionwide: Implement a wholesale replacement of the Clipper backend system and all customer facing fare devices, modernization of retail and customer service, and expansion of ways to	REG170022	21-T07-057	EXEMPT (40 CFR 93.126) - Purchase of office, shop, and operating equipment for existing facilities	Not Modeled
Regional/ Multi-County	MTC	Connected Bay Area	SF Bay Area: Regionwide: Implement a collective approach to freeway operations and management, including communications network building, and traffic management systems and software; Along the I-	REG170002	21-T07-053	EXEMPT (40 CFR 93.126) - Traffic control devices and operating assistance other than signalization	Not Modeled
Regional/ Multi-County	MTC	GL: FTA 5311 Rural Area FY21-FY23	GL: FTA Section 5311 Rural Area Program, Non-ITS portion. Projects include capital and operating assistance. Projects consistent with 40 CFR Part 93.126 Exempt Table 2	VAR210001	21-T01-001	EXEMPT (40 CFR 93.126) - Operating assistance to transit agencies	Not Modeled
Regional/ Multi-County	MTC	GL: Lifeline Transportation Program Cycle 5 and 6	SF Bay Area: Region-wide: 5307 Lifeline set-aside from FY17 and FY18 Large and Small UA. Various 5307 Lifeline projects in large and small urbanized areas. Project is consistent with 40 CFR Part 93.126	VAR170025	21-T01-001	EXEMPT (40 CFR 93.127) - Bus terminals and transfer points	Not Modeled
Regional/ Multi-County	MTC	GL: Transit ADA Operating Support	SF Bay Area: Region-wide: Transit ADA operating support	VAR210003	21-T01-001	EXEMPT (40 CFR 93.126) - Operating assistance to transit agencies	Not Modeled
Regional/ Multi-County	MTC	GL: Transit Operating Assistance	GL - SF Bay Area: Region-wide: Transit Operating Assistance	VAR190006	21-T01-001	EXEMPT (40 CFR 93.126) - Operating assistance to transit agencies	Not Modeled
Regional/ Multi-County	MTC	GL: Transit Preventive Maintenance	GL - SF Bay Area: Region-wide: Transit Preventive Maintenance	VAR190007	21-T01-002	EXEMPT (40 CFR 93.126) - Rehabilitation of transit vehicles	Not Modeled
Regional/ Multi-County	MTC	I-880 Optimized Corridor Operations	Alameda and Santa Clara Counties: Along the I-880 corridor: Implement near-term strategies to integrate and optimize corridor operations, including data sharing platform and system integration.	VAR210008	21-T06-049	EXEMPT (40 CFR 93.126) - Traffic control devices and operating assistance other than signalization	Not Modeled
Regional/ Multi-County	MTC	MTC: COVID-19 Emergency Transit Operations	MTC: Regionwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and supplies,	REG190001	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
Regional/ Multi-County	MTC	Regional Planning - PDA Implementation	SF Bay Area: Regionwide: Planning Assistance to support transportation investments and improve their performance in priority development areas.	REG170016	21-T07-058	EXEMPT (40 CFR 93.126) - Planning activities conducted pursuant to titles 23 and 49 U.S.C	Not Modeled
Regional/ Multi-County	MTC	Regional Planning Activities and PPM - MTC	Regional: Regional Planning Activities and Planning, Programming and Monitoring (PPM)	REG170001	21-T07-058	EXEMPT (40 CFR 93.126) - Planning activities conducted pursuant to titles 23 and 49 U.S.C	Not Modeled
Regional/ Multi-County	MTC	Regional Planning Activities and PPM - MTC	Regional: Regional Planning Activities and Planning, Programming and Monitoring (PPM)	REG210001	21-T07-058	EXEMPT (40 CFR 93.126) - Planning activities conducted pursuant to titles 23 and 49 U.S.C	Not Modeled
Regional/ Multi-County	MTC	Regional Streets and Roads Program	SF Bay Area: Regionwide: Regional Streets and Roads Program including providing assistance to Bay Area agencies to implement & maintain computerized pavement management system (PMS),	REG090039	21-T01-003	EXEMPT (40 CFR 93.126) - Planning activities conducted pursuant to titles 23 and 49 U.S.C	Not Modeled

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List of 2023 TIP Projects by County

County	Sponsor	Project Name	Project Descripion	TIP ID	RTP ID	Air Quality Descripion	Conformity Analysis Year
Regional/ Multi-County	MTC	TCP Financing Repayment Obligations	SF Bay Area: Regionwide: Repayment of principal balance and interest costs associated with securitization of future FTA formula fund apportionments. Also references RTP IDs 17-10-0006 and 17-10-	REG170023	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Regional/ Multi-County	MTC	Technical Assistance Mobility Hub Pilot Program	SF Bay Area: Regionwide: Mobility Hubs Pilot seeks to understand implementation, operations, maintenance, partnerships & VMT reduction. Lessons learned will inform broader regional program. Technical	VAR210006	21-EN09-132	EXEMPT (40 CFR 93.126) - Planning and technical studies	Not Modeled
Regional/ Multi-County	MTC	Toll Bridge Maintenance	Region-wide: Seven state-owned toll bridges: routine maintenance of bridge facilities	REG130001	21-T01-005	EXEMPT (40 CFR 93.126) - Widening narrow pavements or reconstructing bridges (no additional travel	Not Modeled
Regional/ Multi-County	MTC	Toll Bridge Rehabilitation Program	Bay Area: On 7 state-owned toll bridges: Rehabilitation program	REG130002	21-T01-005	EXEMPT (40 CFR 93.126) - Widening narrow pavements or reconstructing bridges (no additional travel	Not Modeled
Regional/ Multi-County	WETA	WETA: COVID-19 Emergency Transit Operations	WETA: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and supplies,	VAR190008	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
Regional/ Multi-County	WETA	WETA: Ferry Channel and Berth Dredging	WETA: Various service areas: Dredge ferry channel, ferry basin and berth	REG090054	21-T11-095	EXEMPT (40 CFR 93.126) - Rehabilitation or reconstruction of track structures, track, and trackbed in	Not Modeled
Regional/ Multi-County	WETA	WETA: Ferry Major Component Rehab/Replacement	WETA: Fleetwide: Rehabilitate and/or replacement major ferry components including shafts, propellers, navigation systems, onboard monitoring and alarm systems, interior components, boarding	REG090057	21-T01-002	EXEMPT (40 CFR 93.126) - Rehabilitation of transit vehicles	Not Modeled
Regional/ Multi-County	WETA	WETA: Fixed Guideway Connectors	WETA: Various locations: This project will replace/rehab fixed guideway connectors such as floats, floating barges, ramps and gangways throughout the system.	REG090067	21-T01-002	EXEMPT (40 CFR 93.126) - Reconstruction or renovation of transit buildings and structures (e.g., rail	Not Modeled
San Francisco	BART	BART/MUNI Direct Connection Platform	BART/MUNI: Powell Street Station: Provide a direct connection between BART & MUNI.	SF-050014	21-T11-115	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
San Francisco	BART	Embarcadero Stn: New North-Side Platform Elevator	San Francisco: Embarcadero BART: Procure and install a new elevator on the north end of the station, expand paid area to include the new elevator, dedicate existing elevator to Muni use 100%, project is	SF-170016	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of office, shop, and operating equipment for existing facilities	Not Modeled
San Francisco	MTC	Regional Planning Activities and PPM - SF County	San Francisco: Regional Planning Activities and Planning, Programming and Monitoring (PPM)	SF-170002	21-T07-058	EXEMPT (40 CFR 93.126) - Planning activities conducted pursuant to titles 23 and 49 U.S.C	Not Modeled
San Francisco	MTC	Regional Planning Activities and PPM - SF County	San Francisco: Regional Planning Activities and Planning, Programming and Monitoring (PPM)	SF-210004	21-T07-058	EXEMPT (40 CFR 93.126) - Planning activities conducted pursuant to titles 23 and 49 U.S.C	Not Modeled
San Francisco	Port of SF	Cargo Way and Amador Street Improvements	In San Francisco: On Cargo Way from Jennings to 3rd Street and Amador Street from Illinois Street to 2,300 ft. east: design and construct a complete street project.	SF-170012	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
San Francisco	SF County TA	Oakdale Caltrain Station	San Francisco: Oakdale near Palou: Planning, preliminary engineering, and environmental work for a new Caltrain station and transit service adjustments to serve station.	SF-090011	21-T11-115	EXEMPT (40 CFR 93.126) - Planning activities conducted pursuant to titles 23 and 49 U.S.C	Not Modeled
San Francisco	SF County TA	Yerba Buena Island (YBI) Ramp Improvements	San Francisco: Existing on and off ramps at the Yerba Buena Island (YBI) interchange at US I-80: Reconst ramps; On the west side of the Island: Rehabilitate existing deficient bridges.	SF-070027	21-T01-004	EXEMPT (40 CFR 93.127) - Interchange reconfiguration projects	Not Modeled
San Francisco	SF County TA	Yerba Buena Island Multi-Use Pathway	San Francisco: On Yerba Buena Island along Hillcrest Rd and Treasure Island Rd: Build new two-way Class I ADA compliant pedestrian and bicycle connections	SF-210001	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
San Francisco	SF DPW	Great Highway Restoration	San Francisco: Great Hwy from Sloat to Skyline (Phase 1): Restore and stabilize roadway, stop bluff slides, and protect infrastructure; Sloat from Great Hwy to Skyline (Phase 2): Restore and improve ped	SF-110005	21-T01-003	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
San Francisco	SFMTA	Cable Car Traction Power & Guideway Rehab	SFMTA: Cable Car System: Traction power and guideway rehab-repair various guideway, track curves, frogs, sheaves, replace Barn 12KV, switchgear, DC Motor, mechanical and infrastructure to improve the	SF-99T002	21-T01-002	EXEMPT (40 CFR 93.126) - Rehabilitation or reconstruction of track structures, track, and trackbed in	Not Modeled

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San Francisco	SFMTA	San Francisco - Folsom Streetscape	San Francisco: On Folsom St from 2nd St to 11th St: Construct traffic safety improvements including a two-way separated bikeway, bike signals, lane removal, raised crosswalks, a transit only lane,	SF-210003	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
San Francisco	SFMTA	SF - Powell Street Safety Improvement	San Francisco: Powell Street from Ellis to Post: Improve pedestrian safety and reduce sidewalk crowding to encourage more people to walk, especially to jobs.	SF-170014	21-T09-061	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
San Francisco	SFMTA	SF Muni Rail Replacement Program	SFMTA: Systemwide: Phased design and replacement of trackway, rail replacement, grinding, ultrasonic testing, track fastener, special trackwork, and related systems serving light rail and cable car lines.	SF-95037B	21-T01-002	EXEMPT (40 CFR 93.126) - Rehabilitation or reconstruction of track structures, track, and trackbed in	Not Modeled
San Francisco	SFMTA	SF Safe Routes to School Non-Infrastructure	San Francisco: Citywide: Coordinate school transportation services, including planning, operations, education and outreach, and capital improvement. It will reduce automobile trips and improve the safety	SF-170023	21-T09-061	EXEMPT (40 CFR 93.126) - Grants for training and research programs	Not Modeled
San Francisco	SFMTA	SFMTA Zero Emission Bus Procurement	SFMTA: Fleet: Procure and deploy battery-electric buses into revenue service.	SF-190013	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
San Francisco	SFMTA	SFMTA: Cable Car Vehicle Renovation Program	SFMTA: Cable car fleet: Overhaul and reconstruct the cable car fleet to maintain system reliability and productivity. Project is phased.	SF-970073	21-T01-002	EXEMPT (40 CFR 93.126) - Rehabilitation of transit vehicles	Not Modeled
San Francisco	SFMTA	SFMTA: COVID-19 Emergency Transit Operations	SFMTA: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and supplies,	SF-190007	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
San Francisco	SFMTA	SFMTA: Motor Coach Mid-Life Overhaul	SFMTA: Existing Motor Coach and Trolley Coach Mid-life overhaul	SF-170018	21-T01-002	EXEMPT (40 CFR 93.126) - Rehabilitation of transit vehicles	Not Modeled
San Francisco	SFMTA	SFMTA: Overhead Line Recon. & Traction Power Prog	SFMTA: Systemwide: Improve Trolley Poles, Overhead Contact System, Rail Traction Power that provides power to Muni, based on evaluation of the Muni Track and Traction Power Condition Assessment,	SF-970170	21-T01-002	EXEMPT (40 CFR 93.126) - Reconstruction or renovation of transit buildings and structures (e.g., rail	Not Modeled
San Francisco	SFMTA	SFMTA: Paratransit Vehicle Replacements	SFMTA: Paratransit service across San Francisco: preserve service and replace 84 paratransit vehicles	SF-090035	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
San Francisco	SFMTA	SFMTA: Rehab Historic Streetcars	SFMTA: Fleet of historic streetcars: Rehabilitate vehicles	SF-170021	21-T01-002	EXEMPT (40 CFR 93.126) - Rehabilitation of transit vehicles	Not Modeled
San Francisco	SFMTA	SFMTA: Replacement of 40' Trolley Coaches	SFMTA: Systemwide: Purchase 40' replacement trolley coaches for the existing aging coaches.	SF-170004	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
San Francisco	SFMTA	SFMTA: Wayside Fare Collection Equipment	SFMTA: Systemwide: Replacement of life-expired fare collection equipment.	SF-030013	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of operating equipment for vehicles (e.g., radios, fareboxes, lifts,	Not Modeled
San Francisco	SFMTA	SFMTA:Train Control & Trolley Signal Rehab/Replace	SFMTA: Systemwide: Rehabilitate or replace elements of the ATCS Wayside/Central Train Control & Rail/Bus Signal Systems.	SF-050024	21-T01-002	EXEMPT (40 CFR 93.126) - Rehabilitation or reconstruction of track structures, track, and trackbed in	Not Modeled
San Francisco	SFMTA	Transbay Terminal Mobility Hub - East Cut	San Francisco: At former temporary Transbay Terminal, block bound by Folsom, Main, Howard and Beale streets, one block east of Salesforce Transit Center: Implement Mobility Hub Pilot improvements.	SF-210005	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
San Francisco	TBJPA	TJPA: COVID-19 Emergency Transit Operations	TJPA: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and supplies,	SF-190009	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
San Francisco	TIMMA	Treasure Island Ferry Terminal Landside Imprvmnts	San Francisco: On Treasure Island at the new Treasure Island Intermodal Terminal: Construct land-side improvements	SF-190006	21-T10-092	EXEMPT (40 CFR 93.126) - Construction of small passenger shelters and information kiosks	Not Modeled
San Francisco	WETA	WETA: Replace Ferry Vessels	WETA: All existing ferry vessels for WETA: Replace vessels when they reach the end of their useful life of 25 years	SF-110053	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
San Mateo	Belmont	Belmont Pavement Preservation	Belmont: Various streets and roads: Pavement preservation	SM-170043	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
San Mateo	Brisbane	Crocker Trail Commuter Connectivity Upgrades	Brisbane: On Crocker Trail bounded by Bayshore Blvd, S Hill Dr, W Hill Dr and Mission Blue Dr: Resurface trail and install various amenities	SM-170041	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
San Mateo	Burlingame	Burlingame - Broadway Grade Separation	Burlingame: Broadway Ave at the Caltrain ROW: Grade separate the roadway form the commuter rail tracks and reconstruction of the Broadway Caltrain Station	SM-210004	21-T11-103	EXEMPT (40 CFR 93.126) - Railroad/highway crossing	Not Modeled

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San Mateo	Burlingame	Burlingame Ped Safe Routes and Mobility Imp	Burlingame: Various locations near schools and access routes to transit: Implement pedestrian safety enhancements at intersections.	SM-210007	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
San Mateo	Burlingame	Burlingame Square Caltrain Station Mobility Hub	Burlingame: At the intersection of California Dr and Burlingame Ave, adjacent to the Burlingame CalTrain Station: Implement streetscape improvements that enhance safety and accessibility for all modes of	SM-210009	21-T03-009	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
San Mateo	Caltrain	Caltrain Electrification	Caltrain: From San Francisco to Gilroy: Electrification of the caltrain corridor from San Francisco to Tamien, including caternary poles, wires, power supply, track and signals, and Electric Multiple Units	SF-010028	21-T11-101	EXEMPT (40 CFR 93.126) - Construction or renovation of power, signal, and communications systems	Not Modeled
San Mateo	Caltrain	Caltrain TVM Rehab and Clipper Functionality	Caltrain: Systemwide: Refurbish and incorporate Clipper functionality into existing Caltrain TVM Machines and upgrade Clipper Card Readers at Caltrain Stations.	SM-170010	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of office, shop, and operating equipment for existing facilities	Not Modeled
San Mateo	Caltrain	Caltrain: COVID-19 Emergency Transit Operations	Caltrain: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and supplies,	SM-190011	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
San Mateo	Caltrain	Caltrain: Systemwide Track Rehab & Related Struct.	Caltrain: Systemwide: Rehabilitate and replace existing track, track structures and related civil infrastructure	SM-03006B	21-T01-002	EXEMPT (40 CFR 93.126) - Rehabilitation or reconstruction of track structures, track, and trackbed in	Not Modeled
San Mateo	CCAG	ITS Improvements in San Mateo County Northern Citi	San Mateo County: Along the US 101 corridor from Smart Corridors Ph 1 limits to the SF County line, and on I-280 from I-380 to the San Francisco County Line: Implement ITS Improvements in San Mateo	SM-170046	21-T07-057	EXEMPT (40 CFR 93.126) - Traffic control devices and operating assistance other than signalization	Not Modeled
San Mateo	CCAG	San Mateo County SR2S Program	San Mateo County: Countywide: Provide modularized safe routes to school programs and projects that focuses on education, encouragement, evaluation and enforcement components to all interested	SM-110022	21-EN09-132	EXEMPT (40 CFR 93.126) - Grants for training and research programs	Not Modeled
San Mateo	CCAG	SM Countywide ITS Improvements - SSF Segment	San Mateo County, City of South San Francisco: County-wide: ITS improvements at various locations in the County.	SM-070002	21-T07-057	EXEMPT (40 CFR 93.126) - Traffic control devices and operating assistance other than signalization	Not Modeled
San Mateo	Daly City	Southgate Ave and School St Safety Improvements	Daly City: Southgate Ave from St. Francis Blvd to Sullivan Ave and School Street from Junipero Serra Blvd to Mission St: Safety improvements including surface treatments and striping to increase pedestrian	SM-210012	21-T09-061	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
San Mateo	East Palo Alto	US 101 University Ave Interchange Improvements	E. Palo Alto: On University Ave across US 101 btw Woodland Ave and Donahoe St: Construct Bike Lane, modify NB and SB off-ramps and intersections with overcrossing with no new lanes for off-ramps. HPP	SM-070006	21-T09-061	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
San Mateo	Half Moon Bay	Half Moon Bay - Poplar Complete Streets	Half Moon Bay: On Poplar St from Main St to Railroad Ave: Implement complete street improvements	SM-170013	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
San Mateo	Millbrae	Millbrae Transit Center MicroMobility Hub Pilot	Millbrae: Near the Millbrae Transit Center: Install new local mobility hub	SM-210010	21-T03-009	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
San Mateo	Millbrae	Park Blvd, San Anselmo Ave and Sta. Teresa Wy Imps	Millbrae: Along San Anselmo Ave, Park Blvd, and Santa Teresa Way: Installation of traffic calming, pedestrian and bicycle improvements	SM-210011	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
San Mateo	MTC	Regional Planning Activities and PPM - San Mateo	San Mateo: Regional Planning Activities and Planning, Programming and Monitoring (PPM)	SM-170002	21-T07-056	EXEMPT (40 CFR 93.126) - Planning activities conducted pursuant to titles 23 and 49 U.S.C	Not Modeled
San Mateo	MTC	Regional Planning Activities and PPM - San Mateo	San Mateo: Regional Planning Activities and Planning, Programming and Monitoring (PPM)	SM-210013	21-T07-058	EXEMPT (40 CFR 93.126) - Planning activities conducted pursuant to titles 23 and 49 U.S.C	Not Modeled
San Mateo	Portola Valley	Portola Valley Street Preservation	Portola Valley: Various streets and roads: Pavement preservation	SM-170044	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
San Mateo	Redwood City	Roosevelt Ave Quick-build Traffic Calming	Redwood City: Along Roosevelt Ave: Install quick-build improvements to implement the approved, traffic calming plan with features to reduce speeding, enhance crossings, and address overall traffic	SM-210002	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
San Mateo	Redwood City	US 101 / Woodside Interchange Improvement	Redwood City: US101/Woodside Rd Interchange: Reconstruct and reconfigure interchange including direct-connect flyover ramp to Veterans Blvd; Seaport Blvd and SR84 from US101/SR84 separation to	SM-050027	21-T06-027	EXEMPT (40 CFR 93.127) - Interchange reconfiguration projects	Not Modeled

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San Mateo	SamTrans	SamTrans Bus Replacement	SamTrans: Bus Fleet: Replace buses that have reached the end of their useful life	SM-210014	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
San Mateo	SamTrans	SamTrans Paratransit Vehicle Replacements	SamTrans: Paratransit vehicle fleet: Replace vehicles that have reached the end of their useful life	SM-210015	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
San Mateo	SamTrans	SamTrans: COVID-19 Emergency Transit Operations	SamTrans: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and	SM-190010	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
San Mateo	San Bruno	Huntington Transit Corridor Bike/Ped Improvements	San Bruno: On Huntington Ave from San Bruno Ave to Herman St: Implement pavement preservation and bike/ped facilities including construction of bicycle facilities along Huntington Ave	SM-170017	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
San Mateo	San Bruno	San Bruno Transit Corridor Ped Connection Ph4	San Bruno: At the intersection of San Bruno Ave and Green Ave: Implement enhancements to improve pedestrian connectivity	SM-210003	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
San Mateo	San Carlos	Brittan Ave. Widening	San Carlos: At the intersection of Brittan and Industrial Road: Widen to accommodate three new left turn pockets	SM-190001	21-T07-056	EXEMPT (40 CFR 93.127) - Intersection channelization projects	Not Modeled
San Mateo	San Mateo	Delaware Street Safe Routes to School Corridor	San Mateo: Delaware St from 19th Ave to Pacific Blvd: Implement bicycle and pedestrian improvements including Class IV separated bike lanes and bicycle boulevard, upgrade pedestrian facilities, and	SM-210006	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
San Mateo	San Mateo	East Hillsdale Boulevard Ped/Bike Overcrossing	City of San Mateo: Over US 101 at the US 101/Hillsdale Boulevard Interchange: Construct pedestrian and bicycle overcrossing	SM-170006	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
San Mateo	San Mateo	SR92/El Camino Real (SR82) Ramp Modifications	San Mateo: At the SR92/El Camino Real (SR82) interchange: Modify existing on/off ramps to improve the ingress and egress of the interchange.	SM-110047	21-T06-048	EXEMPT (40 CFR 93.127) - Interchange reconfiguration projects	Not Modeled
San Mateo	San Mateo Co	Broadmoor Safe Routes to School Ped Impvts	San Mateo County: Various locations near Garden Village Elementary and Ben Franklin Intermediate Schools: Enhance bicycle and pedestrian safety and access	SM-210005	21-T09-061	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
San Mateo	San Mateo Co	Hwy 1 Congestion & Safety Improvements	San Mateo County: Highway 1 between Pacifica in the north and Half Moon Bay in the south: Various improvements such as raised medians, left turn lanes, acceleration lanes, pedestrian crossings, bike	SM-170001	21-T07-056	EXEMPT (40 CFR 93.127) - Intersection channelization projects	Not Modeled
San Mateo	San Mateo Co	Midcoast Multi-Modal Trail	San Mateo County: On Highway 1 from Mirada Road in Miramar to Coronado Street in El Granada: Construct 4,537 feet of multi-use trail.	SM-130032	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
San Mateo	SF City/County	Southern Skyline Blvd. Ridge Trail Extension	San Mateo County: On the east side of SR-35 "Upper Skyline Blvd" between the intersection of Hwy 92 and Hwy 35 southward approximately 6 miles to the SFPUC Peninsula Watershed: Construct Southern	SM-130031	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
San Mateo	SSF	South San Francisco East of 101 Transit Expansion	South San Francisco: Various locations: Install and upgrade bus stops, enhance sidewalk and crosswalk.	SM-210008	21-T10-093	EXEMPT (40 CFR 93.126) - Construction of small passenger shelters and information kiosks	Not Modeled
San Mateo	SSF	SSF Grand Boulevard Complete Streets (Phase III)	South San Francisco: El Camino Real from Chestnut Ave to McLellan Dr: Implement Grand Boulevard Complete Streets improvements	SM-170016	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	Campbell	Campbell PDA Enhancements	Campbell: Various streets in the vicinity of the Campbell PDA: Enhance pedestrian and bicycle infrastructure and calm traffic	SCL210024	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Santa Clara	Campbell	SR 17 Southbound/Hamilton Ave. Off-Ramp Widening	Campbell: Southbound Route 17 at Hamilton Ave: Widen off-ramp to improve operations	SCL210003	21-T06-048	EXEMPT (40 CFR 93.127) - Interchange reconfiguration projects	Not Modeled
Santa Clara	Cupertino	Cupertino Stevens Creek Blvd Class IV Bike Lanes	Cupertino: On Stevens Creek Blvd between Wolfe and Hwy 85: Convert existing Class II bike lanes to Class IV bike lanes	SCL210034	21-T07-056	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	Cupertino	McClellan Road Separated Bikeways (Phase 3)	Cupertino: McClellan Rd from De Anza Blvd to Byrne Ave and Pacifica Drive from De Anza Blvd to Torre Ave: Implement separated bike lane improvements and traffic signal modifications	SCL190036	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	Los Gatos	Los Gatos Creek Trail to Hwy 9 Trailhead Connector	In Los Gatos: The Los Gatos Creek Trail to the north and south sides of Highway 9 between the Highway 17 interchange and University Ave: Construct bike and pedestrian connector	SCL170028	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	Los Gatos	Shannon Road Complete Streets	Los Gatos: On both sides of Shannon Road between Los Gatos Blvd. and Cherry Blossom Lane: Construct sidewalks and Class II bike lanes.	SCL190033	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled

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Santa Clara	Mountain View	Mountain View - Stierlin Rd Bike-Ped Improvements	Mountain View: Various streets and roads in central Mountain View: Implement bicycle and pedestrian improvements	SCL210012	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	Mountain View	Mountain View Mobility Hub Pilot	Mountain View: At the Mountain View Transit Center: Implement multi-modal enhancements including bicycle storage and parking, charging for electric bikes and scooters, circulation improvements and	SCL210025	21-EN09-132	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	Mountain View	Mountain View Shoreline Blvd Pathway Improvements	Mountain View: Adjacent to Shoreline Blvd from Wright Ave to Villa St: Reconstruct a pathway connection to connect neighborhoods and the Transit Center and Downtown.	SCL210027	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	Mountain View	Rengstorff Ave Grade Separation	Mountain View: At the intersection of Rengstroff Ave and the Caltrain right-of-way: Grade separate Caltrain at Rengstorff Avenue	SCL190032	21-T11-103	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Santa Clara	MTC	Diridon Station Planning & Studies	San Jose: Diridon Station: Planning activities to advance delivery of the Diridon Station and rail operations.	SCL210022	21-T07-058	EXEMPT (40 CFR 93.126) - Planning and technical studies	Not Modeled
Santa Clara	MTC	Regional Planning Activities and PPM - Santa Clara	Santa Clara: Regional Planning Activities and Planning, Programming and Monitoring (PPM)	SCL170001	21-T07-058	EXEMPT (40 CFR 93.126) - Planning activities conducted pursuant to titles 23 and 49 U.S.C	Not Modeled
Santa Clara	MTC	Regional Planning Activities and PPM - Santa Clara	Santa Clara: Regional Planning Activities and Planning, Programming and Monitoring (PPM)	SCL210029	21-T07-058	EXEMPT (40 CFR 93.126) - Planning activities conducted pursuant to titles 23 and 49 U.S.C	Not Modeled
Santa Clara	San Jose	Bascom Avenue - Quick Strike Improvements	San Jose: Along the existing Class 2 bikeway on Bascom Ave from Fruitdale to Hamilton: Enhance bikeway to a 1-mile Class IV protected bikeway. Bikeway project elements include painted bike lanes,	SCL210014	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	San Jose	Bay Trail Reach 9 & 9B	San Jose: From the existing San Francisco Bay Trail/HWY 237 Bikeway Trail to the Bay Trail designated parking spaces (adjacent to the publicly accessible Marriott property): Construct 1.1 miles of	SCL050082	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	San Jose	Better Bikeway San Jose - San Fernando Street	San Jose: On San Fernando St from Almaden Blvd to 11th St: Construct bicycle and pedestrian safety improvements	SCL190029	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	San Jose	Coyote Creek Trail (Hwy 237-Story Rd)	San Jose: From Highway 237 to Story Road: Master plan entire system, design and construction of the trail.	SCL050083	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	San Jose	En Movimiento - Quick Strike Improvements	San Jose: Various locations in East San Jose: Build bike boulevard corridors that will provide safe and comfortable connections to existing and planned transit, as well as many popular destinations.	SCL210015	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	San Jose	McKee-Julian Quick Strike Improvements	San Jose: Various locations along McKee Rd-Julian St: Provide safety improvements for vulnerable roadway users, pedestrians, bicyclists, and transit riders on a Vision Zero Priority Safety Corridor with a	SCL210013	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Santa Clara	San Jose	Mt Pleasant Ped & Bike Traffic Safety Improvements	San Jose: Various locations in the Mount Pleasant Area: Implement traffic safety improvements to serve student populations of seven schools	SCL170031	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Santa Clara	San Jose	San Jose Downtown Bikeways - Quick Strike	San Jose: Various locations in the downtown area: Enhance existing facilities to become a connected network of Class IV (Separated) and Class III (Bike Boulevard) all-ages-and abilities	SCL210016	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	San Jose	San Jose: Los Gatos Creek Reach 5 Underpass	In San Jose: Los Gatos Creek Trail between Auzerais Ave and Montgomery/Bird Ave: Construct Los Gatos Creek Trail (Reach 5b/c).	SCL110029	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	San Jose	US 101/Old Oakland Road Interchange improvements	Oakland Rd - Commercial St to US 101: Widen to 8 lanes; Commercial St - Oakland Rd to Berryessa Rd: Add turn lanes; Commercial St - Berryessa Rd to Mabury Rd: Extend roadway: US 101 ramps: Widen	SCL190001	21-T06-028	EXEMPT (40 CFR 93.127) - Interchange reconfiguration projects	Not Modeled
Santa Clara	San Jose	W San Carlos Urban Village Streets Improvements	San Jose: West San Carlos St between I-880 and McEvoy St: Implement safety improvements	SCL170061	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Santa Clara	San Jose	Willow-Keyes Complete Streets Improvements	San Jose: At various locations on the Willow-Keyes corridor: Construct bicycle and pedestrian safety improvements including road diets to construct Class IV protected bike lanes	SCL190028	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	Santa Clara	Saratoga Creek Trail Phase 1	Santa Clara: Saratoga Creek Trail between Homeridge Park and Central Park: Build a class I bicycle and pedestrian trail	SCL170045	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled

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Santa Clara	Saratoga	Blue Hills Elementary Pedestrian Crossing at UPRR	Saratoga: Parallel to Fredericksburg Dr and Guava Ct and the Union Pacific Rail Road Vasona Branch: Reopen and construct an at-grade bike/ped crossing: At various UPRR crossings near Blue Hills	SCL210018	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	Saratoga	Saratoga Village Crosswalks and Sidewalk Rehab	Saratoga: Along Big Basin Way between 6th street and the signalized intersection of Saratoga-Sunnyvale Rd/Saratoga Ave/Hwy 9: Install curb bulbouts and crosswalk and rehabilitate sidewalk.	SCL170054	21-T09-061	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	Sunnyvale	Bernardo Avenue Bicycle Underpass	Sunnyvale: Between North and South Bernardo Avenue under the Caltrain tracks: Construct bicycle underpass	SCL170020	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	Sunnyvale	East Sunnyvale Area "Sense of Place"	Sunnyvale: Various locations in the East Sunnyvale Sense of Place Plan Area: Implement bike, pedestrian and transit access improvements	SCL170024	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	Sunnyvale	Java Dr Road Diet and Bike Lanes	Sunnyvale: On Java Dr from Mathilda to Crossman: Construct approximately 5,000 linear feet of Class II, IIB or IV bike lanes each side via a road diet	SCL170022	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	Sunnyvale	Peery Park "Sense of Place" Improvements	Sunnyvale: In Peery Park Specific Area on Potrero Avenue from Maude Avenue to Central Expwy: Implement bike and pedestrian improvements	SCL170023	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	Sunnyvale	Sunnyvale Bicycle, Pedestrian and SRTS Safety Imps	Sunnyvale: Near schools throughout the City: Construct quick-build bicycle, pedestrian and Safe Routes to School improvements with low-cost measures to improve multi-modal connectivity through the	SCL210023	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	Sunnyvale	Sunnyvale Safe Routes to School Improvements	Sunnyvale: In the vicinity of Bishop Elementary School: Install bike lanes, high visibility crosswalks, raised crosswalks, and curb extensions; Provide bicycle and pedestrian education and encouragement	SCL170059	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Santa Clara	Sunnyvale	Sunnyvale SNAIL Neighborhood Improvements	Sunnyvale: Various locations: Implement bike/ped improvements, close slip lanes, add bulbouts, install detection systems, ADA compliant ped signals, enhance existing bike lanes to include green bike	SCL170017	21-T08-060	EXEMPT (40 CFR 93.127) - Intersection channelization projects	Not Modeled
Santa Clara	VTA	Guadalupe Signal Improvements/SCADA System Repl	VTA: Guadalupe: Improve and rehabilitate signals, replace network switch	SCL210009	21-T01-002	EXEMPT (40 CFR 93.126) - Construction or renovation of power, signal, and communications systems	Not Modeled
Santa Clara	VTA	Hwy. Transp Operations System/FPI Phase 1 & 2	Santa Clara County: At various locations: Implement Transportation Operations System/Freeway Performance Initiative projects	SCL190003	21-T07-056	EXEMPT (40 CFR 93.126) - Traffic control devices and operating assistance other than signalization	Not Modeled
Santa Clara	VTA	I-280 Soundwalls - SR-87 to Los Gatos Creek Bridge	San Jose: On I-280 between SR 87 and Los Gatos Creek Bridge: Construct soundwalls	SCL170064	21-T07-056	EXEMPT (40 CFR 93.126) - Noise attenuation	Not Modeled
Santa Clara	VTA	I-280/Winchester Blvd Interchange Improvement	San Jose: I-280/Winchester Interchange: Construct improvements at the Winchester Blvd. interchange and I-280/I-880/SR 17 freeway connectors including the addition of ramps and a fly-over and the	SCL150014	21-T06-017	EXEMPT (40 CFR 93.127) - Interchange reconfiguration projects	Not Modeled
Santa Clara	VTA	I-280/Wolfe Road Interchange Improvement	Cupertino: I-280/Wolfe Road Interchange: Modify to relieve congestion and improve local circulation.	SCL190011	21-T06-017	EXEMPT (40 CFR 93.127) - Interchange reconfiguration projects	Not Modeled
Santa Clara	VTA	I-680 Soundwalls - Capitol Expwy to Mueller Ave	San Jose: On I-680 between Capitol Expressway and Mueller Avenue: Construct soundwalls	SCL150001	21-T07-056	EXEMPT (40 CFR 93.126) - Noise attenuation	Not Modeled
Santa Clara	VTA	N 1st/Tasman EB Track Switch Mod - TSP Enhancement	San Jose: At the Champion station In the vicinity of the North First St and Tasman Dr intersection: Modify the eastbound trackway circuit to trigger the eastbound transit signal priority (TSP) service calls	SCL210030	21-T01-002	EXEMPT (40 CFR 93.126) - Construction or renovation of power, signal, and communications systems	Not Modeled
Santa Clara	VTA	SR 237 Westbound On-Ramp at Middlefield Rd.	Mountain View: Along Middlefield Rd from Logue Dr to 400¿ south of the eastbound SR 237 off-ramp: Improve traffic operations and enhance safety and implement Complete Streets improvements	SCL230001	21-T06-043	EXEMPT (40 CFR 93.127) - Intersection channelization projects	Not Modeled
Santa Clara	VTA	SR 237/Lawrence Expressway/Carribean Dr IC Imp	Sunnyvale: SR-237/Lawrence Expressway/Carribean Dr Interchange: Modify interchanges to relieve congestion and improve traffic operations	SCL210019	21-T06-043	EXEMPT (40 CFR 93.127) - Interchange reconfiguration projects	Not Modeled
Santa Clara	VTA	SR 87/Capitol Expressway/Narvaez Ave. IC Imp	San Jose: SR 87/Capitol Expressway interchange: Modify the existing interchange with standard northbound on and off ramps that connect directly to Capitol Expressway instead of Narvaez Avenue.	SCL210020	21-T06-040	EXEMPT (40 CFR 93.127) - Interchange reconfiguration projects	Not Modeled

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List of 2023 TIP Projects by County

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Santa Clara	VTA	SR-17 Bike/Ped Trail and Wildlife Crossing	Santa Clara County: SR-17 South of Los Gatos: Construct grade separated wildlife crossing, up to 5.4 miles of fencing, and a multi-use regional trail overcrossing	SCL210028	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	VTA	US 101/Ellis Street Interchange Improvement	Mountain View: US 101/Ellis Street Interchange Modify: Modify interchange	SCL210021	21-T06-028	EXEMPT (40 CFR 93.127) - Interchange reconfiguration projects	Not Modeled
Santa Clara	VTA	US 101/San Antonio Rd/Charleston/Rengstorff IC Imp	Mountain View and Palo Alto: US 101 interchanges at San Antonio and Charleston Road/Rengstorff Avenue: Construct interchange improvements include adding new auxiliary lane.	SCL190012	21-T06-028	EXEMPT (40 CFR 93.127) - Interchange reconfiguration projects	Not Modeled
Santa Clara	VTA	US 101/SR 152/10th Ramp and Intersection Imp.	Gilroy: US-101/SR-152/10th St Interchange: Widen the existing bridge, modify existing on- and off-ramp; upgrade local roadways to current standards to improve local circulation.	SCL210002	21-T06-048	EXEMPT (40 CFR 93.127) - Interchange reconfiguration projects	Not Modeled
Santa Clara	VTA	US 101/SR 25 Interchange - Phase 1	Santa Clara County: US 101 and SR 25 Interchange: Phase 1 Reconfigure a portion of the overall interchange re-construction, focusing on improving the movement from southbound US 101 to southbound	SCL190013	21-T06-028	EXEMPT (40 CFR 93.127) - Interchange reconfiguration projects	Not Modeled
Santa Clara	VTA	VTA Axle Press Replacement	San Jose: At the Guadalupe Division: Replace the Ajax-Ceco Axle press	SCL210032	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of office, shop, and operating equipment for existing facilities	Not Modeled
Santa Clara	VTA	VTA Electronic Locker Upgrade and Replacement	VTA: At VTA park and ride lots, Light Rail Stations and Transit Centers: Replace bicycle lockers with new, Wi-Fi enabled, electronic lockers allowing VTA to serve more customers and provide real-time	SCL210017	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	VTA	VTA Network Switch Replacement Upgrade	VTA: Throughout the VTA light rail system: Procure and install new replacement SCADA network backbone switches throughout the VTA light rail system at locations identified in the SCADA Fiber Network	SCL210031	21-T01-002	EXEMPT (40 CFR 93.126) - Construction or renovation of power, signal, and communications systems	Not Modeled
Santa Clara	VTA	VTA North Yard Tire Awning	Mountain View: At VTA North Yard: Build a steel frame awning with a metal roof and install lighting under the awning.	SCL210033	21-T01-002	EXEMPT (40 CFR 93.126) - Reconstruction or renovation of transit buildings and structures (e.g., rail	Not Modeled
Santa Clara	VTA	VTA Rail Substation Rehab/Replacement	VTA: Light Rail System: Replace Transit Power Subsystem	SCL210006	21-T01-002	EXEMPT (40 CFR 93.126) - Construction or renovation of power, signal, and communications systems	Not Modeled
Santa Clara	VTA	VTA Track Intrusion Abatement	VTA: Various locations along trackway: Installation of fencing, barriers, signage, flashing signs, and pavement markings.	SCL150008	21-T01-002	EXEMPT (40 CFR 93.126) - Rehabilitation or reconstruction of track structures, track, and trackbed in	Not Modeled
Santa Clara	VTA	VTA: COVID-19 Emergency Transit Operations	VTA: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and supplies,	SCL190038	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
Santa Clara	VTA	VTA: Facilities ADA Upgrades	VTA: Various passenger facilities systemwide: Modify and upgrade ADA non-compliant items to bring them into compliance with current ADA codes	SCL190039	21-T01-002	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Santa Clara	VTA	VTA: Guadalupe Steam Rack Improv & Liner Replace	VTA: At Guadalupe Division: Replace existing steam rack (light rail) track with a new liner system and overhead roof structure.	SCL190053	21-T01-001	EXEMPT (40 CFR 93.126) - Reconstruction or renovation of transit buildings and structures (e.g., rail	Not Modeled
Santa Clara	VTA	VTA: HVAC Replacement	VTA: At various facilities system-wide: Replace heating, ventilation and cooling equipment	SCL190026	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of office, shop, and operating equipment for existing facilities	Not Modeled
Santa Clara	VTA	VTA: Light Rail Bridge and Structure - SG Repair	VTA: Various Locations: Light rail bridge and structure defect investigation and repair. Stabilization measures to address Hamilton structure settlement.	SCL110099	21-T01-002	EXEMPT (40 CFR 93.126) - Rehabilitation or reconstruction of track structures, track, and trackbed in	Not Modeled
Santa Clara	VTA	VTA: Light Rail Station Rehabilitation	VTA: At various light rail stations: Provide rehabilitation and repair of maintenance issues outlined in the condition assessment	SCL190048	21-T01-002	EXEMPT (40 CFR 93.126) - Reconstruction or renovation of transit buildings and structures (e.g., rail	Not Modeled
Santa Clara	VTA	VTA: Non-Revenue Vehicle Procurement	VTA: Systemwide: Acquire non-revenue vehicles to replace existing units that have reached the end of their useful life	SCL170047	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of support vehicles	Not Modeled
Santa Clara	VTA	VTA: Paratransit Vehicle Procurement	VTA: Paratransit Fleet: Procure vehicles and associated equipment for paratransit services.	SCL170005	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Santa Clara	VTA	VTA: Rail Replacement Program	VTA: Throughout the Light Rail system: Replace rails (no rail expansion).	SCL050002	21-T01-002	EXEMPT (40 CFR 93.126) - Rehabilitation or reconstruction of track structures, track, and trackbed in	Not Modeled

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Santa Clara	VTA	VTA: SCADA Control Center System Replacement	VTA: Systemwide: Provide upgrades to the Supervisory Control and Data Acquisition (SCADA) System hardware and software; At the Control and Data Center: Facility expansion	SCL170050	21-T01-002	EXEMPT (40 CFR 93.126) - Construction or renovation of power, signal, and communications systems	Not Modeled
Santa Clara	VTA	VTA: Security Enhancement at Chaboya Parking Lot	VTA: At the Chaboya Bus Yard: Security enhancements	SCL210008	21-T01-002	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Santa Clara	VTA	VTA: Standard & Small Bus Replacement	VTA: Fleetwide: Standard and Small Bus Replacement	SCL050001	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Santa Clara	VTA	VTA: TP OCS Rehab & Replacement	VTA: Systemwide: Rehabilitate and replace overhead catenary system (OCS) and associated components	SCL090044	21-T01-002	EXEMPT (40 CFR 93.126) - Construction or renovation of power, signal, and communications systems	Not Modeled
Solano	Benicia	Benicia - Park Road Improvements	Benicia: Park Road between I-780 and Bayshore Road: Resurface roadway and construct Class II/IV bicycle lane facilities and storm drain improvements	SOL170011	21-T08-060	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Solano	Caltrans	Rio Vista SR12 Pavement Rehab and Intersection Imp	Solano County: SR12 from Currie Rd to the County Line: Rehabilitate roadway; Rio Vista: At SR12/Church Rd. Intersection: Add Standard Shoulders, EB Left Turn Lane, WB Acceleration Lane and Deceleration	SOL150003	21-T01-003	EXEMPT (40 CFR 93.127) - Intersection channelization projects	Not Modeled
Solano	Caltrans	Solano WB I-80 Cordelia Truck Scales	Solano County: WB I-80: Replace and relocate the existing Cordelia Truck Scales, expand capacity and create braided off-ramp connection to WB I-80	SOL190025	21-T07-055	EXEMPT (40 CFR 93.127) - Truck size and weight inspection stations	Not Modeled
Solano	Dixon	Dixon: COVID-19 Emergency Transit Operations	Dixon: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and supplies,	SOL190018	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
Solano	Fairfield	Fairfield - Cadenasso Drive Paving	Fairfield: On Cadenasso Dr: Pavement preservation	SOL210001	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Solano	Fairfield	Fairfield West Texas Street Complete Streets	Fairfield: Along West Texas St between Beck Ave and Pennsylvania Ave: Modernizes a relinquished highway to improve conditions for bicyclists and pedestrians traveling including implementing a road diet	SOL210009	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Solano	Fairfield	Fairfield: COVID-19 Emergency Transit Operations	Fairfield: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and supplies,	SOL190020	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
Solano	Fairfield	Fairfield-Suisun Intercity/Local Bus Replacement	Fairfield: Systemwide: Replace local/intercity buses that have exceeded their expected useful life.	SOL110041	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Solano	Fairfield	Grange Middle School SR2S and PavementPreservation	Fairfield: In the vicinity of Grange Middle School: Enhance bicycle and pedestrian safety mobility and pavement preservation.	SOL170010	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Solano	F-S Transit	Fairfield - Electric Bus Fleet and Infrastructure	Fairfield: Systemwide: Procure all-electric, zero-emission buses and supporting charging infrastructure	SOL190003	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Solano	MTC	Regional Planning Activities and PPM - Solano	Solano County: County-wide: Regional Planning Activities and Planning, Programming and Monitoring (PPM)	SOL170001	21-T07-058	EXEMPT (40 CFR 93.126) - Planning activities conducted pursuant to titles 23 and 49 U.S.C	Not Modeled
Solano	MTC	Regional Planning Activities and PPM - Solano	Solano County: County-wide: Regional Planning Activities and Planning, Programming and Monitoring (PPM)	SOL210008	21-T07-058	EXEMPT (40 CFR 93.126) - Planning activities conducted pursuant to titles 23 and 49 U.S.C	Not Modeled
Solano	Rio Vista	Rio Vista: COVID-19 Emergency Transit Operations	Rio Vista: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and	SOL190019	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
Solano	Solano County	Solano County Farm to Market Phase 3	Solano County: Various locations in Suisun Valley: Construct bike lanes	SOL170016	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Solano	Solano County	Solano County Roadway Preservation	Solano County: On Midway Road from Interstate 80 to approximately 200 feet west of Porter Road: Place asphalt overlay.	SOL170015	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Solano	Solano County	Suisun Vallley Bicycle and Pedestrian Imps	Solano County: At Mankas Corner: Construct staging area with bicycle and pedestrian improvements; At Various Locations in Solano County: Add a Class II bike lane to enhance bike access to areas	SOL130007	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled

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Solano	SolTrans	SolTrans Electric Bus Charging Infrastructure	SolTrans: Systemwide: Implement core infrastructure improvements to support the charging of a 100% Zero Emissions Bus fleet.	SOL190017	21-T01-002	EXEMPT (40 CFR 93.126) - Construction or renovation of power, signal, and communications systems	Not Modeled
Solano	SolTrans	SolTrans: Bus Replacement (Alternative Fuel)	SolTrans: Eight 45' MCI commuter coaches: Replace vehicles as they reach their useful life.	SOL090034	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Solano	SolTrans	SolTrans: COVID-19 Emergency Transit Operations	SolTrans: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and	SOL190021	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
Solano	SolTrans	SolTrans: Data Management Technology Enhancements	SolTrans: Systemwide: Procure data management systems and software	SOL170002	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of office, shop, and operating equipment for existing facilities	Not Modeled
Solano	STA	I-80/I-680/SR 12 Interchange Phase 2A	Solano County: I-80/I-680/SR-12 Interchange: Complete the construction of the I-80 connection to SR 12W that was started with the Construction Package 1.	SOL190024	21-T06-015	EXEMPT (40 CFR 93.127) - Interchange reconfiguration projects	Not Modeled
Solano	STA	Solano Connected Mobility Implementation Plan	Solano County: Countywide: Develop a countywide Connected Mobility Implementation Plan to address how Solano reacts to the recommendations of Blue Ribbon Task Force	SOL210006	21-T10-093	EXEMPT (40 CFR 93.126) - Planning and technical studies	Not Modeled
Solano	STA	Solano Mobility Call Center	Solano County: County-wide: Operate call center featuring in-person assistance for customers related to transit, commuting, and mobility services, including ADA, Clipper, and ride matching, among others	SOL170009	21-T01-001	EXEMPT (40 CFR 93.126) - Operating assistance to transit agencies	Not Modeled
Solano	STA	Solano Regional Transit Improvements - TIRCP 2020	STA: Throughout Solano County and Solano Express Bus stops at various stations: Network integration planning and implementation of various transit and access improvements	SOL190023	21-T10-093	EXEMPT (40 CFR 93.126) - Construction or renovation of power, signal, and communications systems	Not Modeled
Solano	STA	Solano Safe Routes to School Program	Solano County: Countywide: Implement Countywide Solano Safe Routes to School Program, including Planning, Education, and Encouragement events and materials. Toll credits will be used in lieu of match	SOL110019	21-T09-061	EXEMPT (40 CFR 93.126) - Transportation enhancement activities (except rehabilitation and operation	Not Modeled
Solano	STA	SolanoExpress Bus Electrification	Solano County: Countywide: Purchase electric over-the-road coaches for long-haul SolanoExpress routes.	SOL190002	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Solano	Suisun City	McCoy Creek Trail - Phase 2	Suisun City: Along the west bank of the McCoy Creek canal and the north bank of the Laurel Creek canal from Pintail Dr to Blossom Avenue: Construct a Class I concrete pedestrian/bicycle trail with a bridge	SOL170007	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Solano	Suisun City	New Railroad Avenue Pavement Rehabilitation	Suisun City: Railroad Ave from Sunset Ave to Birchwood Ct: Rehabilitate roadway on eastbound lanes; Railroad Ave from Sunset Ave to Marina Blvd: Restripe existing Class 2 bicycle lanes on both sides of	SOL170014	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Solano	Vacaville	Vaca Valley/I505 Multimodal Improvements	Vacaville: On Vaca Valley Parkway at E Monte Vista Ave and I-505 ramps: Install roundabouts and construct bicycle/pedestrian facilities over I-505 connecting to existing facilities and ADA improvements	SOL170013	21-T07-056	EXEMPT (40 CFR 93.127) - Intersection channelization projects	Not Modeled
Solano	Vacaville	Vacaville Pavement Preservation	Vacaville: Various Streets and Roads: Pavement preservation	SOL210002	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Solano	Vacaville	Vacaville: COVID-19 Emergency Transit Operations	Vacaville: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and	SOL190022	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
Solano	Vacaville	Vacaville: Electric Bus Charging Infrastructure	Vacaville: System-wide: Implement core infrastructure improvements to support the charging of a 100% Zero Emissions Bus fleet.	SOL210003	21-T01-002	EXEMPT (40 CFR 93.126) - Reconstruction or renovation of transit buildings and structures (e.g., rail	Not Modeled
Solano	Vacaville	Vacaville: Electric Bus Fleet	Vacaville: Fleetwide: Purchase electric zero-emission buses.	SOL210004	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Solano	Vacaville	Vacaville: Transit Building Expansion	Vacaville: Transit building: Expand building	SOL210005	21-T01-002	EXEMPT (40 CFR 93.126) - Reconstruction or renovation of transit buildings and structures (e.g., rail	Not Modeled
Solano	Vallejo	Vallejo - Sacramento St Road Diet and Rehab	Vallejo: Sacramento St from Tennessee St to Capitol St: Implement road diet, rehabilitation, and bike/ped improvements	SOL190004	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled

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Solano	Vallejo	Vallejo Bay Trail / Vine Trail Gap Closure	Vallejo: Between the existing Bay Trail to the south and the Bay Trail and Napa Vine Trail in American Canyon: Build multi-use path to close the gap between the existing trail segments	SOL170008	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Solano	Vallejo	Vallejo Ferry Mobility Hub Improvement	Vallejo: In and around the Vallejo Ferry Terminal: Implement mobility hub improvements such as signage and wayfinding, sheltered waiting areas, parking and charging for electric micro-mobility vehicles,	SOL210007	21-EN09-132	EXEMPT (40 CFR 93.126) - Construction of small passenger shelters and information kiosks	Not Modeled
Solano	Vallejo	Vallejo Springs Rd Pavement Preservation	Vallejo: On Springs Rd from Humboldt St. to Maywood Dr: Pavement preservation including pavement rehabilitation, curb ramps imp., curb and gutter, and pavement striping	SOL210010	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Sonoma	Cotati	Cotati Downtown-Civic Center Connectivity Safety	Cotati: Various locations in Downtown and Civic Center: Pavement preservation and bicycle and pedestrian safety improvements	SON210002	21-T09-061	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Sonoma	Healdsburg	Healdsburg Avenue Complete Streets Improvements	Healdsburg: On Healdsburg Ave from Powell Ave to Passalaqua Rd: Implement complete streets improvements for all modes of travel including reducing travel lanes from 5 to 3	SON170024	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Sonoma	Healdsburg	Healdsburg Electric Bike Share	Healdsburg: Various locations: Establish an Electric Bike Share Program	SON210003	21-EN09-132	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Sonoma	MTC	Regional Planning Activities and PPM - Sonoma	Sonoma County: Regional Planning Activities and Planning, Programming and Monitoring (PPM)	SON170002	21-T07-058	EXEMPT (40 CFR 93.126) - Planning activities conducted pursuant to titles 23 and 49 U.S.C	Not Modeled
Sonoma	MTC	Regional Planning Activities and PPM - Sonoma	Sonoma County: Regional Planning Activities and Planning, Programming and Monitoring (PPM)	SON210007	21-T07-058	EXEMPT (40 CFR 93.126) - Planning activities conducted pursuant to titles 23 and 49 U.S.C	Not Modeled
Sonoma	Petaluma	Petaluma AVL Equipment	Petaluma: Systemwide: Purchase and maintain AVL system equipment for fixed route vehicle.	SON170017	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of operating equipment for vehicles (e.g., radios, fareboxes, lifts,	Not Modeled
Sonoma	Petaluma	Petaluma: COVID-19 Emergency Transit Operations	Petaluma: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and	SON190008	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
Sonoma	Petaluma	Petaluma: Purchase 2 Replacement Fixed Route Buses	Petaluma: Battery Electric Buses: Purchase Battery Electric vehicles to replace Fixed Route Diesel buses that have expended their useful life.	SON210006	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Sonoma	Petaluma	Petaluma: Transit Yard & Facilities Improvements	Petaluma: Transit Yard and Facility: Improvements to enhance security and maintain a state of good repair, including pavement repair and upgrades, video surveillance system, office security, yard lighting,	SON170005	21-T01-002	EXEMPT (40 CFR 93.126) - Reconstruction or renovation of transit buildings and structures (e.g., rail	Not Modeled
Sonoma	Rohnert Park	Rohnert Park Pedestrian Safety Improvements	Rohnert Park: Various street intersections, mid-block crossings, and multi-use path/street intersections throughout the City, but especially serving the Central Rohnert Park Priority Development Area:	SON210004	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Sonoma	Rohnert Park	Southwest Boulevard Complete Streets	Rohnert Park: On Southwest Blvd between Commerce Blvd and 300-feet north of Adrian Dr: Rehabilitate pavement; reconfigure lanes; install / improve on-street bike facilities, sidewalks, intersection,	SON210009	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Sonoma	Santa Rosa	Highway 101 Bicycle and Pedestrian Overcrossing	Santa Rosa: Over Highway 101 in the vicinity of the Santa Rosa Junior College and the Coddingtown Mall: Construct a Class I shared-use ADA accessible bicycle and pedestrian bridge	SON170012	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Sonoma	Santa Rosa	Jennings Ave Bike & Ped RR Crossing Corridor	In Santa Rosa: At Jennings Ave and SMART railroad tracks: Construct a bicycle and pedestrian crossing and develop a Safe Routes to School service program focusing on education and awareness for the	SON150003	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Sonoma	Santa Rosa	Santa Rosa Pavement Rehab of Various Streets	In Santa Rosa: Various locations: Pavement rehabilitation; Various locations: Restripe roadways to add Class II bike lanes	SON170023	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Sonoma	Santa Rosa	SantaRosa Downtown Comm Infrastructure Enhancement	Santa Rosa: In downtown and Railroad Square: Upgrade the existing traffic signal interconnect infrastructure from copper wire to a fiber optic backbone.	SON190011	21-T07-057	EXEMPT (40 CFR 93.126) - Traffic control devices and operating assistance other than signalization	Not Modeled
Sonoma	Santa Rosa	US 101 Hearn Ave Interchange	Santa Rosa: US 101/Hearn Ave over-crossing/interchange: Replace the US 101/Hearn Ave over-crossing/interchange with a new over crossing/interchange including bike lanes, sidewalks, and re-aligned	SON150006	21-T06-029	EXEMPT (40 CFR 93.127) - Interchange reconfiguration projects	Not Modeled
Sonoma	SantaRosa Bus	Santa Rosa CityBus: Electric Bus Replacement	Santa Rosa CityBus: Nine local transit buses: Replace with Nine electric buses and purchase/install related charging equipment	SON170026	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled

Note: Projects with a conformity analysis year of 2050 reference programmatic projects or projects with a completion date after 2040 in Plan Bay Area 2050.

List of 2023 TIP Projects by County

County	Sponsor	Project Name	Project Descripion	TIP ID	RTP ID	Air Quality Descripion	Conformity Analysis Year
Sonoma	SantaRosa Bus	Santa Rosa CityBus: ZEB Replacement	Santa Rosa CityBus: Replace two local transit clean-diesel buses with two electric buses	SON210008	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Sonoma	SantaRosa Bus	Santa Rosa Transit Mall Roadbed Rehabilitation	Santa Rosa: At the Transit Mall: Rehabilitate the roadbed	SON210001	21-T01-002	EXEMPT (40 CFR 93.126) - Reconstruction or renovation of transit buildings and structures (e.g., rail	Not Modeled
Sonoma	SantaRosa Bus	SR CityBus: COVID-19 Emergency Transit Operations	Santa Rosa CityBus: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE	SON190009	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
Sonoma	Sebastopol	Bodega Avenue Bike Lanes and Pavement Rehab	Sebastopol: Bodega Ave from Pleasant Hill Ave to High St: Rehabilitate pavement, fill in sidewalk gaps, widen pavement, add bike lanes, and implement pedestrian safety improvements. Project is phased.	SON170021	21-T01-003	EXEMPT (40 CFR 93.126) - Pavement resurfacing and/or rehabilitation	Not Modeled
Sonoma	Sebastopol	SR 116 and Bodega Ave Pedestrian Improvements	Sebastopol: Along SR-116 between Hurbut Ave and Maple Ave: Construction of ADA-compliant ramps; Along Bodega Ave at the uncontrolled crossings at Robinson Rd and Florence Ave: Implement	SON210005	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Sonoma	SMART	SMART: COVID-19 Emergency Transit Operations	SMART: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of PPE and supplies,	SON190010	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
Sonoma	Son Co Reg Park	Joe Rodota Trail Bridge Replacement	Sonoma County: On the Joe Rodota Trail near the City of Sebastopol: Remove and replace two deteriorating bicycle and pedestrian bridges	SON170025	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Sonoma	Son Co Reg Park	Sonoma County - West County Trail Gap Closures	Sonoma County: West County Trail along Green Valley Rd and Occidental Rd: Construct Class I bike path segments to close gaps in the trail	SON230001	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Sonoma	Son Co TA	Highway 116/121 Intersection Improvement Project	Sonoma County: Southwest of the City of Sonoma at the intersection of State Routes 116, and 121, and Bonneau Road: Improve intersection	SON150009	21-T07-056	EXEMPT (40 CFR 93.127) - Intersection signalization projects at individual intersections	Not Modeled
Sonoma	Son Co TA	Sonoma County - County-Wide SRTS Program	Sonoma County: Countywide: Safe Routes to Schools Education Program in schools, while encouraging schools to lead their own ongoing programs, with a goal of increasing active or shared modes of	SON170009	21-EN09-132	EXEMPT (40 CFR 93.126) - Grants for training and research programs	Not Modeled
Sonoma	Son Co Transit	Sonoma Co Transit: COVID-19 Emergency Transit Ops	Sonoma County Transit: Systemwide: Capital, planning and operating assistance related to the coronavirus public health emergency including costs to shutdown, maintain and restart service, purchase of	SON190007	21-T01-001	EXEMPT (40 CFR 93.126) - Emergency relief (23 U.S.C. 125)	Not Modeled
Sonoma	Son Co Transit	Sonoma County Transit: Replace 2009 CNG Buses	Sonoma County Transit: 40-foot CNG-Fueled Bus Fleet: Purchase Replacement Buses	SON170006	21-T01-002	EXEMPT (40 CFR 93.126) - Purchase of new buses and rail cars to replace existing vehicles or for	Not Modeled
Sonoma	Sonoma City	Fryer Creek Pedestrian and Bicycle Bridge	Sonoma: At Newcomb Street over Fryer Creek: Construct a new bicycle and pedestrian bridge and path as well as circulation and accessibility improvements to Newcomb Street and Fryer Creek Drive.	SON170022	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Sonoma	Sonoma County	Crocker Bridge Bike and Pedestrian Passage	Sonoma County: On existing north piers of Crocker Bridge: Construct a Class 1 bicycle and ped facility	SON170014	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Sonoma	Sonoma County	Replace Hauser Bridge over Gualala River 20C0240	In Sonoma: Bridge No.20C0240,Hauser Road Bridge over over South Fork Gualala River, 5 Mi east of Seaview Road. Replace existing one-lane bridge with a new two-lane bridge	SON110025	21-T01-005	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Sonoma	Windsor	Windsor River Road/Windsor Road Intersection Imps	Windsor: At the Windsor River Road/Windsor Road/SMART intersection: Construct rail crossing safety improvements, multi-use path, pedestrian and vehicle traffic improvements.	SON170001	21-T09-061	EXEMPT (40 CFR 93.126) - Railroad/highway crossing	Not Modeled

Note: Projects with a conformity analysis year of 2050 reference programmatic projects or projects with a completion date after 2040 in Plan Bay Area 2050.

Appendix B

List of New Projects in the 2023 TIP by County

County	Sponsor	Project Name	Project Descripion	TIP ID	RTP ID	Air Quality Descripion	Conformity Analysis Year
Non-Exempt							
Alameda	Fremont	Irvington BART Station	Fremont: Along the BART corridor in the Irvington District: Construct a new BART station	ALA230004	21-T11-104	NON-EXEMPT	2030
Exempt							
Alameda	ACTC	Alameda CTC: San Pablo Avenue Bus/Bike Lanes	Oakland, Emeryville, and Berkeley: Along San Pablo Avenue from 16th Street in Downtown Oakland to Heinz Street: Install pedestrian crossing improvements and dedicated bus lanes and bike lanes	ALA230008	21-T10-077	EXEMPT (40 CFR 93.126) - Traffic control devices and operating assistance other than signalization	Not Modeled
Alameda	ACTC	East Bay Greenway Multimodal (Phase 1)	Alameda County: Along the BART alignment following parallel arterial roadways from Lake Merritt BART Station to S. Hayward BART Station: Install Class I & Class IV bikeway facilities. Includes road diet	ALA230007	21-T08-060	EXEMPT (40 CFR 93.126) - Projects that correct, improve, or eliminate a hazardous location or feature	Not Modeled
Alameda	ACTC	San Pablo Ave Parallel Bike Improvements	Berkeley and Albany: Various locations along bicycle boulevard/neighborhood bikeway routes parallel to San Pablo Avenue: Install bicycle improvements including crossing safety, speed/volume control	ALA230010	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Alameda	ACTC	San Pablo Ave Safety and Bus Bulb Improvements	Berkeley and Albany: San Pablo Avenue in Berkeley and Albany from Heinz St to the Contra Costa County line: Install bus bulbs and pedestrian/bicycle crossing improvements	ALA230009	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Alameda	BART	DT Berkeley BART Station Elevator Modernization	Berkeley: At the Downtown Berkeley BART Station: Modernize station elevators	ALA230001	21-T01-002	EXEMPT (40 CFR 93.126) - Reconstruction or renovation of transit buildings and structures (e.g., rail	Not Modeled
Alameda	BART	Hayward Fleet Maintenance Facilities	BART: At the Hayward Maintenance Complex: Expand complex to accommodate additional rail vehicles; tire fleet maintenance; and support additional rail cars and new fleet preventative maintenance for	ALA230005	21-T01-002	EXEMPT (40 CFR 93.126) - Reconstruction or renovation of transit buildings and structures (e.g., rail	Not Modeled
Alameda	Fremont	I-680/Mission Boulevard Interchange Modernization	Fremont: I-680/Mission Blvd: Redesign the interchange to reduce the steep grade of the southbound off-ramp onto Mission Boulevard and incorporate a separated bicycle and pedestrian path along	ALA230003	21-T08-060	EXEMPT (40 CFR 93.127) - Interchange reconfiguration projects	Not Modeled
Alameda	Fremont	I-880/Decoto Road Interchange Modernization	Fremont: At the I-880/Decoto Road interchange: Reconstruct the existing interchange to include a new Class I trail and a dedicated bus lane in both directions of travel through the interchange.	ALA230002	21-T07-056	EXEMPT (40 CFR 93.127) - Interchange reconfiguration projects	Not Modeled
Alameda	Oakland	Reconnecting the Town (RAISE)	Oakland: On Broadway between Embarcadero West and 11th Street and Martin Luther King Jr. Way between 2nd and 7th: Implement bus reliability, pedestrian and bike way improvements	ALA230006	21-T10-073	EXEMPT (40 CFR 93.126) - Traffic control devices and operating assistance other than signalization	Not Modeled
Contra Costa	EB Reg Park Dis	Martinez Bay Trail Gap Closure	East Bay Regional Parks District: Along the Carquinez Loop Trail and SF Bay Trail in the vicinity of Berrellesa St: Close a 0.5 mile gap by constructing a shared-use path along with crossing improvements	CC-230001	21-T01-003	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled
Santa Clara	VTA	SR 237 Westbound On-Ramp at Middlefield Rd.	Mountain View: Along Middlefield Rd from Logue Dr to 400¿ south of the eastbound SR 237 off-ramp: Improve traffic operations and enhance safety and implement Complete Streets improvements	SCL230001	21-T06-043	EXEMPT (40 CFR 93.127) - Intersection channelization projects	Not Modeled
Sonoma	Son Co Reg Park	Sonoma County - West County Trail Gap Closures	Sonoma County: West County Trail along Green Valley Rd and Occidental Rd: Construct Class I bike path segments to close gaps in the trail	SON230001	21-T08-060	EXEMPT (40 CFR 93.126) - Bicycle and pedestrian facilities	Not Modeled

Appendix C

RTPID	Title	Scope	Regionally-Significant Elements[1]	Known Regionally-Significant Elements	Analysis Years[2] 2025	2030	2040	2050
21-T01-001	Operate & Maintain the Existing System | Baseline Public Transit Service Levels | Regional	This program includes funding to operate the Bay Area's baseline transit services. Improvements include operations, routine preventative maintenance, and investments to restore transit service hours to 2019 levels.	No					
21-T01-002	Operate & Maintain the Existing System | Public Transit Capital Assets | Regional	This program includes funding to maintain and replace the Bay Area's baseline transit capital assets. Improvements include vehicle rehabilitation or replacement; reconstruction or renovation of transit buildings and structures; and rehabilitation or reconstruction of track.	No					
21-T01-003	Operate & Maintain the Existing System | Local Streets & Roads | Regional	This program includes funding to operate and maintain the Bay Area's local streets and roads. Improvements include routine patching and pothole repair; sweeping and cleaning; signal operations; lighting; resurfacing or rehabilitation with no new capacity; preventative maintenance; and emergency repair.	No					
21-T01-004	Operate & Maintain the Existing System | Local Bridges | Regional	This program includes funding to operate and maintain the Bay Area's local bridges. Improvements include bridge rehabilitation, replacement or retrofitting with no new capacity.	No					
21-T01-005	Operate & Maintain the Existing System | Toll Bridges | Regional	This program includes funding to operate and maintain the Bay Area's seven state-owned toll bridges and generally implement the region's Toll Bridge Program. Improvements include toll bridge rehabilitation, replacement or retrofitting with no new capacity, and toll operations.	No					
21-T01-006	Operate & Maintain the Existing System | Highways | Regional	This program includes funding to operate and maintain the Bay Area's state highways and generally implement the State Highway Operation and Protection Program (SHOPP). Improvements include resurfacing and/or rehabilitation with no new capacity, preventative maintenance, and emergency repair.	No					
21-T01-007	Other Investments to Operate & Maintain the Existing System | Regional	This program includes funding to implement other programmatic investments to operate and maintain the Bay Area's transportation systems. This program generally implements county, transit agency and other local programs and initiatives to improve upon baseline transit conditions. Improvements include resurfacing and/or rehabilitation of local streets and roads; construction of new bus or rail storage/maintenance facilities; and modernization or minor expansions of transit structures and facilities outside existing right-of-way, such as stations or rail yards. Example investments include implementation of BART's Hayward Maintenance Complex, Electrical & Mechanical Infrastructure Program, and Seismic Retrofit Program; Marin Transit's Operations & Maintenance Facility; VINE's Maintenance Facility; and the Caldecott Tunnel (Bore 1 & 2) Modernization.	No					
21-T02-008	Community-Led Transportation Enhancements in Equity Priority Communities | Regional	This program includes funding to implement transportation priorities identified by the Bay Area's Equity Priority Communities. Improvements could include lighting and safety measures; improvements to transit stations and stops; and subsidies for shared mobility, like bike share or car share.	No					
21-T03-009	Seamless Mobility Enhancements | Regional	This program includes funding to deploy a smartphone app for trip planning, payment and real-time passenger information, and to implement county, transit agency and other local station access and mobility programs and initiatives. Improvements include bus stop modernization; small passenger shelters and information kiosks; transfer centers; and station access improvements, including wayfinding signage.	No					
21-T04-010	Regional Transit Fare Policy | Regional	This program includes funding to implement a streamlined fare structure across the Bay Area's transit operators and replace operator-specific fare programs with an integrated regional fare structure and means-based fare discount.	No					
21-T04-011	Local Transit Fare Policy | Regional	This program includes funding to implement county, transit agency and other local programs and initiatives to implement discount transit fare programs. This program includes funding to implement VTA's Measure B Affordable Fare Program.	No					
21-T05-012	Per-Mile Tolling | Regional	This program includes funding to implement toll infrastructure, such as toll gantries, to collect per-mile tolls charged to vehicles on the Bay Area's congested freeway corridors with transit alternatives. Toll corridors include: I-80 (ALA, CC, SOL); I-238 (ALA); I-280 (SF, SM, SCL); I-380 (SM); I-580 (ALA); I-680 (ALA, CC, SCL); I-880 (ALA, SCL); US-101 (MRN, SF, SM, SCL, SON); SR-4 (CC); SR-17 (SCL); SR-24 (ALA, CC); SR-85 (SCL); SR-87 (SCL); SR-92 (SM); SR-237 (SCL); and SR-242 (CC).	Yes	I-80 (ALA, CC); I-238 (ALA); I-280 (SF, SM, SCL); I-580 (ALA); I-680 (ALA, CC, SCL); I-880 (ALA, SCL); US-101 (SF, SM, SCL); SR-4 (CC), SR-24 (ALA, CC); SR-237 (SCL); SR-242 (CC)	x	x	x
				I-80 (CC, SOL); I-380 (SM); I-580 (ALA); US-101 (MRN, SF, SCL, SON); SR-4 (CC); SR-17 (SCL); SR-85 (SCL); SR-87 (SCL); SR-92 (SM)		x	x

RTPID	Title	Scope	Regionally-Significant Elements[1]	Known Regionally-Significant Elements	Analysis Years[2] 2025	2030	2040	2050
21-T06-013	Corridor & Interchange Improvements | I-80 | Contra Costa County	This program includes funding to implement interchange improvements at Central Ave, San Pablo Dam Rd and Pinole Valley Rd.	Yes	at San Pablo Dam Rd	x	x	x	x
21-T06-014	Corridor & Interchange Improvements | I-80 | San Francisco	This program includes funding to implement interchange improvements at Yerba Buena Island.	Yes	at Yerba Buena Island	*	x	x	x
21-T06-015	Corridor & Interchange Improvements | I-80 | Solano County	This program includes funding to implement interchange improvements at I-680/SR-12, Redwood Pkwy and Lagoon Valley Rd.	Yes	at I-680/SR-12 (Package 2A), Lagoon Valley Rd	x	x	x	x
				at I-680/SR-12 (Packages 3-5), Redwood Pkwy			x	x
				at I-680/SR-12 (Packages 6-7)				x
21-T06-016	Corridor & Interchange Improvements | I-280 | San Francisco	This program includes funding to implement interchange improvements at the Balboa Park Station area.	Yes	at the Balboa Park Station area	x	x	x	x
21-T06-017	Corridor & Interchange Improvements | I-280 | Santa Clara County	This program includes funding to implement interchange improvements at Lawrence Expy/Stevens Creek Blvd, Winchester Blvd, Wolfe Rd, Saratoga Ave, SR 85/Homestead Rd, Bird Ave, and between 3rd St and 7th St; braided ramps between Foothill Expy and SR-85; and new HOV lanes between Magdalena Ave and the Santa Clara/San Mateo county line.	Yes	at Winchester Blvd; between 3rd St and 7th St; new HOV lanes between Magdalena Ave and the Santa Clara/San Mateo county line			x	x
21-T06-018	Corridor & Interchange Improvements | I-380 | San Mateo County	This program includes funding to implement interchange improvements at US-101 and El Camino Real and a new eastbound freeway lane between I-280 and El Camino Real.	Yes	new eastbound freeway lane between I-280 and El Camino Real			x	x
21-T06-019	Corridor & Interchange Improvements | I-580 | Alameda County	This program includes funding to implement Design Alternatives Assessments between the Bay Bridge Toll Plaza and SR-238; for interchange improvements at Hacienda Dr/Fallon Rd and Santa Rita Rd/Tassajara Rd; and funding for a planning study to scope interchange improvements at I-680.	Yes	at Hacienda Dr, Fallon Rd/El Charro Rd			x	x
21-T06-020	Corridor & Interchange Improvements | I-580 | Richmond-San Rafael Bridge	This program includes funding to implement improvements to east side bridge access. It also reserves funding to implement permanent recommendations based on the third eastbound freeway lane pilot project and the westbound bicycle/pedestrian path pilot project.	No					
21-T06-021	Corridor & Interchange Improvements | I-680 | Alameda County	This program includes funding to implement interchange improvements at Stoneridge Dr.	Yes	at Stoneridge Dr			x	x
21-T06-022	Corridor & Interchange Improvements | I-680 | Contra Costa County	This program includes funding to implement interchange improvements at SR-4, as well as and new auxiliary lanes between Rudgear Rd and El Cerro Blvd and between Bollinger Canyon Rd and Alcosta Blvd.	Yes	at SR-4 (Phases 1-2)	~~*~~	x	x	x
				at SR-4 (Phase 4)		x	x	x
				at SR-4 (Phase 5); auxiliary lanes between Rudgear Rd and El Cerro Blvd; auxilary lanes between Bollinger Canyon Rd and Alcosta Blvd			x	x
21-T06-023	Corridor & Interchange Improvements | I-680 | Santa Clara County	This program includes funding to implement interchange improvements at Montague Expy, Alum Rock Ave and McKee Rd.	Yes	at Montague Expy			x	x
21-T06-024	Corridor & Interchange Improvements | I-880 | Alameda County	This program includes funding to implement interchange improvements on I-880 at Oak St/Union St, at Whipple Rd, at Winton Ave/A St, between 23rd Ave and 29th Ave, at 42nd Ave and High St, and at 5th Ave and Washington St.	Yes	at ~~Whipple Rd~~ and ~~Industrial Pkwy~~, 23rd Ave and 29th Ave	x	x	x	x
				at Whipple Rd and Industrial Pkwy; between Oak St and Broadway, Winton Ave and A St		x	x	x
21-T06-025	Corridor & Interchange Improvements | I-880 | Santa Clara County	This program includes funding to implement interchange improvements at Montague Expy.	No					

RTPID	Title	Scope	Regionally-Significant Elements[1]	Known Regionally-Significant Elements	Analysis Years[2] 2025	2030	2040	2050
21-T06-026	Corridor & Interchange Improvements | US-101 | Marin County	This program includes funding to implement interchange improvements at I-580 and a new southbound HOV lane between Novato and the Sonoma/Marin county line ("Marin-Sonoma Narrows").	Yes	new southbound HOV lane between Novato and the Sonoma/Marin county line ("Marin-Sonoma Narrows")	x	x	x	x
				at I-580		~~x~~	x	x
21-T06-027	Corridor & Interchange Improvements | US-101 | San Mateo County	This program includes funding to implement interchange improvements at SR-92, 3rd Ave, Holly St, Peninsula Ave, Produce Ave, Sierra Point Pkwy, University Ave, and Woodside Rd; and funding for a planning study to scope interchange improvements at Candlestick.	Yes	at ~~Holly St~~, ~~Peninsula Ave~~, ~~Produce Ave~~	~~x~~	~~x~~	~~x~~	~~x~~
				at Holly St, Peninsula Ave, Produce Ave, SR-92		x	x	x
21-T06-028	Corridor & Interchange Improvements | US-101 | Santa Clara County	This program includes funding to implement interchange improvements at SR-25, SR-237, Blossom Hill Rd, Buena Vista Ave, Ellis St, Mabury Rd/Taylor St, Moffett Blvd, Montague Expy, Old Oakland Rd, Shoreline Blvd, Trimble Rd/De La Cruz Blvd/Central Expy, Zanker Rd/Skyport Dr/Fourth St, and between San Antonio Rd and Charleston Rd/Rengstorff Ave; and ramp metering improvements in Morgan Hill and Gilroy.	Yes	at SR-25, Blossom Hill Rd, Trimble Rd/De La Cruz Blvd/Central Expy	x	x	x	x
				at Buena Vista Ave, Zanker Rd/Skyport Dr/Fourth St		x	x	x
				at SR-237, Mabury Rd/Taylor St			x	x
21-T06-029	Corridor & Interchange Improvements | US-101 | Sonoma County	This program includes funding to implement interchange improvements at Arata Ln, Hearn Ave, Railroad Ave, and Rainier Ave and new HOV lanes through Petaluma ("Marin-Sonoma Narrows").	Yes	at Arata Ln	x	x	x	x
				at Railroad Ave			x	x
21-T06-030	Corridor & Interchange Improvements | SR-1 | San Mateo County	This program includes funding to implement interchange improvements at Manor Dr and safety and operational improvements in Half Moon Bay and between Half Moon Bay and Pacifica.	Yes	at Manor Dr		x	x	x
21-T06-031	Corridor & Interchange Improvements | SR-4 | Contra Costa County	This program includes funding to implement Integrated Corridor Mobility between I-80 and SR-160 and operational improvements between Port Chicago Hwy and San Marcos Blvd/Willow Pass Rd.	Yes	EB and WB operational improvements between Port Chicago Hwy and San Marcos Blvd/Willow Pass Rd	~~x~~	x	x	x
				Integrated Corridor Mobility between I-80 and SR-160; ~~WB operational improvements between Port Chicago Hwy and San Marcos Blvd/Willow Pass Rd~~			x	x
21-T06-032	Corridor & Interchange Improvements | SR-17 | Santa Clara County	This program includes funding to implement interchange improvements at SR-9.	Yes	at SR-9		x	x	x
21-T06-033	Corridor & Interchange Improvements | SR-24 | Contra Costa County	This program includes funding to implement interchange improvements at Camino Pablo and a new eastbound auxiliary lane between Wilder Rd and Camino Pablo.	Yes	new eastbound auxiliary lane between Wilder Rd and Camino Pablo			x	x
21-T06-034	Corridor & Interchange Improvements | SR-29 | Napa County	This program includes funding to implement interchange improvements at SR-221 ("Soscol Junction"), Lincoln Ave, Madison St, Trower Ave, and Airport Blvd ("Airport Junction"); operational and multimodal improvements between Napa Junction and American Canyon Rd; and new highway lanes between SR-37 and American Canyon.	Yes	at SR-221 ("Soscol Junction")	x	x	x	x
				at Airport Blvd ("Airport Junction")			x	x
				new highway lanes between SR-37 and American Canyon.				x
21-T06-035	Corridor & Interchange Improvements | SR-37 | Multiple	This program includes funding to implement new HOV lanes between Mare Island and Sears Point and toll infrastructure to collect tolls charged to westbound vehicles.	Yes	new HOV lanes between Mare Island and Sears Point	~~x~~	x	x	x
21-T06-036	Corridor & Interchange Improvements | SR-37 | Solano County	This program includes funding to implement interchange improvements at Fairgrounds Dr.	Yes	at Fairgrounds Dr	~~x~~	x	x	x
21-T06-037	Corridor & Interchange Improvements | SR-84 | Alameda County	This program includes funding to implement interchange improvements at I-680 and new highway lanes between Ruby Hill Dr and I-680.	Yes	new highway lanes between Ruby Hill Dr and I-680	x	x	x	x
21-T06-038	Corridor & Interchange Improvements | SR-84 | Dumbarton Bridge	This program includes funding to implement the Gateway 2020 Study, including access improvements to the west side of the Dumbarton Bridge, and Dumbarton Corridor Transportation Studies at US-101, including phased implementation of near-term recommendations and environmental studies for long-term recommendations.	No					

RTPID	Title	Scope	Regionally-Significant Elements[1]	Known Regionally-Significant Elements	Analysis Years[2] 2025	2030	2040	2050
21-T06-039	Corridor & Interchange Improvements | SR-85 | Santa Clara County	This program includes funding to implement interchange improvements at SR-237 and El Camino Real; auxiliary lane improvements between El Camino Real and SR-237; and a new eastbound auxiliary lane between SR-85 and Middlefield Rd.	No					
21-T06-040	Corridor & Interchange Improvements | SR-87 | Santa Clara County	This program includes funding to implement interchange improvements at Capitol Expy/Narvaez Ave and technology-based operational improvements between US-101 and SR-85.	No					
21-T06-041	Corridor & Interchange Improvements | SR-92 | Alameda County	This program includes funding to implement interchange improvements at Clawiter Rd.	Yes	at Clawiter Rd		x	x	x
21-T06-042	Corridor & Interchange Improvements | SR-152 | Santa Clara County	This program includes funding for a planning study to scope a new alignment between US-101 and SR-156.	No					
21-T06-043	Corridor & Interchange Improvements | SR-237 | Santa Clara County	This program includes funding to implement interchange improvements at SR-85, Great American Pkwy, Lawrence Expy/Caribbean Dr, Java Dr, Maude Ave, and Middlefield Rd; intersection improvements at El Camino Real/Grant Rd; a new westbound auxiliary lane between McCarthy to N 1st St; new eastbound auxiliary lanes between Mathilda Ave and Fair Oaks Ave; and new auxiliary lanes between Coyote Creek/Zanker Rd to N 1st St.	Yes	new westbound auxiliary lane between McCarthy to N 1st St	*	*	x	x
				new eastbound auxiliary lanes between Mathilda Ave and Fair Oaks Ave; and new auxiliary lanes between Coyote Creek/Zanker Rd to N 1st St.		x	x	x
21-T06-044	Corridor & Interchange Improvements | SR-239 | Contra Costa County	This program includes funding for a planning study to scope a new alignment between Brentwood and Tracy.	No					
21-T06-045	Corridor & Interchange Improvements | SR-242 | Contra Costa County	This program includes funding to implement interchange improvements at Clayton Rd.	Yes	at Clayton Rd			x	x
21-T06-046	Corridor & Interchange Improvements | SR-262 | Alameda County	This program includes funding to implement interchange improvements at I-680 and new freeway lanes between I-680 and I-880.	Yes	at I-680; new freeway lanes between I-680 and I-880				x
21-T06-047	Corridor & Interchange Improvements | New Freeway | Contra Costa County	This program includes funding to implement new freeway lanes and interchange improvements on SR-4/Vasco Rd between Balfour Rd and Vasco Rd and a new 2-lane expressway between Vasco Rd and Byron Hwy.	Yes	new freeway lanes and interchange improvements on SR-4/Vasco Rd between Balfour Rd and Vasco Rd; new 2-lane expressway between Vasco Rd and Byron Hwy			x	x
21-T06-048	Other Investments to Improve Interchanges & Address Highway Bottlenecks | Regional	This program includes funding to implement other programmatic investments to improve interchanges and address highway bottlenecks. This program generally implements county and other local programs and initiatives to programmatically implement highway improvements. Improvements include interchange modifications and minor lane additions or lane extensions of less than 1/4-mile (i.e., highway or freeway lane, auxiliary lane, or HOV lane). Example investments include implementation of VTA's Envision Highway Minor Projects.	Yes	Envision Highway Minor Projects (SCL)				x
21-T06-049	Bay Area Forward Program | Regional	This program includes funding to implement initiatives to maximize the efficiency of freeway and arterial systems through active traffic demand management and multi-modal strategies. Improvements include implementation of toll bridge corridor "forward" programs, adaptive ramp metering, adaptive signal timing with transit signal priority, bus on shoulder lanes, congestion pricing on toll bridge corridors, arterial first and last mile solutions, and shared mobility pilot deployments.	Yes	active traffic demand management, toll bridge corridor "forward" programs, adaptive ramp metering, adaptive signal timing with transit signal priority, bus on shoulder lanes, congestion pricing on toll bridge corridors	x	x	x	x
21-T07-050	511 Bay Area Program | Regional	This program includes funding to support the 511 Bay Area Program, which provides multi-modal traveler information.	No					

RTPID	Title	Scope	Regionally-Significant Elements[1]	Known Regionally-Significant Elements	Analysis Years[2] 2025	2030	2040	2050
21-T07-051	All Electronic Tolling Program | Regional	This program includes funding to support the All-Electronic Tolling Program, which converts the seven state-owned toll bridges to Open Road Tolling. Improvements include procurement of a new toll system and overhead gantries, improvements to roadway infrastructure to allow for high-speed tolling, and support of a regional customer service center.	No					
21-T07-052	Carpool/Vanpool Program | Regional	This program includes funding to provide carpool-matching tools and encourage carpool behavior through outreach, education, rewards, incentives and new technology.	No					
21-T07-053	Connected Bay Area Program | Regional	This program includes funding to implement the Connected Bay Area Program, which improves and integrates system infrastructure and operations to manage the region's transportation network. Improvements include the Regional Communication Infrastructure Network, the Incident Management Program, and the Transportation Management Center & Communications.	No					
21-T07-054	Motorist Aid Services Program | Regional	The program includes funding to support the Freeway Service Patrol, Call Box programs and other motorist aid activities.	No					
21-T07-055	Minor Freight Improvements | Regional	This program includes funding to implement freight improvements throughout the Bay Area. This program generally implements programs that improve freight operations and support the Port of Oakland. Improvements include new weigh stations and rest areas and improvements to existing freight terminals and freight rail. Example projects include grade separation improvements at 7th Street at the Port of Oakland and improvements at the I-80 Westbound Truck Scales in Cordelia.	Yes	grade separation improvements at 7th Street at the Port of Oakland (ALA)	~~x~~	x	x	x
21-T07-056	Minor Roadway Improvements | Regional	This program includes funding to implement minor roadway improvements. This program generally implements projects exempt from regional air quality conformity, but it does include non-exempt local roadway widenings or extensions. Improvements include local road extensions or new lanes, and intersection improvements such as channelization and signalization. Example projects include improvements to Oakland Army Base, Quarry Lakes Pkwy, Decoto Rd, Dublin Blvd, El Charro Rd, and Auto Mall Pkwy (ALA); Newell Dr and Airport Junction (NAP); implementation of Envision Expy program, Calaveras Blvd, and Mary Ave (SCL); Hunters Point Shipyard and Candlestick Point, Alemany Rd, and Treasure Island (SF); and Farmers Ln (SON).	Yes	Dougherty Rd, ~~Dublin Blvd~~, ~~North Canyons Pkwy~~, ~~Tassajara Rd~~ (ALA); ~~Brentwood Blvd~~, ~~Crow Canyon Rd~~, Laurel Rd, Lone Tree Way, San Ramon Blvd, Willow Pass Rd (CC); Novato Blvd (MRN); SR-29 (NAP); 10th St Bridge, ~~Montague Expy~~ (SCL); Peabody Rd (SOL)	x	x	x	x
				Dublin Blvd, North Canyons Pkwy, Tassajara Rd, Union City Blvd (ALA); Brentwood Blvd, Camino Tassajara Rd, Crow Canyon Rd, E Cypress Rd, W Leland Rd (CC); Mary Ave, Montague Expy, Oakland Rd (SCL); Jepson Pkwy (SOL)		x	x	x
				Auto Mall Pkwy, Decoto Rd, El Charro Rd, Quarry Lakes Pkwy (ALA); Pittsburg-Antioch Hwy (CC); Newell Dr, Soscol Ave, Trower Ave (NAP); Brokaw Bridge, Calaveras Blvd, Lawrence Expy, San Thomas Expy, Envision Expy Program (SCL)		x	x	
21-T07-057	Technology Improvements | Regional	This program includes funding to implement technology improvements on the Bay Area's transportation systems. This program generally implements county, transit agency and other local management systems' travel demand management and emissions reduction technologies programs and initiatives. Improvements include incident management; signal coordination; Intelligent Transportation Systems; Traffic Operations Systems/Congestion Management Systems; ramp metering; Computer-Aided Dispatch/Automatic Vehicle Location; fare media; construction or renovation of power, signal and communications systems; toll management systems; toll media; car and bike share; alternative fuel vehicles and facilities; parking programs; carpool/vanpool; ridesharing activities; information, marketing and outreach; and traveler information.	Yes	Intelligent Transportation Systems (SM)				x
21-T07-058	Planning/Program | Regional	This program includes funding to support regional and local planning programs and initiatives to support implementation of Plan Bay Area 2050. Investments include planning, research, technical assistance and program implementation. Example regional projects include support for Priority Development Area (PDA) planning and implementation; the Bay Area Preservation Pilot revolving loan fund; and the Housing Incentive Pool pilot program to incentivize the production of affordable housing.	No					
21-T07-059	Financing/Reserve for Major Capital Projects | Regional	This program includes funding for financing costs of major capital projects (e.g., Caltrain Downtown Extension) and a funding reserve for projects with cost overruns.	No					
21-T08-060	Complete Streets Network | Regional	This program includes funding to implement a regional Complete Streets network with an emphasis on improvements near transit and in Equity Priority Communities. It also includes funding to implement county and local initiatives to support active transportation systems. Investments include new and extended bike and pedestrian facilities; minor bicycle and/or pedestrian facility gap closures; minor road diets (less than 1/4-mile); ADA compliance; landscaping; lighting; streetscape improvements; secure bike parking at transit stations; and support to local jurisdictions to maintain and expand car-free slow streets. Example projects include the Bay Trail (MUL), Bay Skyway (SF), Better Market Street (SF), East	Yes	Fruitvale Ave, Shattuck Ave, Telegraph Ave (ALA); Benicia Rd, West Texas Rd (SOL); Petaluma Blvd (SON)	x	x	x	x
				El Camino (SM); SR-29/Sonoma Blvd (SOL)		x	x	x
				Military West (SOL)			x	x

RTPID	Title	Scope	Regionally-Significant Elements[1]	Known Regionally-Significant Elements	Analysis Years[2] 2025	2030	2040	2050
		expand car-free slow streets. Example projects include the Bay Trail (MRN), Bay Skyway (SF), Better Market Street (SF), East Bay Greenway (ALA), and Urban Greenways and Trails (ALA).		Bay Skyway (SF)				x
21-T09-061	Regional Vision Zero Policy through Street Design and Reduced Speeds | Regional	This program includes funding to implement and advance a regional Vision Zero policy, which includes implementation of slower highways and streets through street design and automated enforcement, and other programmatic investments to advance Vision Zero policies. This program generally implements regional, county and local programs to support Vision Zero initiatives; Safe Routes to Schools programs; and the Highway Safety Improvement Program. Improvements include railroad/highway crossing improvements; warning devices; shoulder improvements; traffic control devices other than signalization; guardrails, median barriers and crash cushions; pavement marking; fencing; skid treatments; lighting improvements; widening narrow pavements with no added capacity; changes in vertical and horizontal alignment; transit safety, communications and surveillance systems; truck climbing lanes outside urban areas; and emergency truck pullovers.	No					
21-T10-062	Multimodal Transportation Enhancements | AC Transit and WETA | Alameda Point	This program includes funding to implement improvements to existing transit service in the City of Alameda. Improvements include new bus service on Appezzato Pkwy with dedicated lanes (15 min peak headways); new bus service between Fruitvale BART and Seaplane Lagoon (20 min headways); new crosstown express bus service between Harbor Bay Ferry Terminal and Alameda Main St Ferry Terminal (20 min peak headways); and new ferry service between Seaplane Lagoon and San Francisco Ferry Building (30 min peak headways).	Yes		x	x	x	x
21-T10-063	Multimodal Transportation Enhancements | SFMTA | Southeast San Francisco	This program includes funding to implement transportation enhancements in the Candlestick/Hunters Point Shipyard project area, including improvements to existing bus service; new express bus service to downtown San Francisco; and multi-modal corridors of streets, transit facilities, pedestrian paths and dedicated bicycle lanes.	Yes				x	x
21-T10-064	Local Bus | Modernization | VTA | Systemwide	This program includes funding to implement improvements to existing bus service. Improvements include transit priority infrastructure; transit signal priority; bus lanes; queue jumps; stop improvements; faster fare collection equipment; off-board fare collection; all-door boarding; and software and hardware upgrades for improved headway management.	Yes					x
21-T10-065	Local Bus | Service Frequency Boost | AC Transit | Systemwide	This program includes funding to implement improvements to AC Transit's existing local bus service. Improvements include frequency upgrades (5-10 min peak headways along routes 72/72M/72R, 18, 51A/B, 6, 20/21, 57, 40/40L, 97, 99, Tempo BRT, NL, F-local and F-Transbay) and local/rapid service on some routes.	Yes		x	x	x	x
21-T10-066	Local Bus | Service Frequency Boost | County Connection	This program includes funding to implement improvements to existing County Connection bus service, including frequency upgrades (15 min peak headways) on routes feeding BART stations.	Yes				x	x
21-T10-067	Local Bus | Service Frequency Boost | NVTA	This program includes funding to implement improvements to existing Napa VINE regional/local bus service. Improvements include frequency upgrades (30 min peak headways); expanded service hours (from 4am-12am); and Sunday service.	Yes				x	x
21-T10-068	Local Bus | Service Frequency Boost | SFMTA | Systemwide	This program includes funding to implement improvements to existing bus service, including Muni Forward transit priority improvements along Rapid and high-frequency transit corridors; transfer and terminal investments; street improvements in support of Vision Zero; route realignments; and frequency upgrades (4-8 min peak headways on routes 1, 7, 8, 14, 14R, 22, 24, 29, 30, 38, 38R, 44, 45 and 55).	Yes				x	x
21-T10-069	Local Bus | Service Frequency Boost | VTA | Systemwide	This program includes funding to implement improvements to existing VTA bus service, including Measure B Frequent Core Network frequency upgrades (15 min peak headways on routes 22, 23, 25, 26, 57, 60, 61, 64, 66, 68, 70, 72, 73 and 77).	Yes				x	x
21-T10-070	Local Bus | Service Frequency Boost | PDAs	This program includes funding to implement improvements to existing bus service in Priority Development Areas (PDAs) without existing high-frequency rail, ferry or bus service. Improvements include frequency upgrades (30 min peak headways) and reorganization and/or expansion of bus routes.	Yes	ALA	x	x	x	x
				CC, MRN, NAP, SM, SCL, SOL, SON		x	x	x
21-T10-071	Local Bus | Service Frequency Boost | Sonoma County	This program includes funding to implement improvements to existing bus service, including frequency upgrades (15 min peak headways on Santa Rosa City Bus routes 1, 2, 3, 4, 5, 6, 8, 9, 10 and 12; 30-80 min peak headways on Sonoma County Transit routes 30, 40, 48, 56 and 60; 30 min peak headways on Golden Gate Transit route 72).	Yes		x	x	x	x

RTPID	Title	Scope	Regionally-Significant Elements[1]	Known Regionally-Significant Elements	Analysis Years[2] 2025	2030	2040	2050
21-T10-072	Rapid Bus | Modernization | AC Transit | E 14th St/Mission St/Fremont Blvd	This program includes funding to implement new rapid bus service along E 14th St/Mission St/Fremont Blvd between the San Leandro and Warm Springs BART stations. Improvements include frequency upgrades (10 min peak headways for Route 10 and 20 min headways for Route 99), dedicated lanes and mobility hubs at BART stations.	Yes		x	x	x	x
21-T10-073	Rapid Bus | AC Transit | Modernization	This program includes funding to implement rapid transit improvements to existing bus service. Improvements include new rapid bus service; improved bus stops and stations; new/improved transit signal priority (including on-street and on-bus equipment); transit priority infrastructure; dedicated bus lanes; queue jumps; and frequency upgrades (5-12 min peak headways on routes 18, 20/21, 40, 57, 97 and NL).	Yes	Foothill Blvd (40), Fruitvale Ave (20/21), Grand Ave (NL), Shattuck Ave/Martin Luther Kind Jr Way (18)	x	x	x	x
				Broadway, Hesperian Blvd (97), MacArthur Blvd/40th St (57/NL), Telegraph Ave			x	x
21-T10-074	Rapid Bus | Modernization | VTA | El Camino Real	This program includes funding to implement rapid transit improvements to existing bus service along El Camino Real. Improvements include dedicated lanes, transit signal priority, improved stop infrastructure and new rolling stock.	Yes				x	x
21-T10-075	Rapid Bus | Contra Costa Co | Service Expansion | Antioch-Brentwood	This program includes funding to implement new bus service along SR-4 between Hillcrest eBART to Brentwood Intermodal Station. Improvements include frequency upgrades (20 min peak headways), rapid transit improvements and a new park-and-ride facility.	Yes				x	x
21-T10-076	BRT | Modernization | AC Transit | 23rd St	This program includes funding to implement new BRT service along 23rd St from Hercules to Contra Costa College, Richmond BART and the Richmond Ferry. Improvements include high-frequency service (10 min peak headways), queue jumps, transit signal priority, new vehicles, improved stops and possible bus-only lanes.	Yes			x	x	x
21-T10-077	BRT | Modernization | AC Transit | San Pablo Ave	This program includes funding to implement BRT improvements to existing bus service along San Pablo Ave from 20th St to Richmond Pkwy Transit Center. Improvements include frequency upgrades (5 min peak headways), improved stop infrastructure, merging of local/rapid stops, dedicated lanes and transit signal priority.	Yes			x	x	x
21-T10-078	BRT | Modernization | SamTrans | El Camino Real	This program includes funding to implement BRT improvements to existing bus service along El Camino Real from Daly City BART to Palo Alto Caltrain Station. Improvements include frequency upgrades (15 min peak headways), dedicated lanes (45% of route), transit priority infrastructure and transit signal priority.	Yes				x	x
21-T10-079	BRT | Modernization | SFMTA | Geary Blvd	This program includes funding to implement BRT improvements to existing bus service along Geary Blvd from Market St to 34th Ave. Improvements include frequency (5.5 min peak headways), dedicated lanes, transit signal priority and peak express service.	Yes		*	x	x	x
21-T10-080	BRT | Modernization | SFMTA | Geneva Ave/Harney Way	This program includes funding to implement BRT improvements to existing bus service along Geneva Ave/Harney Way. Improvements include dedicated lanes, transit signal priority, high-quality stations and transit priority infrastructure.	Yes		*	x	x	x
21-T10-081	BRT | Modernization | SFMTA | Van Ness Ave	This program includes funding to implement BRT improvements to existing bus service along Van Ness Ave from Mission St to Union St. Improvements include dedicated lanes, transit signal priority, high-quality stations and transit priority infrastructure.	Yes		x	x	x	x
21-T10-082	Light Rail | Service Expansion | SFMTA | Historic Streetcar	This program includes funding to extend Muni's existing E-line or F-line service from Fisherman's Wharf to Fort Mason through the historic railway tunnel between Van Ness Ave and the Fort Mason Center. Improvements include two new stations.	Yes			x	x	x
21-T10-083	Light Rail | Service Expansion | SFMTA | Chinatown ("Central Subway")	This program includes funding to extend Muni's existing T-line to Chinatown through the Central Subway. Improvements include light rail shuttles between Chinatown and Mission Bay (via the Mission Bay Loop) during peak periods and frequency upgrades (7 min peak headways, 4-5 mins with shuttle).	Yes		x	x	x	x
21-T10-084	Light Rail | Service Frequency Boost | SFMTA | Muni Forward	This program includes funding to implement improvements to Muni's existing N-line and E-line service. Improvements include Muni Forward transit priority infrastructure and frequency upgrades (N-line 4 min peak headways, and E-line 12 min peak headways).	Yes			x	x	x

RTPID	Title	Scope	Regionally-Significant Elements[1]	Known Regionally-Significant Elements	Analysis Years[2] 2025	2030	2040	2050
21-T10-085	Light Rail | Grade Separations & Modernization | VTA | Downtown San Jose	This program includes funding to implement improvements to VTA's existing light rail service in Downtown San Jose. Improvements include grade separation to create a subway between Diridon Station and Civic Center Station and frequency upgrades (7.5 min peak headways).	Yes					x
21-T10-086	Light Rail | Grade Separations & Modernization | VTA | North San Jose	This program includes funding to implement improvements to VTA's existing light rail service. Improvements include grade separations between Civic Center Station and Baypointe and frequency upgrades (7.5 min peak headways).	Yes					x
21-T10-087	Light Rail | Service Expansion | VTA | Eastridge	This program includes funding to extend VTA's existing Orange Line service from Alum Rock Station to the Eastridge Transit Center. Improvements include two new stations and elevated structures.	Yes		*	x	x	x
21-T10-088	Light Rail | Service Expansion | VTA | Stevens Creek Blvd	This program includes funding to implement new LRT service along Stevens Creek Blvd between De Anza College and Baypointe. Improvements include eight new stations, three-car trains and frequency upgrades (10 min peak headways).	Yes					x
21-T10-089	Light Rail | Service Expansion | VTA | Vasona	This program includes funding to extend VTA's existing Green Line service from Winchester Station to Vasona Junction. Improvements include two new stations, one infill station and three-car trains.	Yes				x	x
21-T10-090	Automated People Mover | Service Expansion | VTA | Mineta San Jose International Airport Connector Automated People Mover	This program includes funding to implement a new automated people mover service between San Jose International Airport and Diridon Station (5 min all-day headways).	Yes				x	x
21-T10-091	Congestion Pricing | Downtown San Francisco	This program includes funding to implement cordon-based congestion pricing for vehicles leaving and entering downtown San Francisco. Improvements include street improvements to support transit operations and cycling and pedestrian safety; frequency improvements on various Muni/SamTrans routes; transit signal priority; and dedicated bus lanes.	Yes		*	x	x	x
21-T10-092	Congestion Pricing | Treasure Island	This program includes funding to implement cordon-based congestion pricing for vehicles leaving and entering Treasure Island. Improvements include Muni bus frequency upgrades; free shuttles; a new ferry terminal; new ferry service between Treasure Island and the San Francisco Ferry Building; and new AC Transit express bus service to Oakland.	Yes				x	x
21-T10-093	Other Investments to Enhance Local Transit Frequency, Capacity & Reliability | Regional	This program includes funding to implement other programmatic investments to enhance local transit frequency, capacity and reliability. This program generally implements county, transit agency, and other local programs and initiatives to make bus and light rail travel faster and more reliable. Improvements include fleet and facilities expansions; transit corridor improvements; and transit station improvements.	Yes	Brentwood Intermodal Transit Center (CC); SR-29/Imola Park and Ride, Transit Signal Priority (NAP); Fairgrounds Dr Park and Ride (SOL)	x	x	x	x
				Oakley Park and Ride (CC)		x	x	x
				Park and Rides (NAP)			x	x
21-T11-094	Ferry | Service Frequency Boost | GGBHTD | Larkspur-San Francisco	This program includes funding to implement new ferry service between Larkspur and San Francisco Mission Bay (80 min peak headways); and improvements to existing ferry service between Larkspur and San Francisco, including frequency upgrades (20-25 min peak headways).	Yes		x	x	x	x
21-T11-095	Ferry | Service Frequency Boost | WETA	This program includes funding to implement improvements to existing ferry service between the San Francisco Ferry Building and Alameda/Oakland, Harbor Bay, Vallejo, Richmond and South San Francisco, including frequency upgrades (15-30 min peak headways).	Yes	Alameda/Oakland and Harbor Bay (ALA); Vallejo (SOL); South San Francisco (SM)	x	x	x	x
				Richmond (CC)		x	x	x
21-T11-096	Ferry | Service Expansion | WETA | Berkeley-San Francisco	This program includes funding to implement new ferry service between San Francisco and Berkeley, including a new terminal in Berkeley (30 min peak headways).	Yes			x	x	x

RTPID	Title	Scope	Regionally-Significant Elements[1]	Known Regionally-Significant Elements	Analysis Years[2] 2025	2030	2040	2050
21-T11-097	Ferry | Service Expansion | WETA | San Francisco Ferry Building-Mission Bay	This program includes funding to implement new ferry service between the San Francisco Ferry Building and Mission Bay, including a new terminal in Mission Bay (20 min peak headways).	Yes		*	x	x	x
21-T11-098	Ferry | Service Expansion | WETA | Redwood City-San Francisco-Oakland	This program includes funding to implement new ferry service between Oakland, San Francisco and Redwood City, including a new terminal in Redwood City (30 min peak headways).	Yes		*	x	x	x
21-T11-099	Ferry | Service Expansion | Private Service | Antioch-Martinez-Hercules-San Francisco	This program includes funding to implement new privately operated ferry service between San Francisco and Antioch, Martinez and Hercules, including new ferry terminals (2-5 peak trips per day).	Yes			x	x	x
21-T11-100	Hovercraft | Service Pilot | Private Service | Foster City-San Francisco	This program includes funding to implement new hovercraft service, as a pilot, between Foster City and San Francisco, including two basic hoverports (30 min peak headways).	Yes		x	x	x	x
21-T11-101	Rail | Modernization & Electrification | Caltrain/High Speed Rail | San Francisco to San Jose	This program includes funding to implement improvements to the Caltrain/High-Speed Rail Corridor. Improvements include corridor electrification between San Francisco and Tamien station in San Jose and frequency upgrades (6 trains per hour per direction in peak).	Yes		x	x	x	x
21-T11-102	Rail | Modernization & Electrification | Caltrain/High Speed Rail | San Jose to Pacheco Pass	This program includes funding to implement improvements to the Caltrain/High-Speed Rail Corridor. Improvements include corridor electrification south of Tamien station in San Jose and grade separations from San Jose through the Pacheco Pass.	Yes				x	x
21-T11-103	Rail | Grade Separations & Modernization | Caltrain/High Speed Rail	This program includes funding to implement improvements to the Caltrain/High-Speed Rail Corridor. Improvements include grade separations funded by Santa Clara County's Measure B and San Mateo County's Measure A, as well as future grade separations to enable High-Speed Rail service within the Bay Area's urban core.	Yes				x	x
21-T11-104	Rail | New Station | BART | Irvington Station	This program includes funding to implement a new BART rail station at Irvington in Fremont, including a park-and-ride facility and complementary route changes to existing AC Transit bus service.	Yes			x	x	x
21-T11-105	Rail | Service Frequency Boost | ACE | System	This program includes funding to implement improvements to existing ACE service between San Joaquin County and San Jose, including frequency upgrades (8 daily roundtrips).	Yes	5 daily roundtrips	x	x	x	x
				6 daily roundtrips		x	x	x
				7 daily roundtrips			x	x
				8 daily roundtrips				x
21-T11-106	Rail | Service Frequency Boost | BART | System ("Core Capacity")	This program includes funding to implement improvements to existing BART service, including frequency upgrades (12 min peak headways).	Yes			x	x	x
21-T11-107	Rail | Service Frequency Boost | Caltrain | System	This program includes funding to implement improvements to existing Caltrain rail service between San Francisco and San Jose, including frequency upgrades (8 trains per hour per direction in peak).	Yes				x	x
21-T11-108	Group Rapid Transit | Service Expansion | Redwood City-Newark ("Dumbarton Rail")	This program includes funding to implement new group rapid transit service between Redwood City and Newark, including seven new stations (1 min peak headways).	Yes				x	x

RTPID	Title	Scope	Regionally-Significant Elements[1]	Known Regionally-Significant Elements	Analysis Years[2] 2025	2030	2040	2050
21-T11-109	Rail | Service Expansion | BART | to Santa Clara ("Silicon Valley Phase II")	This program includes funding to extend BART's existing Green Line and Orange Line rail services from Berryessa to Santa Clara, including four new stations and park-and-ride facilities.	Yes			x	x	x
21-T11-110	Rail | Service Expansion | Caltrain/High Speed Rail | to Downtown San Francisco ("DTX")	This program includes funding to extend Caltrain rail service from 4th St/Townsend St in San Francisco to the Salesforce Transit Center in downtown San Francisco, including two new stations.	Yes			x	x	x
21-T11-111	Rail | Service Expansion | Capitol Corridor | to Coast Subdivision ("South Bay Connect")	This program includes funding to implement improvements to existing Capitol Corridor rail service between Oakland and Newark/Fremont. Improvements include relocation of rail service between Oakland Coliseum and Newark from the Niles Subdivision to the Coast Subdivision and one new station.	Yes			x	x	x
21-T11-112	Rail | Service Expansion | Oakland-San Francisco ("Link21")	This program includes funding to implement Link21, providing new transbay rail service between San Francisco and Oakland, including new stations in the East Bay and San Francisco (10 trains per hour per direction in peak).	Yes					x
21-T11-113	Rail | Service Expansion | SMART | to Windsor	This program includes funding to extend SMART rail service from the Sonoma County Airport in Santa Rosa to Windsor.	Yes		*	x	x	x
21-T11-114	Rail | Service Expansion | San Joaquin County-Dublin/ Pleasanton ("Valley Link")	This program includes funding to implement new rail service between San Joaquin Valley and the Dublin/Pleasanton BART station, including three new stations within Alameda County and three-car trains (12 min peak headways).	Yes			x	x	x
21-T11-115	Other Investments to Expand & Modernize the Regional Rail Network | Regional	This program includes funding to implement other programmatic investments to expand and modernize the regional rail network. This program generally implements county, transit agency and other local programs and initiatives to make rail and ferry travel faster and more reliable. Improvements include fleet and facilities expansion; track and structures; train control; traction power; and stations or terminals.	Yes	Oakley Amtrak Train Platform (CC)	x	x	x	x
				Hercules Train Station (CC); North Petaluma, San Rafael Transit Center (MRN)		x	x	x
21-T12-116	Express Lanes | Regional	This program includes funding to implement express lanes through HOV lane conversions on I-80 (ALA, CC), I-280 (SCL), I-680 (CC), I-880 (SCL), US-101 (SCL), SR-4 (CC), SR-84 (ALA), SR-85 (SCL), SR-87 (SCL), SR-92 (ALA); partial HOV lane conversions on I-80 (SOL), I-280 (SF), I-680 (CC), US-101 (SF); freeway lane conversions on I-80 (SOL), I-280 (SCL), I-580 (ALA), I-680 (SCL), I-880 (ALA); new lanes on I-80 (SOL), I-680 (ALA), I-880 (ALA), US-101 (SM); new dual lanes with HOV lane conversions on SR-85 (SCL); and new dual lanes on US-101 (SCL).	Yes	HOV lane conversions on US-101 (SCL), SR-85 (SCL); partial HOV lane conversions on I-80 (SOL); new dual lanes on US-101 (SCL)	x	x	x	x
				HOV lane conversions on I-80 (ALA, CC), I-680 (CC), I-880 (SCL), SR-4 (CC), SR-87 (SCL); partial HOV lane conversions on I-280 (SF), I-680 (CC), US-101 (SF); new lanes on I-680 (ALA), I-880 (ALA), US-101 (SM)		x	x	x
				HOV lane conversions on I-80 (ALA), I-280 (SCL), SR-84 (ALA), SR-92 (ALA); freeway lane conversions on I-80 (SOL), I-280 (SCL), I-580 (ALA), I-680 (SCL); new lanes on I-80 (SOL), I-680 (ALA); and new dual lanes with HOV lane conversions on SR-85 (SCL); new dual lanes on US-101 (SCL)			x	x
				freeway lane conversions on I-880 (ALA)				x
21-T12-117	Express Bus | Service Expansion | GGBHTD	This program includes funding to implement improvements to existing express bus service along US-101 and I-580, including frequency upgrades (20-40 min headways on routes 4, 18, 27, 101, 40X and 56X).	Yes		x	x	x	x
21-T12-118	Express Bus | Service Expansion | NVTA	This program includes funding to implement new express bus service between Napa (Redwood Park-and-Ride) and the Vallejo Ferry Terminal. Improvements include bus-on-shoulder facilities and new rolling stock.	Yes			x	x	x
21-T12-119	Express Bus | Service Expansion | SamTrans	This program includes funding to implement new express bus service along US-101 and I-280 (on express lanes where available) from Foster City, San Mateo and Burlingame to Downtown San Francisco; from San Mateo and Palo Alto to Western San Francisco; and from San Bruno to Sunnyvale. Improvements include park-and-ride facilities, ramp improvements and bus stop improvements (20 min peak headways).	Yes		*	x	x	x

RTPID	Title	Scope	Regionally-Significant Elements[1]	Known Regionally-Significant Elements	Analysis Years[2]			
					2025	2030	2040	2050
21-T12-120	Express Bus | Service Expansion | AC Transit | Transbay Corridor	This program includes funding to implement improvements to existing express bus service along I-80, I-580 and I-880 (on express lanes where available). Improvements include frequency upgrades (15 min peak headways on routes F, O, P, J, V and L) and planning for express bus expansion throughout the inner East Bay.	Yes					x
21-T12-121	Express Bus | Service Expansion | I-80	This program includes funding to implement new express bus service along I-80 (on express lanes where available) between Vallejo and Downtown Oakland, including park-and-ride facilities (15 min peak headways).	Yes			x	x	x
21-T12-122	Express Bus | Service Expansion | I-680	This program includes funding to implement new express bus service along I-680 (on express lanes where available) between Martinez and San Jose (20 min peak headways). Improvements include bus-on-shoulder and park-and-ride facilities.	Yes		*	x	x	x
21-T12-123	Express Bus | Service Expansion | SFMTA | US-101 & I-280	This program includes funding to implement improvements to existing express bus service along US-101 and I-280 (on express lanes where available), including frequency upgrades (10 min peak headways on routes 8BX and 14X).	Yes			x	x	x
21-T12-124	Express Bus | Modernization | US-101	This program includes funding to implement improvements to existing express bus service along US-101 between Novato and San Rafael, including bus-on-shoulder facilities.	Yes			x	x	x
21-T12-125	Express Bus | Service Expansion | SolTrans	This program includes funding to implement improvements to existing regional bus service. Improvements include frequency upgrades (15 min peak headways), transit signal priority, adaptive signal timing and ramp metering.	No					
21-T12-126	Express Bus | Service Expansion | ReX (Basic) | Blue Line (San Francisco to San Jose)	This program includes funding to implement new express bus service along US-101, SR-85 and I-280 (on express lanes where available) between San Francisco (Salesforce Transit Center) and San Jose (Diridon Station). Improvements include high-frequency service (10 min peak headways) and station area amenities like upgraded local bus stops, taxi/TNC loading zones, and improved bicycle/pedestrian infrastructure.	Yes		x	x	x	x
21-T12-127	Express Bus | Service Expansion | ReX (Basic) | Red Line (Oakland to Redwood City)	This program includes funding to implement new express bus service along I-580, I-238, I-880, SR-84 and US-101 (on express lanes where available) between Downtown Oakland (19th St BART Station) and Redwood City (Caltrain Station). Improvements include high-frequency service (10 min peak headways) and station area amenities like upgraded local bus stops, taxi/TNC loading zones, and improved bicycle/pedestrian infrastructure.	Yes				x	x
21-T12-128	Express Bus | Service Expansion | ReX (Premium) | Green Line (Vallejo to SFO Airport)	This program includes funding to implement new express bus service along I-80, I-280 and US-101 (on express lanes where available) between Vallejo and San Francisco International Airport. Improvements include high-frequency service (10 min peak headways); capital improvements such as in-line bus stations on freeways and arterials; and station area amenities like upgraded local bus stops, taxi/TNC loading zones, and improved bicycle/pedestrian infrastructure.	Yes			x	x	x
21-EN01-129	Sea Level Rise Adaptation Infrastructure | SR-37	This program includes funding to implement adaptation infrastructure along the SR-37 corridor from Novato to Vallejo. This program includes actions such as the elevation of critical infrastructure.	No					
21-EN01-130	Sea Level Rise Adaptation Infrastructure | Regional	This program includes funding to implement adaptation infrastructure in locations that are forecasted to be permanently inundated with two feet of sea level rise by 2050, providing protection from king tides and storms. This program includes actions such as the elevation of critical infrastructure and implementation of ecotone levees, traditional levees, sea walls, and marsh restoration and adaptation. Examples of adapting critical transportation infrastructure include I-880 (ALA), SR-84 (ALA), I-580/US-101/SMART (MRN), BART (MUL), SR-237/VTA (SCL), and US-101 (SM).	No					
21-EN08-131	Clean Vehicle Initiatives | Regional	This program includes funding to support the adoption and use of clean vehicles, which include more fuel-efficient vehicles and electric vehicles, through purchase incentives and deployment of charging and fueling infrastructure, in partnership with the Air District and the state. These investments would expand existing strategies in MTC's Climate Initiatives Program, which include a vehicle buyback & electric vehicle incentive program; a regional electric vehicle charger network; a clean vehicle feebate program; as well as new requirements for the electrification of Transportation Network Company vehicles and autonomous vehicles.	No					

RTPID	Title	Scope	Regionally-Significant Elements[1]	Known Regionally-Significant Elements	Analysis Years[2]			
					2025	2030	2040	2050
21-EN09-132	Regional Transportation Demand Management Initiatives | Regional	This program includes funding to support transportation demand management programs through MTC's Climate Initiatives Program, including a wide range of programs that discourage single-occupancy vehicle trips and support use of other travel modes. Programs include the Bay Area Commuter Benefits Program, vanpool programs, bikeshare and carshare services, targeted transportation alternatives programs, and a regional parking fee program.	No					

Notes:

(1) Regionally-significant is defined as a project which serves regional transportation needs and would normally be included in the modeling of a metropolitan area's regional transportation network.

(2) For this conformity analysis, the analysis years are 2025, 2030, 2040 and 2050 for the 2008 and 2015 ozone and 2006 PM2.5 standards.

Appendix D

PLAN BAY AREA 2050

FORECASTING AND MODELING REPORT

OCTOBER 2021

ASSOCIATION OF BAY AREA GOVERNMENTS

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Executive Summary

This report presents a technical overview of the forecasting and modeling processes performed in support of the Association of Bay Area Governments (ABAG) and the Metropolitan Transportation Commission's (MTC) Plan Bay Area 2050. The plan included several phases of modeling and analysis (described in detail in Chapter 1. This report focuses primarily on the later phases of the planning process, the Final Blueprint and Environmental Impact Report (EIR) analyses, as these phases built upon and refined work from prior phases like Horizon and the Draft Blueprint. The report includes details on each of the modeling components that are used to analyze the plan strategies.

The first step in the modeling process is the development of the **Regional Growth Forecast**, which uses the Regional Economic Models, Inc. (REMI) Policy Insight+ (or PI+) tool to forecast the growth in jobs by industry, housing units and population in the Bay Area. Custom inputs and adjustments to the model are described in detail in Chapter 2, as well as the post processes which derive household size and income distributions from this high-level Regional Growth Forecast. The second step in the modeling process is the application of the **Land Use Model**, which is used to forecast that regional growth in jobs and households at more specific geographies — jurisdictions and travel analysis zones — within the Bay Area. MTC and ABAG use Bay Area UrbanSim 2 (BAUS2) for this analysis, which is a custom variant of the UrbanSim model with additional features developed for policy priorities in the Bay Area. The third step in the modeling process is the application of the **Travel Model**, which simulates the travel of each forecasted Bay Area resident on an average weekday in a given model year as they travel to their workplace and other destinations using the planned transportation infrastructure. The travel modeling process includes a forecast of travel by different modes of transportation and analysis of greenhouse gas emissions generated from the vehicle miles traveled.

There are two additional data exchanges between these modeling components (described in more detail in the **Model System Overview**). First, staff incorporates feedback from the Land Use Model analysis into the Regional Growth Forecast to capture the effects of strategies that affect housing supply and prices as well as job locations and type; this feedback is new to the process and was not included in previous long-range plans. Second, staff incorporates feedback from the Travel Model analysis into the Land Use Model by feeding back measures of accessibility from the travel model into BAUS2. This means that transportation strategies, as well as overall traffic congestion, affecting accessibility can affect the value of commercial and residential development.

For each of these modeling tools, the respective section in the report describes the modeling methodology, including input assumptions inherent to all scenarios. Each section then includes details about how the strategies that comprise the Plan and the EIR Alternatives are represented in the modeling process. Finally, each section describes some high-level findings.

Between 2015 and 2050, the region's employment is projected to grow by 1.4 million to just over 5.4 million total jobs. Population is forecasted to grow by 2.7 million people to 10.3 million. This population will comprise over 4.0 million households, for an increase of nearly 1.4 million households from 2015. At a more local level, the Plan focuses that growth in both Transit-Rich Areas and High-Resource Areas while improving the jobs-housing balance in the region's most populous counties. The Plan also improves non-automobile mode shares, with substantial increases in transit boardings, while reducing vehicle miles traveled and greenhouse gas emissions per capita.

Chapter 1 | Introduction

Plan Bay Area 2050 modeling analysis was performed in several phases. As part of the **Horizon Initiative's Futures Planning**,[1] staff developed and studied three divergent what-if scenarios called "Futures" to identify how a range of forces could potentially shape the Bay Area. Futures Planning transcended previous scenario planning efforts by including a greater variety of political, technological, economic, and environmental challenges that will impact Bay Area residents.

Using the futures defined and modeled during Futures Planning, staff conducted the **Project Performance Assessment**[2] to understand how major transportation investments would fare in an uncertain future. By modeling major transportation projects and strategies within the context of the divergent futures, the Project Performance Assessment explored synergies between individual projects and strategies More information on the Project Performance Assessment process can be found in the Plan Bay Area 2050 Performance Report.

Before embarking on the core modeling effort of Plan Bay Area 2050, one further phase of modeling was performed: the **Incremental Progress Assessment**. Requested by the California Air Resources Board[3], the Incremental Progress Assessment enables "a normalized comparison, to the greatest degree feasible, of the previously submitted RTP/SCS [Regional Transportation Plan/Sustainable Communities Strategy] to the proposed RTP/SCS". This involved applying current exogenous variables and the updated modeling framework to the previous plan inputs – in this case, using the land use distribution and transportation networks from Plan Bay Area 2040. This assessment served to show the size of the region's greenhouse gas emissions reduction gap with respect to regional targets.

Building upon the earlier steps, the modeling team began the technical analysis for the plan, and the first step was the development of the **Regional Growth Forecast**. That is, before developing a localized growth pattern as part of the plan, a long-range regional growth forecast must be developed to identify the number of people, jobs and housing units required through 2050. The findings from this analysis — that the Bay Area must accommodate 1.5 million new homes (necessary to house the anticipated expanded population and address overcrowding) and 1.4 million new jobs — underpinned the remaining phases of modeling.

Informed by the results of the Horizon Initiative's Futures Planning and the Project Performance Assessment, 25 transportation, housing, economic and environmental strategies, alongside an expanded set of Growth Geographies, were developed and analyzed in the **Draft Blueprint**. After feedback from stakeholders and the public following findings from the Draft Blueprint analysis, these strategies were then refined and expanded into a set of 35 Plan strategies through the Final Blueprint phase. Throughout the Plan Bay Area 2050 process, a strategy is defined as a public policy or set of investments that can be implemented in the Bay Area at the city, county, regional or state level over the next 30 years. The Blueprint integrated critical strategies to address regional challenges, such as the Bay Area's severe and longstanding housing crisis. With infrastructure investments in walking, biking and public transportation — as well as critical sea level protections designed to keep most Bay Area communities from flooding through 2050 — the Blueprint made meaningful progress toward the adopted Plan Bay Area 2050 vision and advanced critical climate and equity goals. Additionally, three additional alternatives were developed for analysis in the Environmental Impact Report: the **EIR Alternatives** (including the No Project Alternative).

In the sections that follow, input assumptions and methodology primarily refer to the modeling done for the Final Blueprint, hereby referred to as the **Plan** and **EIR Alternatives**.

1 See more information about Horizon and Futures Planning: https://www.planbayarea.org/2050-plan/horizon.

2 See more information about the Horizon/Plan Bay Area 2050 Project Performance Assessment: https://mtc.ca.gov/our-work/plans-projects/horizon/project-performance-assessment.

3 See CARB's Final Sustainable Communities Strategy Program and Evaluation Guidelines: https://ww2.arb.ca.gov/sites/default/files/2019-11/Final%20SCS%20Program%20and%20Evaluation%20Guidelines%20Report.pdf.

Consistency with the Regional Housing Needs Allocation

Plan Bay Area 2050 identifies Growth Geographies and strategies for the next 30 years, whereas the Regional Housing Needs Allocation is a short-to-medium term housing allocation process, distributing growth as assigned by California Housing and Community Development. While each process is subject to a different set of objectives established by state and/or federal law, Plan Bay Area 2050 contains a range of strategies that would bolster housing production and increase zoned capacity in identified Growth Geographies. The estimated impact of the full bundle of strategies is that by 2050, the region would have an additional 1.4 million households and 1.5 million housing units (see Table 8), well above the 441,000 housing-unit need identified for the 8-year period from 2023-2031. Given that Plan Bay Area 2050 accommodates more than three times the number of new housing units required in the next eight years, staff can confirm that Plan Bay Area 2050 identifies areas within the region "sufficient to house an eight-year projection of the regional housing need for the region."

Model System Overview

Analysis for Plan Bay Area 2050 involves a sequence of modeling tools used together to create and study the scenarios of interest. The Regional Growth Forecast is the first step, identifying how much the Bay Area might grow between the plan baseline year (2015) and the plan horizon year (2050), including population, jobs, households, and associated housing units. The location of these households and jobs are then projected on a more localized level throughout the Bay Area by the Land Use Model (Bay Area UrbanSim 2, hereby referred to as BAUS2), which represents the potential effects of land use strategies and infrastructure investments. These first two models each represent the entire sequence of years in five-year increments, starting with the plan baseline year and ending at the plan horizon year. Finally, the Travel Model is used to analyze an average weekday for a single given model year, simulating a day's worth of travel for each Bay Area resident given their daily activities and enabling staff to understand the effects of transportation strategies on daily vehicle miles traveled, transit ridership and active transportation.

The strategies that comprise the Plan and the EIR Alternatives are listed below, along with the modeling tools used to quantify them. The column with the heading "Off-Model" refers to analysis done to quantify the effects of these strategies outside of the other modeling tools. More detail on the off-model processes used to estimate greenhouse gas emissions can be found in the section Off-Model Calculations. Some strategies were represented consistently across the Plan and EIR Alternatives 1 and 2; these are noted as "Included in all EIR Alternatives except No Project." Some strategies are included in the different alternatives with different details depending on the alternative; these are noted as "Variants included in all EIR Alternatives (except No Project)." Further information about how the strategies are represented in the modeling tools can be found in the Strategy Implementation section within the larger section on that modeling tool.

Table 1. Strategy modeling tools

STRATEGY	EIR ALTERNATIVES	REMI	BAUS2	TM1.5	OFF-MODEL
Housing | Protect and Preserve Affordable Housing					
H1: Further Strengthen Renter Protections Beyond State Law	Included in all EIR Alternatives except No Project	-	✓	-	-
H2: Preserve Existing Affordable Housing	Variants included in all EIR Alternatives	✓	✓	-	-
Housing | Spur Housing Production for Residents of All Income Levels					
H3: Allow a Greater Mix of Housing Densities and Types in Growth Geographies	Variants included in all EIR Alternatives except No Project	✓	✓	-	-
H4: Build Adequate Affordable Housing to Ensure Homes for All	Variants included in all EIR Alternatives	✓	✓	-	-
H5: Integrate Affordable Housing into All Major Housing Projects	Included in all EIR Alternatives except No Project	✓	✓	-	-
H6: Transform Aging Malls and Office Parks into Neighborhoods	Variants included in all EIR Alternatives except No Project	✓	✓	-	-
Housing | Create Inclusive Communities					
H7: Provide Targeted Mortgage, Rental and Small Business Assistance to Equity Priority Communities	Variants included in all EIR Alternatives except No Project	-	-	-	✓
H8: Accelerate Reuse of Public and Community Land for Mixed-Income Housing and Essential Services	Variants included in all EIR Alternatives except No Project	✓	✓	-	-

STRATEGY	EIR ALTERNATIVES	REMI	BAUS2	TM1.5	OFF-MODEL
Economy | Improve Economic Mobility					
EC1: Implement a Statewide Universal Basic Income	Included in all EIR Alternatives except No Project	✓	-	-	✓
EC2: Expand Job Training and Incubator Programs	Included in all EIR Alternatives except No Project	✓	✓	-	-
EC3: Invest in High-Speed Internet in Underserved Low-Income Communities	Not modeled	-	-	-	-
Economy | Shift the Location of Jobs					
EC4: Allow Greater Commercial Densities in Growth Geographies	Variants included in all EIR Alternatives except No Project	-	✓	-	-
EC5: Provide Incentives to Employers to Shift Jobs to Housing-Rich Areas Well Served by Transit	Included in all EIR Alternatives except No Project	-	✓	-	-
EC6: Retain and Invest in Key Industrial Lands	Included in all EIR Alternatives except No Project	-	✓	-	-
EC7: Assess Transportation Impact Fees on New Office Developments	Included in EIR Alternative 1 only	-	✓	-	-
EC8: Implement Office Development Caps in Job-Rich Cities	Included in EIR Alternative 2 only	-	✓	-	-

STRATEGY	EIR ALTERNATIVES	REMI	BAUS2	TM1.5	OFF-MODEL
Transportation | Maintain and Optimize the Existing System					
T1: Restore, Operate and Maintain the Existing System	Variants included in all EIR Alternatives	✓	-	✓	-
T2: Support Community-Led Transportation Enhancements in Equity Priority Communities	Not modeled	-	-	-	-
T3: Enable a Seamless Mobility Experience	Included in all EIR Alternatives except No Project	-	-	✓	-
T4: Reform Regional Transit Fare Policy	Variants included in all EIR Alternatives except No Project	✓	-	✓	-
T5: Implement Per-Mile Tolling on Congested Freeways with Transit Alternatives	Included in all EIR Alternatives except No Project	✓	-	✓	-
T6: Improve Interchanges and Address Highway Bottlenecks	Variants included in all EIR Alternatives	✓	-	✓	-
T7: Advance Other Regional Programs and Local Priorities	Variants included in all EIR Alternatives	✓	-	✓	-
Transportation | Create Healthy and Safe Streets					
T8: Build a Complete Streets Network	Included in all EIR Alternatives except No Project	✓	-	✓	-
T9: Advance Regional Vision Zero Policy through Street Design and Reduced Speeds	Included in all EIR Alternatives except No Project	-	-	✓	-
Transportation | Build a Next-Generation Transit Network					
T10: Enhance Local Transit Frequency, Capacity and Reliability	Variants included in all EIR Alternatives	✓	-	✓	-
T11: Expand and Modernize the Regional Rail Network	Variants included in all EIR Alternatives	✓	-	✓	-
T12: Build an Integrated Regional Express Lanes and Express Bus Network	Variants included in all EIR Alternatives	✓	-	✓	-

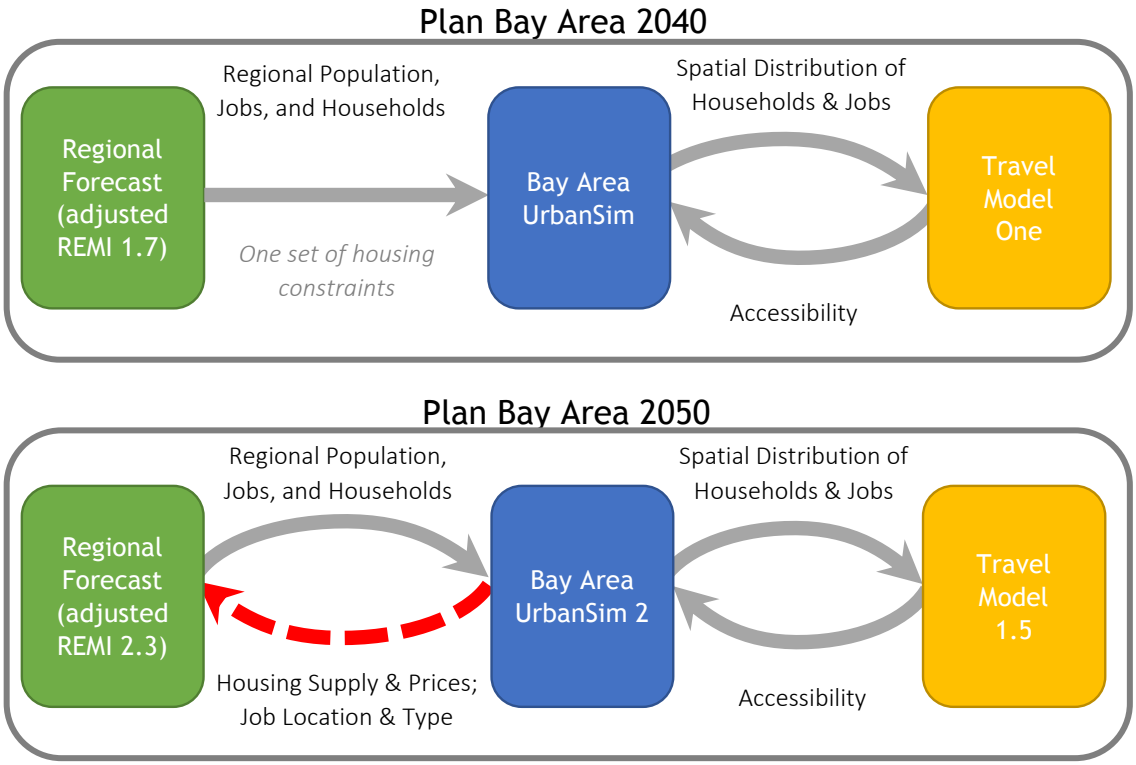
STRATEGY	EIR ALTERNATIVES	REMI	BAUS2	TM1.5	OFF-MODEL
Environment | Reduce Risks from Hazards					
EN1: Adapt to Sea Level Rise	Variants included in all EIR Alternatives	✓	✓	✓	-
EN2: Provide Means-Based Financial Support to Retrofit Existing Residential Buildings	Included in all EIR Alternatives except No Project	✓	-	-	✓
EN3: Fund Energy Upgrades to Enable Carbon-Neutrality in All Existing Commercial and Public Buildings	Included in all EIR Alternatives except No Project	-	-	-	✓
Environment | Expand Access to Parks and Open Space					
EN4: Maintain Urban Growth Boundaries	Variants included in all EIR Alternatives except No Project	-	✓		-
EN5: Protect and Manage High-Value Conservation Lands	Not modeled	-	-	-	✓
EN6: Modernize and Expand Parks, Trails and Recreation Facilities	Not modeled	-	-	-	✓
Environment | Reduce Climate Emissions					
EN7: Expand Commute Trip Reduction Programs at Major Employers	Included in all EIR Alternatives except No Project	-	✓	✓	-
EN8: Expand Clean Vehicle Initiatives	Included in all EIR Alternatives except No Project	-	-	-	✓
EN9: Expand Transportation Demand Management Initiatives	Included in all EIR Alternatives except No Project	-	-	✓	✓

Although these models are run in sequence, they are run multiple times and iteratively so that they interact with each other, and metrics produced by downstream models can factor into upstream models. For example, transportation strategies that affect travel accessibilities will affect land use outcomes because of the feedback from the Travel Model to Bay Area UrbanSim 2.

Regional Growth Forecast and Land Use Model Interaction

The Regional Growth Forecast, produced by MTC and ABAG staff using the Regional Economic Models, Inc. (REMI) demographic and economic model, and the land use model interact with each other in two ways. In previous plans, the Regional Growth Forecast identified the total amount of population, job, household, and housing unit growth, which was then forecast to grow in local areas using the Bay Area UrbanSim land use model based on strategies integrated into the plan.

Figure 1. Integrated model flow Plan Bay Area 2040 vs. Plan Bay Area 2050



The Bay Area's housing market is so far from equilibrium[4] that strategies to increase housing supply at all income levels (thereby lowering housing prices) would affect the location of firms, labor markets, households, housing markets, and city size.[5] Additionally, a housing market that is closer to equilibrium would be able to accommodate those priced out of the region into the megaregion and beyond, reducing in-commute need. To better capture the impact of changed local housing policies on regional housing prices and the overall regional growth trajectory, staff added a feedback link to the model flow, which would enable a more complete analysis of housing price outcomes. The new approach was informally referred to as the "Backward Arrow" during the Plan Bay Area 2050 process, shown in red in Figure 1 above.

To implement this feedback linkage, housing strategies were tested in Bay Area UrbanSim 2 to find a package to allow for the construction of sufficient low-income deed-restricted units and market-rate units by 2050 to drive down the housing cost to year 2000 levels. On the regional model side, staff worked within limitations of the REMI model; since it does not explicitly treat the count of housing units, the key lever used to represent the increase in housing supply was to adjust the model's representation of the region's housing prices relative to the nation. Therefore, staff adjusted the relative housing price and investment variables accordingly in REMI. Additionally, adjustments to headship rates and vacancy rates were made to reflect a healthier and more dynamic housing market to estimate household and housing unit numbers. These processes are discussed later in detail.

4 For further explanation, please see Edward Glaeser and Joseph Gyourko. "The Economic Implications of Housing Supply" NBER Working Paper No. 23833, September 2017.

5 For further explanation, please see Chang-Tai Hsieh and Enrico Moretti. "Housing Constraints and Spatial Misallocation" American Economic Journal: Macroeconomics. 2019, 11(2): 1–39.

Land Use Model and Travel Model Interaction

Bay Area UrbanSim 2 and Travel Model 1.5 work as a system to capture the interaction between transportation and land use. Accessibility to a variety of destinations and amenities is a key driver in both household and business location choice. For instance, households often prefer locations near employment, retail, and similar households but avoid other features such as industrial land use. Business preferences vary by sector with some firms looking for locations popular with similar firms (e.g., Silicon Valley) while others desire locations near an airport or university. In all cases, the accessibility between a given location in the region (defined as a transportation analysis zone or TAZ) and all other locations/TAZs is provided to BAUS2 by the Travel Model. This data represents overall regional accessibility for future years considering changing infrastructure and policy.

Moving in the other direction, BAUS2 provides the travel model with a projected land use pattern and spatial distribution of activities for each year into the future. This pattern includes the location of housing, jobs, and other activities that serve as the start and end locations for trips predicted by the travel model. This information is provided to the travel model at a TAZ level aggregation for each future year examined. Overall, the linkages between the two models allow land use patterns to evolve in relation to changes in the transportation system and for future travel patterns to reflect dynamic shifts in land use, thus representing long-term induced demand.

Forecast Modeling Suite

The Plan Bay Area 2050 Regional Growth Forecast identifies how much the Bay Area might grow between the plan baseline year (2015) and the plan horizon year (2050), including population, jobs, households, and associated housing units. The forecast also includes important components of that growth, including employment by sector, population by age and ethnic characteristics, and households by income level. These figures were then integrated into the Bay Area UrbanSim 2 land use model which explores how Plan strategies affect growth in households and employment at a local level.

The Plan Bay Area 2050 Regional Growth Forecast was primarily developed using the REMI (Regional Economic Models, Inc.) Policy Insight+ (or PI+) model version 2.3.1[6]; for the remainder of this report, REMI PI+ will be used interchangeably with REMI. The REMI PI+ model integrates into one package a dynamic accounting of the core components of the economy: industry structure and competitiveness relative to other regions, propensity to export, and population and labor market structure. The population is explicitly connected to industry growth and demand for labor, assuming that employment growth is a driving force of regional population and household growth, with migration increasing in times of strong employment growth. This is an updated version of the REMI PI+ model used to calculate the growth forecast for Plan Bay Area 2040, which used REMI PI+ version 1.7.8.

The model produces projections of population, employment, gross regional product, and labor force. To generate other key components of the Regional Growth Forecast, staff also developed a household model and a household income distribution model, built around the projections from the REMI analysis. Household projections are generated through a headship rate analysis. The household module uses the projected age and ethnic distribution of the adult population and a moving average of the percent in different age categories that are heads of household to project the number of households associated with demographic characteristics and size of the population.

The household income distribution analysis estimates the share of households in each of four mutually exclusive income groups, to coincide with analysis required in the transportation model. The share of households in low-, moderate-low-, moderate-high-, and high-income categories is estimated using a regression analysis which ties the share in each wage category with ethnic and age distribution, industry characteristics, relative housing prices, and per capita income.

Modeling Context

For decades, developing a Regional Growth Forecast has been a key element of the long-range transportation planning process for the Bay Area. However, in recent years, it has become apparent that critical issues need to be better addressed in the context of developing such a forecast.

The first is related to regional affordability. In Plan Bay Area 2040, it was estimated that the average share of lower-income household income spent on housing would rise by approximately 13 percentage points; this was due in part to the fact that regional housing strategies were limited in nature and affected only the geographic distribution of forecasted growth rather than overall level of housing growth in the Regional Growth Forecast itself. As part of this planning process, policymakers specifically asked “what it would take” to move the needle on affordability, but solutions for these affordability shortcomings were not identified in time for integration into that plan. Plan Bay Area 2050 presents an opportunity to integrate new housing strategies specifically designed to increase supply for all income levels — consistent with policymaker direction for Plan Bay Area 2050 — which will in turn contribute to a more affordable region and a slightly higher Regional Growth Forecast.

6 REMI PI+: https://www.remi.com/model/pi/.

The second is related to uncertainty. While required by statute, the creation of a single Regional Growth Forecast in prior cycles did not provide the opportunity to explore how different trajectories for regional growth would affect critical environmental, economic, and other goals. To address this gap, MTC and ABAG staff undertook the Horizon Initiative in 2018 and 2019, which explored not only how different growth trajectories would affect the region but also how the region could respond to those different trajectories through new strategies.

Both factors mean that developing the Regional Growth Forecast is a more policy-conscious effort, equally focused on contextual uncertainties as well as policy linkages and implications. Upon the kickoff of the Plan Bay Area 2050 cycle, staff accordingly worked with a technical advisory committee to make methodological refinements that incorporate lessons learned from both efforts. The methodology adopted by the ABAG Executive Board in September 2019 enables the Regional Growth Forecast to incorporate changes in strategies that would affect the level of growth in the region, while also affecting affordability, equity, economic mobility, and other critical outcomes.

MTC and ABAG staff developed a draft range for the Regional Growth Forecast forecasts based on the adopted methodology and sought feedback from technical stakeholders during winter 2020. The Final Regional Growth Forecast incorporates comments and feedback received; it also integrates the effects of key Plan strategies.

With the declaration of a public health emergency by the federal government on January 31, 2020, and shelter-in-place guidelines issued at the state- and countywide levels beginning in March 2020, it became clear that the virus would have a widespread impact on many facets of life, especially over the next one to ten years. The economic impact was recognized in February and March with stock markets declining and unemployment ticking upwards. Therefore, MTC and ABAG staff revised the forecast in April and May 2020, making changes to the employment numbers between 2020 and 2030 to reflect significant economic impacts from the coronavirus pandemic and the 2020 recession over the first ten years of the planning horizon; more details are provided below, in the section, Integrating COVID-19 Pandemic and Subsequent Recession. The revised Final Regional Growth Forecast was adopted in September 2020 with the approval of MTC Resolution No. 4437 and ABAG Resolution No. 16-2020.

REMI Modeling

The following sections first introduce the economic and demographic assumptions that underpin the Final Regional Growth Forecast, as well as adjustments made to the near-term forecast to integrate the impact of the recession spurred by the COVID-19 pandemic. This results in a "status quo" baseline forecast for the future of the Bay Area that reflects near-term economic impacts but does not fully accommodate regional growth in an affordable and equitable manner. The report then delves into how a selection of key strategies from the Plan were incorporated into the Final Regional Growth Forecast to meet the Plan's affordability goals.

Adjustments to REMI Baseline

Demographic Adjustments

Staff adjusted Hispanic international migration based on numbers from the most recent U.S. Census Bureau projections. Compared to Census projections, REMI PI+ 2.3.1 using default inputs (REMI Default) projects 42,000 more Hispanic international migrants in 2020. The difference decreases for the next 30 years, and by 2050, the REMI Default projection is just 1,000 higher than the Census (See Table 2).

Table 2. Hispanic international migration - Census vs REMI PI+ 2.3 default

	2020	2030	2040	2050
Census Hispanic	414,000	412,000	410,000	391,000
REMI Unadjusted Hispanic	456,000	431,000	415,000	392,000
Census Total	1,010,000	1,064,000	1,098,000	1,110,000
REMI Unadjusted Total	1,111,000	1,112,000	1,113,000	1,113,000

SOURCE: REMI PI+ 2.3.1; Census 2017 National Population Projections

Therefore, staff updated REMI's Hispanic international migration assumptions using Census 2020, 2030, and 2040 numbers and interpolated for the in-between years, as the Census trends more closely align with observed data in recent years. The gender and age distributions from REMI were used to produce detailed Hispanic international migration for all years between 2020 and 2050. Additionally, in conversation with the California Department of Finance (DOF) about REMI birth rates, DOF noted that REMI fertility rates are projected to be slightly higher, notably for Hispanic individuals (which could overstate births). REMI Default birth rates are higher than DOF estimates, although somewhat lower than rates found in earlier REMI versions. As a result, staff also reduced Hispanic birth rates at the national level by 20%, consistent with observations from a variety of sources that indicated slowing Hispanic birth rates throughout the country as well as in Mexico. This adjustment lowers the total national population in 2050 by less than 0.3%.

Economic Adjustments

At the national level, staff adjusted the employment growth downward for the data processing sector. Data processing (which includes data processing, hosting, and related services) is projected to grow by 136% between 2018 and 2050 in REMI Default for the nation. REMI Default projects the average annual growth rate for this sector for 2018-2028 to be 2.2%, slightly above the BLS 2018-2028 forecast (2.1%). However, after 2030, REMI Default projects an average annual growth rate of roughly 3% for the data processing sector. Staff adjusted data processing employment using the 2020-2030 annual average growth rate from REMI and assuming a constant growth rate after 2030, which lowers the national total employment slightly.

The REMI Default forecast estimates that the region's share of the U.S. employment and population will continue to grow. The share of U.S. data processing jobs was estimated to grow from 18.5% to 22.5% in 2050. However, this contrasts sharply with historic experience. Based on Bureau of Economic Analysis (BEA) data, the Bay Area's share of total U.S. employment, even at peak periods, has never been above 2.9% and has not reached that level since the early 1990s. Staff identified sector shares to adjust and their period of adjustment, and created new regional controls that keep the share of some sectors constant after 2025 and after 2040, as shown in Table 3.

Table 3. Sector share adjustments made to REMI

1. Sectors with share constant after 2025 (basic sectors):
   - Oil and gas extraction
   - Mining (except oil and gas)
   - Support activities for mining
   - Beverage and tobacco product manufacturing
   - Wholesale trade
   - Data processing, hosting, and related services; Other information services
   - Broadcasting, except Internet
   - Telecommunications
   - Professional, scientific, and technical services
   - Management of companies and enterprises
   - Administrative and support services
2. Sectors with share constant after 2040 (local serving):
   - Construction
   - Retail trade
   - Transit and ground passenger transportation
   - Monetary authorities - central bank; Credit intermediation and related activities
   - Securities, commodity contracts, other investments; Funds, trusts, other financial vehicles

SOURCE: ABAG, MTC, and Center for Continuing Study of the California Economy

Relative Housing Price Adjustment

In REMI, the relative housing price influences overall population levels because it factors into the relative wage levels of the region, net of housing costs. Higher relative prices will make the region less attractive to new workers and labor costs more expensive, all other things equal. REMI does not account for absolute levels for current and future prices but instead provides a measure of relative prices for regions compared to national levels. Staff looked at U.S. Census Bureau American Community Survey (ACS) median home prices and Zillow reported home and rental prices to determine if the REMI relative housing price index had accurately reflected the relative strength of the Bay Area housing market. Based on a review of ACS and Zillow data, staff determined that the price difference was not fully captured in the REMI index. REMI Default shows Bay Area prices ranging from 1.3 times the national level in Solano to 3.6 times the national level in San Francisco in 2018 – with a weighted average of 2.8. Using Zillow homeowner and renter indices, the weighted average of this aggregated series is 3.1, 11% above the REMI price index. Staff used this higher ratio for 2018 for each county and maintained this proportional higher price through 2050. This relative housing price was utilized for adjusting the REMI Default.

Table 4. Relative housing price comparisons - REMI, ACS, and Zillow*

	ACS RELATIVE HOME VALUE	ZILLOW ALL HOME INDEX	ZILLOW RENTAL INDEX	ZILLOW AVERAGE ALL HOME AND RENTAL	REMI	ZILLOW RELATIVE TO REMI
Alameda	4.4	3.6	1.9	2.7	2.5	1.1
Contra Costa	3.5	2.5	1.7	2.1	2.1	1.0
Marin	5.5	4.4	2.4	3.4	3.3	1.0
Napa	3.4	3.3	1.8	2.6	2.0	1.3
San Francisco	6.2	7.0	2.7	4.9	3.6	1.4
San Mateo	6.2	5.9	2.3	4.1	3.5	1.2
Santa Clara	5.7	4.7	2.1	3.4	3.1	1.1
Solano	2.3	1.8	1.3	1.5	1.3	1.2
Sonoma	3.4	2.9	1.7	2.3	2.0	1.2
Weighted Average	**4.8**	**4.0**	**2.2**	**3.1**	**2.8**	**1.1**

SOURCE: ABAG and MTC from REMI PI+ 2.3.1, calculations from data from the American Community Survey, and Zillow Home Value Index (2018, Bay Area Counties and U.S.), Zillow Rental Index (2018, Bay Area Counties and U.S.). Weighted average calculated using California Department of Finance housing unit numbers.

***NOTE:** Staff used Zillow index only because it includes detailed rental information. ACS data was shown for reference in this table.

Integrating COVID-19 Pandemic and Subsequent Recession

While there was limited data at the time of the forecast revision, staff used the available information and consulted with, or reviewed, the work of other forecasters, including but not limited to estimates from the Congressional Budget Office, the UCLA Anderson Forecast (March 16th 2020 report), and the University of Michigan Research Seminar in Quantitative Economics (RSQE) forecast report (March 2020 release). Staff determined that while employment totals would be impacted significantly in the near term, the direct impact on population and households would be more limited as COVID-19 impacts are both nationwide and global.

To represent the near-term economic impacts of the recession caused by the pandemic along with the anticipated subsequent recovery, staff made changes to employment projections in the Plan Bay Area 2050 Final Growth Forecast for the years between 2020 and 2030 in REMI. The regional forecast is meant to represent a moderate growth trend over a thirty-year period and does not typically represent economic cycles. Even recognizing the unprecedented stimulus measures that have been put into place, the recovery from this event is likely to go on for several years. Over the longer term, the Bay Area is expected to return to the previously forecasted trend line by 2030.

Strategy Implementation

The Plan integrated critical strategies to address regional challenges, including the region's longstanding affordability crisis. These strategies would have implications for the level of growth in the region. For example, making the region more affordable would attract more residents who may have otherwise been priced out of the Bay Area. Similarly, the investment associated with building more housing would create more jobs and labor demand. Recognizing these dynamics, based off the baseline forecast, staff sought to incorporate the impacts of the strategies adopted for the Final Blueprint into the Regional Growth Forecast. These strategies impact all the models used, but in this section, the focus is on the REMI PI+ model. Ultimately, not every strategy is anticipated to have significant impacts on the Regional Growth Forecast; many strategies only need to be incorporated in BAUS2 and/or Travel Model 1.5. After reviewing the 35 strategies, staff determined that the following strategies would likely influence the Regional Growth Forecast, with impacts ranging widely across strategies (Table 5).

Table 5. Strategies incorporated in Final Regional Growth Forecast

CATEGORY	STRATEGY	MODEL INPUT ADJUSTMENTS
TRANSPORTATION	Restore, Operate and Maintain the Existing System	Increase investment in construction sector and government administrative spending
	Improve Interchanges and Address Highway Bottlenecks	
	Advance Other Regional Programs and Local Priorities	
	Build a Complete Streets Network	
	Enhance Local Transit Frequency, Capacity and Reliability	
	Expand and Modernize the Regional Rail Network	
	Build an Integrated Regional Express Lanes and Express Bus Network	
	Reform Regional Transit Fare Policy	Increase disposable income (consumer spending)
	Implement Per-Mile Tolling on Congested Freeways with Transit Alternatives	Decrease disposable income
HOUSING	Allow a Greater Mix of Housing Densities and Types in Growth Geographies	Decrease housing costs, increase investment in construction sector
	Accelerate Reuse of Public and Community Land for Mixed-Income Housing and Essential Services	
	Transform Aging Malls and Office Parks into Neighborhoods	
	Preserve Existing Affordable Housing	Increase disposable income (consumer spending) and government administrative spending
	Build Adequate Affordable Housing to Ensure Homes for All	
	Integrate Affordable Housing Into All Major Housing Projects	
ECONOMY	Implement a Statewide Universal Basic Income[7]	Adjust income distribution results outside REMI model
	Expand Job Training and Incubator Programs	Increase investment in manufacturing and education sectors
ENVIRONMENT	Adapt to Sea Level Rise	Increase investment in construction sector
	Provide Means-Based Financial Support to Retrofit Existing Residential Buildings	

7 The UBI strategy replaced the Childcare Subsidy strategy after the Draft Blueprint and the latter was modeled as part of the Regional Growth Forecast. However, staff expects the net impact of the Childcare Subsidy strategy on the region's economy and demographics to be negligible.

Transportation Strategies

The economic impact of transportation investments generally fits into two categories: (1) direct effects from spending — in operations and maintenance (O&M)[8] and construction of new projects – as well as multiplier effects; (2) enhanced economic competitiveness through improved network efficiency and congestion reduction (which reduces cost for businesses), as well as improved air quality and quality of life. While staff recognized the importance of capturing the comprehensive effects of the proposed transportation strategies, the forecast only considered the impact in the first category due to limited model capacities. Therefore, the forecast reflects a more conservative estimate of the transportation spending in the plan.

Seven of the transportation strategies include major investments in transportation infrastructure. These strategies were represented in the Regional Growth Forecast as increased demand within the construction industry and increased government administrative spending. The strategies were:

- T1: Restore, Operate and Maintain the Existing System
- T6: Improve Interchanges and Address Highway Bottlenecks
- T7: Advance Other Regional and Local Transit Projects
- T8: Build a Complete Streets Network
- T10: Enhance Local Transit Frequency, Capacity and Reliability
- T11: Expand and Modernize the Regional Rail Network
- T12: Build an Integrated Regional Express Lanes and Express Bus Network.

For the transportation strategy T4: Reform Regional Transit Fare Policy, staff anticipated that a $10 billion means-based fare discount, funded through existing transportation revenues, would increase transit subsidies, and allow for consumer spending reallocation (i.e., money saved would be spent on other commodities). In contrast, staff represented strategy T5: Implement Per-Mile Tolling on Congested Freeways with Transit Alternatives as a reduction in personal income.

Housing Strategies

Housing strategies are designed to spur housing production as well as to protect and preserve affordable housing. Boosting housing capacity is addressed through strategic zoning changes, seeking to support the development of housing throughout the region where appropriate. Staff assumed these zoning change-related strategies would allow and encourage private construction investment for market rate housing, which would help the region reach the goal of driving down its 2050 average housing cost, affecting the overall regional growth trajectory significantly. As mentioned in the Regional Growth Forecast and Land Use Model Interaction section, this was modeled in REMI by adjusting the relative housing price variable downward starting in 2022 so that by 2050 Bay Area home price relative to the U.S. would be back to 2001 levels.[9] Additionally, the level of residential construction investment was increased in the model based on expected housing development. Staff estimated the set of strategies to fund affordable housing protection, preservation, and production would allow consumer spending reallocation (95% of the subsidy provided) and increase government administrative spending (remaining 5%).

Economic Strategies

Economic strategies are primarily focused on improving economic mobility and shifting the location of jobs. Two of the strategies that are designed to improve economic mobility are included in the regional economic model: EC1: Implement a Statewide Universal Basic Income (UBI); and EC2: Expand Job Training and Incubator Programs. Other strategies designed to shift location of jobs are represented in the land use and travel models, but not reflected in the Regional Growth Forecast.

8 O&M is where most of the forecasted transportation revenues will be spent. Staff considers the current level of operations and maintenance spending sufficient to maintain existing conditions of the region's transportation assets. Therefore, staff did not simulate the impacts of these baseline investments separately. However, in cases where there are additional revenues to improve the condition beyond today's levels or to fund operations and maintenance demand necessitated by new projects, staff modeled the impacts of these investments.

9 Because in REMI, historical data dates to only 2001, relative housing price index of year 2001 level was used instead of the 2000 level.

Strategy EC1: Implement a Statewide Universal Basic Income is costly but provides many benefits to low and low-to-moderate income households. While the model's ability to capture the full effects of the UBI strategy is limited, staff tested the strategy in the REMI model through an increase in both taxation and spending, which resulted in a minimal to neutral economic impact. Given that the purpose of the strategy is to improve economic mobility, in the end staff updated the income distribution results outside the REMI model to represent its impact. Strategy EC2: Expand Job Training and Incubator Programs is represented by increasing investment in the manufacturing and education industries.

Environmental Strategies

Strategy EN1: Adapt to Sea Level Rise focuses on protecting the shoreline as well as critical transportation infrastructure in areas at risk. To the extent that there would be increases in capital projects spending such as building levees and infrastructure enhancements, staff increased demand for the construction industry using the REMI model.

Strategy EN2: Provide Means-Based Financial Support to Retrofit Existing Residential Buildings is estimated to cost $15 billion, of which staff assumed that $12 billion[10] was directly invested into the construction industry in the model. This was not modeled as increased consumer spending because staff assumed that without the subsidies, homeowners would not be incentivized to retrofit existing building at all.

Revenues to Fund Plan Strategies

Staff assumed that the current levels of government funding for programs, including transportation operations, maintenance, and investment will continue. Funding for the strategies included in the REMI model would be generated by additional taxes.

For the purposes of the Regional Growth Forecast, staff assumed that:

- Additional transportation revenues would be generated by a sales tax increase;
- Additional housing revenues would be generated by a business tax increase;
- Additional economic revenues would be generated by a personal income tax increase; and
- Additional environment revenues would be generated by a property tax increase.

10 The Draft Blueprint assumed a total cost of $20 billion for this strategy, and the $12 billion investment in the construction industry was based upon this assumption. While the Final Blueprint/Plan adjusted the total down to $15 billion, the $12 billion investment in the construction industry remained unchanged.

Households

In the Regional Growth Forecast, households are closely related to the age, racial and ethnic composition of the population, reflecting important patterns of how households are formed in relation to demographic features. Typically, young adults leave the home or migrate to an area and form their own households or share housing with others. For young adults, it is common to see relatively higher average household sizes. Some will pair up and form families, often with two adults in a household. Life events, such as divorce or loss of a partner in later years will be result in fewer adults per household in the upper half of the population age distribution. While children make up a sizeable chunk of the population, they only indirectly impact the number of households formed, and units occupied. The typical accounting framework relates the number of households to the number of adults: headship rates.

Headship rates, while serving to capture the propensity for a given group of adults to form households, also reflect a larger set of behavioral and economic conditions in a region, for which reason these rates vary between regions, and over time. Some ethnic groups are more prone to multi-generational households, which will be reflected in the headship rates. Further, in regions with higher housing costs, the propensity to form households is slightly lower than in more affordable regions. To project a future number of households, accordingly, staff needs information about the future population and its age and racial/ethnic structure.

Headship rates can change over time as behavior or economics change. As housing affordability is currently at historically low levels in the Bay Area and one of the plan goals is to increase housing affordability, current headship rates were assumed to represent a constrained housing market. With a proactive state and regional housing policy framework adjusting the capacity for housing, more households would be able to form than would be the case today. To practically reflect this, headship rates were set to transition from today's constrained levels to rates observed two decades ago, in effect "rolling back" the clock on the housing market.

Headship rates were set to vary by year, starting with observed rates from ACS 2012-2016 sample, and then transitioned to the somewhat higher rates found in Census 2000 Public Use Microdata Sample (PUMS). As this change took place over more than a decade, it was assumed this transition to a more accommodating housing market and associated household formation regime would take a more than a decade and a half – with a few years to allow for policy to become effective. Rates were thusly transitioned from existing rates starting in 2022, and gradually rolled back to 2000 levels, with the transition assumed to be complete by 2038. The practical effect of this is for a given population, a slightly larger number of households would result, reflecting a healthier and more dynamic housing market.

The rates are applied to the forecasted future household population, where the household population is segmented into the four racial/ethnic groups accounted for in REMI: Hispanic/Latinx; White, Not Hispanic; Black, Not Hispanic, and Other, Not Hispanic. The household population is further broken down into 15 five-year age groups, beginning at 15, and ending at 85 and over for a total of 60 age/ethnic and racial groups. The detailed headship rates for the years 2015, 2030 and 2050 for the final forecast are provided in Table 6. For many age groups, a small increase of rates can be observed from 2015 to 2050.

Table 6. Headship rates, by year, age group, race/ethnic group

RACE / ETHNICITY	BLACK-NON-HISPANIC			HISPANIC			OTHER-NON-HISPANIC			WHITE-NON-HISPANIC		
Age Group	2015	2030	2050	2015	2030	2050	2015	2030	2050	2015	2030	2050
Ages 15-19	0.02	0.02	0.03	0.01	0.02	0.02	0.01	0.02	0.03	0.01	0.01	0.02
Ages 20-24	0.14	0.18	0.23	0.11	0.12	0.15	0.13	0.15	0.18	0.15	0.19	0.25
Ages 25-29	0.32	0.36	0.43	0.24	0.26	0.29	0.27	0.28	0.30	0.34	0.38	0.44
Ages 30-34	0.40	0.44	0.51	0.37	0.38	0.39	0.40	0.41	0.42	0.47	0.49	0.51
Ages 35-39	0.48	0.51	0.56	0.41	0.42	0.44	0.47	0.46	0.44	0.51	0.52	0.54
Ages 40-44	0.54	0.55	0.58	0.45	0.46	0.49	0.48	0.48	0.48	0.53	0.54	0.56
Ages 45-49	0.56	0.57	0.60	0.48	0.49	0.51	0.50	0.50	0.50	0.56	0.57	0.58
Ages 50-54	0.61	0.62	0.65	0.49	0.50	0.51	0.49	0.49	0.49	0.57	0.58	0.60
Ages 55-59	0.58	0.61	0.65	0.49	0.50	0.51	0.48	0.48	0.49	0.58	0.59	0.61
Ages 60-64	0.64	0.66	0.69	0.49	0.49	0.49	0.44	0.45	0.46	0.60	0.61	0.64
Ages 65-69	0.67	0.68	0.70	0.48	0.48	0.49	0.44	0.44	0.43	0.62	0.64	0.66
Ages 70-74	0.74	0.74	0.75	0.51	0.52	0.54	0.43	0.43	0.44	0.65	0.66	0.67
Ages 75-79	0.72	0.73	0.75	0.49	0.53	0.59	0.44	0.45	0.47	0.66	0.68	0.70
Ages 80-84	0.66	0.69	0.73	0.53	0.54	0.55	0.44	0.47	0.52	0.70	0.72	0.74
Ages 85+	0.68	0.69	0.70	0.54	0.54	0.54	0.48	0.48	0.49	0.75	0.76	0.77

NOTE: Headship rates vary by year, starting with observed rates from U.S. Census Bureau, American Community Survey 2014-2018 sample, and are transitioned to higher rates found in U.S. Census Bureau, Census 2000 PUMS. Transition is from 2022-2038. Data is for the nine-county San Francisco Bay Area.

Income

After household counts have been projected, they are disaggregated further into income groups. Household income is an important predictor for housing location choices as well as travel behavior and is thus important to downstream analyses. The income distribution analysis considers structural characteristics of the region including demographic factors such as the age profile and ethnic mix, and economic factors such as the predominant industries and occupations in which people work, as well as the various sources of income (retirement income, public assistance income, wage and salary income) observed in the aggregate. The core translation performed is one where such overall factors of a regional economy are related to the share of households in each of four income groups. The relationship is based on observed county-level data for the nation's largest metropolitan areas, where economic and demographic variables serve as predictors of the relative shares in different household income groups.

The income categories are defined below. They were originally defined as approximate quartiles in 2000 dollars because that is the year of currency used in the Travel Model. Over the years as income inequality has risen, they have morphed into quantiles. The income quantiles presented below are used throughout the remainder of this report.

Table 7. Income quantile definitions used in the modeling system

QUANTILE	2000 DOLLARS	2020 DOLLARS
Q1: low-income	Less than $30,000	Less than $50,000
Q2: moderate-low-income	$30,000 to $60,000	$50,000 to $100,000
Q3: moderate-high-income	$60,000 to $100,000	$100,000 to $170,000
Q4: high-income	More than $100,000	More than $170,000

The relationship between regional economic performance and the distribution of incomes is complex and dependent on not just compensation practices but also how people group together to form households, decide whether to hold a job or retire, raise children, and a host of other considerations. These decisions themselves will vary over time, but there is much than can be seen from the data available. All other things equal, for example, locations with a relatively large share of management occupations may be expected to have more upper income households, while locations with a higher proportion receiving public assistance may conversely be expected to have more low-income households.

To capture such relationships, staff specified four regression models (using data from ACS at the county level) on the relationship between demographic and economic variables and share of households in each of the four income quartiles defined above, with a generally good fit.[11] These relationships are carried forward, with data from REMI on the future economy (employment, age, industry, occupation) used to predict the relative share of households in the four income groups, and those shares are applied to the projected household counts.

11 Because ordinary least squares (OLS) regressions are not limited to the range between 0 and 1, the predicted shares from the four models are scaled to sum to 100%, and the predicted shares are indexed to 2015 observed levels. The projection then moves the observed levels up or down depending on the index.

Findings: Regional Growth Forecast Results

Table 8 shows both the baseline forecast and the Plan Bay Area 2050 Final Regional Growth Forecast. The baseline forecast does not integrate regional strategies and represents a "status quo" future where regional goals such as affordability would not be achieved, in conflict with state requirements to fully accommodate future regional growth and affordability objectives established in the adopted Plan Bay Area 2050 Guiding Principles. As discussed previously, the Final Regional Growth Forecast incorporates the impacts of regional strategies on the region's economy, demographics and households.

In the Final Regional Growth Forecast, between 2015 and 2050, the region's employment is projected to grow by 1.4 million to just over 5.4 million total jobs. Population is forecasted to grow by 2.7 million people to 10.3 million. This population will comprise over 4.0 million households, for an increase of nearly 1.4 million households from 2015. The number of housing units is projected to grow by 1.5 million units. Compared to the baseline forecast, integrating the regional strategies and fully accommodating future residents led to 300,000 more jobs, 760,000 more people, 460,000 more households, and 480,000 more housing units.

Table 8. Plan Bay Area 2050 Baseline Forecast and Final Regional Growth Forecast

	2015	2020	2025	2030	2035	2040	2045	2050
BASELINE FORECAST								
Total Population	**	**	8,130,000	8,360,000	8,700,000	9,040,000	9,330,000	9,570,000
Total Employment	**	**	4,050,000	4,530,000	4,680,000	4,850,000	4,980,000	5,110,000
Total Households	**	**	2,930,000	3,080,000	3,230,000	3,370,000	3,490,000	3,580,000
Total Housing Units	**	**	3,050,000	3,240,000	3,400,000	3,550,000	3,670,000	3,770,000
FINAL REGIONAL GROWTH FORECAST								
Total Population	7,660,000	7,940,000	8,230,000	8,560,000	9,010,000	9,490,000	9,930,000	10,330,000
Total Employment	4,010,000	4,080,000	4,150,000	4,640,000	4,830,000	5,050,000	5,230,000	5,410,000
Total Households	2,680,000	2,760,000	2,950,000	3,210,000	3,500,000	3,710,000	3,890,000	4,040,000
Total Housing Units	2,710,000	2,840,000	3,060,000	3,370,000	3,670,000	3,900,000	4,080,000	4,250,000

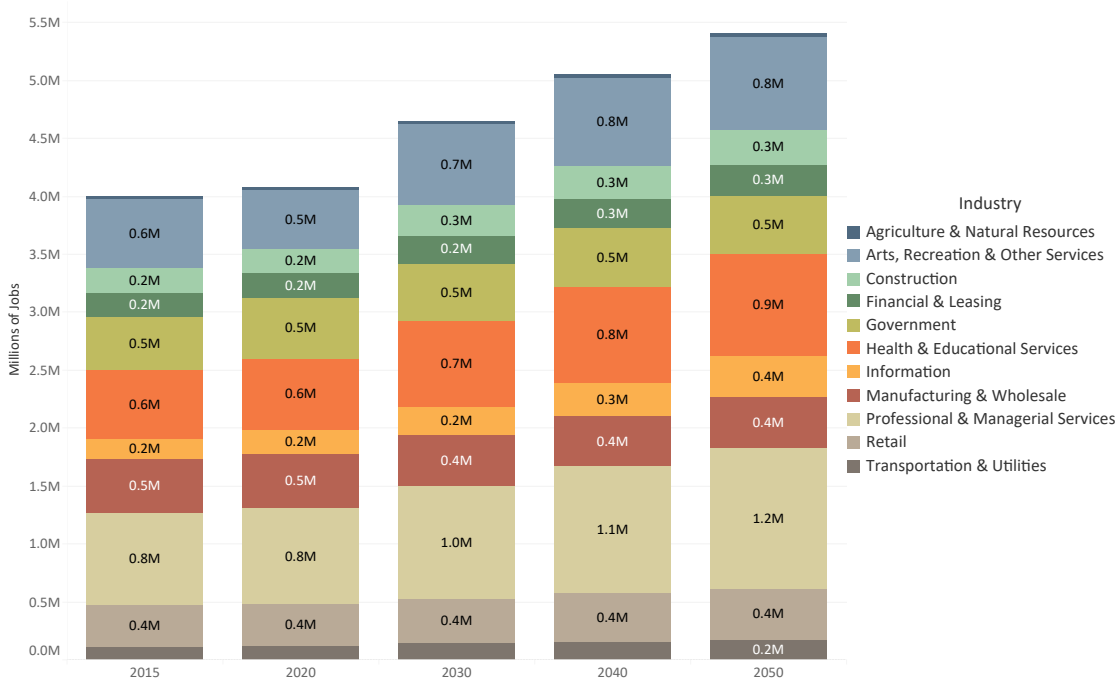
** = See Final Regional Growth Forecast below.

The Final Regional Growth Forecast projects approximately 400,000 more jobs, 200,000 fewer people, 300,000 more households and 300,000 more housing units in 2040 compared to the Plan Bay Area 2040 forecast. There are several reasons for the difference in the forecasts between Plan Bay Area 2040 and this latest forecast for the Bay Area. Differences in population are largely due to the assumption that the recent observed decline in Hispanic international migration and birth rates would continue, which is consistent with U.S. Census Bureau and California Department of Finance assumptions. Second, strong employment growth during the 2010s has resulted in adjustments to the early years of the forecast, and as a result the endpoint of the trend is also higher. Meanwhile, comparing the age composition of the population in these two forecasts, this forecast has a higher number of older adults, who usually have higher headship rates, forming more households. Finally, this forecast integrated housing strategies that would encourage more housing production and investment, resulting in higher household and housing unit numbers, as well as creating more jobs.

Employment Growth and Change

Figure 2 compares the level and distribution of employment in 2015 to projected employment in future years up to 2050. Professional and managerial services, and health and educational services are forecasted to continue dominating future employment in the San Francisco Bay Area, and the information sector more than doubles its current job numbers. Meanwhile, despite increases in both output and demand in all sectors as well as proposed strategies intended to stimulate employment in certain industries, the forecast shows declining employment in a few sectors, due to both technologically induced higher productivity and changes in economic structure, particularly in the manufacturing and wholesale industries. Finally, job forecasts both for construction as well as transportation and warehousing are boosted by the infusion of investments.

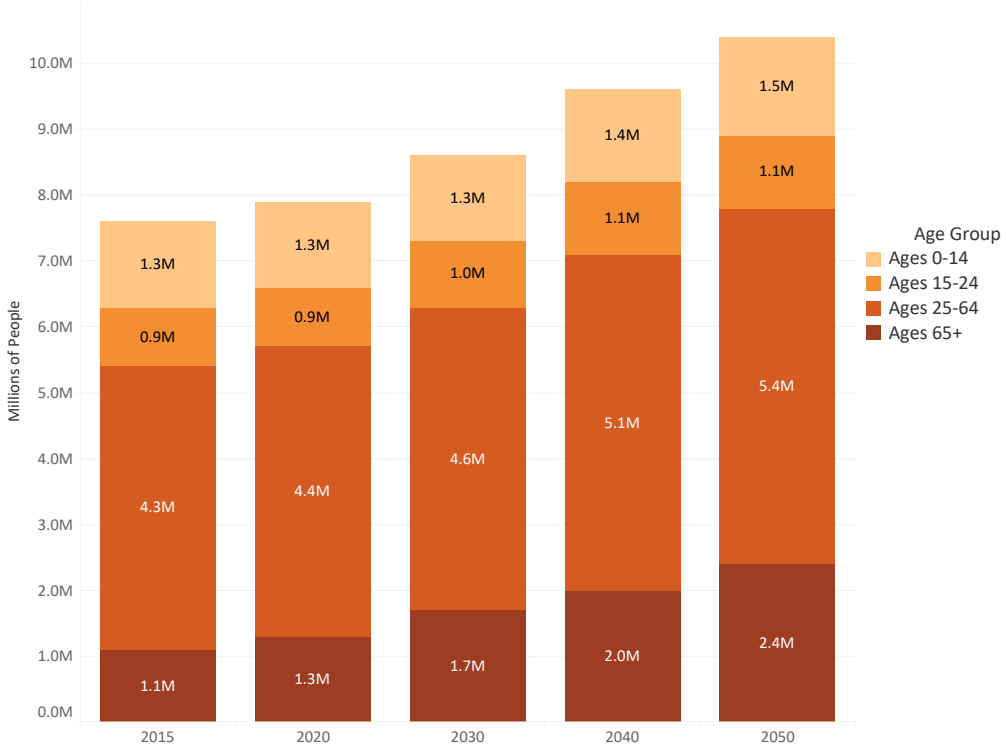
Figure 2. Employment by sector in the Regional Growth Forecast



Population Growth and Change

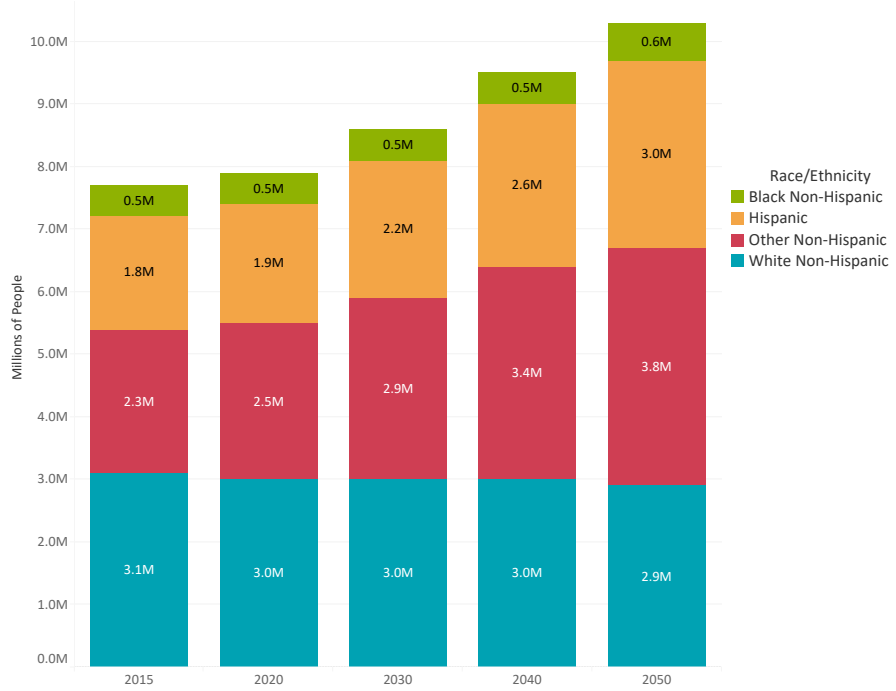
Figure 3 compares the population by age group in 2015 with that of the projections for future years up to 2050. Between 2015 and 2050, the number of working-age adults is forecasted to grow by 25%, but the share declines by 4% (from 56% to 52%). The growth in the share of people in the 65+ age group is anticipated to continue in the decades ahead from 14% of the total population in 2015 to 23 percent in 2050. While the 2050 total population is projected to be 35% higher than in 2015, growth will differ widely by age group.

Figure 3. Population by age group in the Regional Growth Forecast (in millions)



Ethnically, the region continues to diversify over time, as shown in Figure 4. Growth takes place mainly in Hispanic and Asian racial/ethnic groups (the largest group within the Other Non-Hispanic category in the figure). There is a small increase in the Black Non-Hispanic population, while the White Non-Hispanic population decreases steadily over time. By 2050, Asian, Native American, Pacific Islander, and More than One Racial group will reach 4 million people, while the Hispanic population will grow to the same level as White Non-Hispanic: around 3 million people.

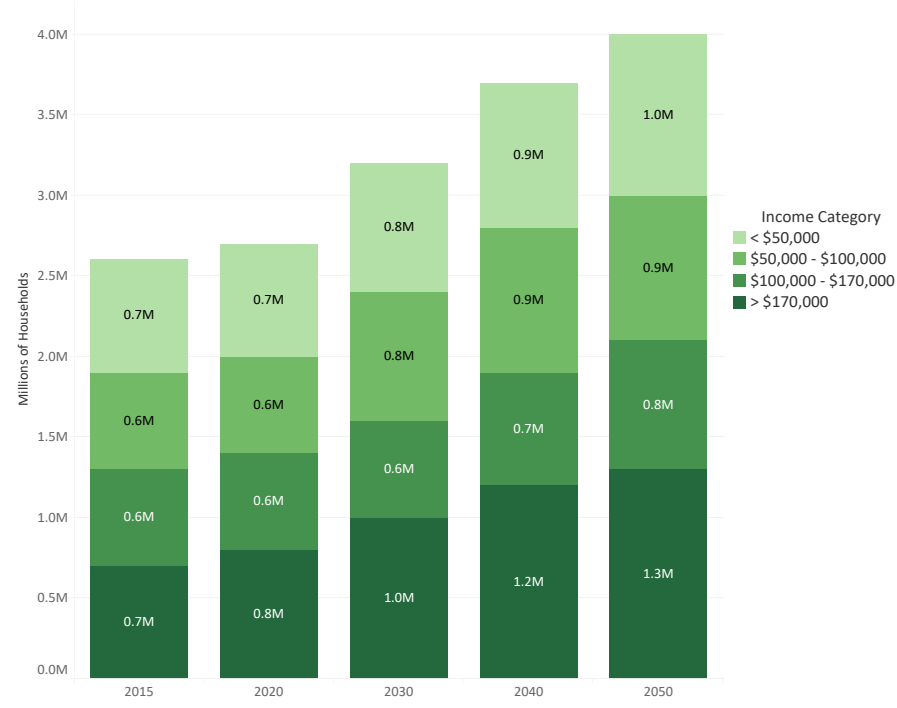
Figure 4. Population by race/ethnicity in the Regional Growth Forecast (in millions)



Household Income Distribution

Figure 5 compares the household income distribution in 2015 with the projected income distribution for future years. The amount of household growth projected (1.4 million new households between 2015 and 2050) reflects strategies that encourage both market rate and affordable housing development, increasing the number of housing units produced.

Figure 5. Projected income distribution of households in the Bay Area (in millions; income segments are in 2020 dollars[12])



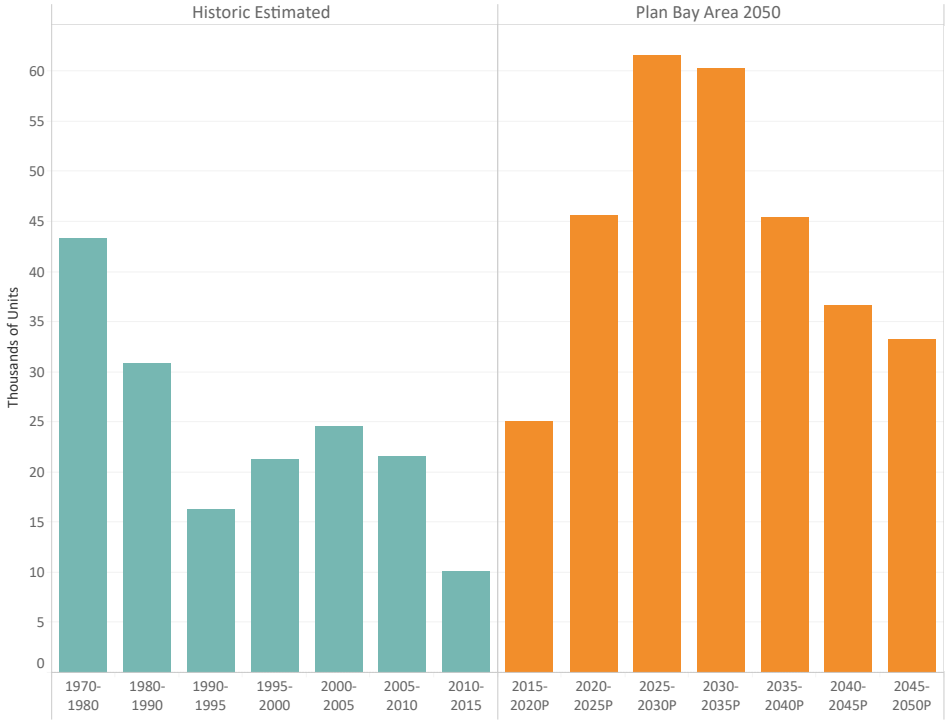
12 See Table 7: Income quantile definitions used in the modeling system.

While the number of households in all four income categories is expected to grow, household growth is anticipated to be strongest in the highest income category, reflecting the expected strength of growth in high-wage sectors combined with non-wage income (interest, dividends, capital gains, transfers). Household growth is also anticipated to be high in the lowest-income category, reflecting possible occupational shifts, wage stagnation, the retirement of seniors without pension assets, as well as the proposed affordable housing strategies. However, with the assumed implementation of a statewide Universal Basic Income strategy starting in 2025, portions of the households in the lowest-income category would be able to move up to the mid-lower income category.[13]

Housing Production

To translate growth in households to the anticipated demand for housing units, staff assumed a healthy vacancy rate for the region of five percent beginning from 2030[14] — leading to a projected increase of housing units by 1.5 million through 2050; the level of demand for new housing units follows the formation of new households. The forecast implies an annual average rate of increase of between 25,000 and 61,000 units, depending on the time period. As shown in Figure 6, this means a significant increase of production for the next three decades to a level of production above that of 1970s and 1980s, which requires the region successfully implement the housing strategies proposed in the plan.

Figure 6. Annual housing production, historic and projected (in thousands of housing units)



The Regional Housing Control Total in the Plan Bay Area 2050 Final Regional Growth Forecast, also known as the year 2050 total housing units projection, reflects the "Backward Arrow" linkage described previously which captures the impact of increasing housing supply at all income levels and lowering housing prices. The number also implies a much healthier housing market in the Bay Area compared to today's levels: higher headship rates, lower household size, healthier vacancy rate, improved job-housing ratio, and an affordable housing stock — nearly a quarter of the housing stock in 2050 would be deed-restricted affordable housing units in the Plan.

13 Although the UBI subsidies would be provided to households of all income groups, staff anticipate that the funding would come from a tax on households that not in the lowest-income category. That is to say, the net impact would only be a portion of the households in the lowest-income category would move up to mid-low-income category. According to PUMS 2014-2018 data, 11.6% of the lowest-income category households have such a level of income the UBI subsidies would push them over the income threshold to mid-low-income category. Staff assumes the ratio remains consistent, moving 11.6% lowest-income households into mid-low-income group in the pre UBI forecast results from 2025 to 2050 to simulate the impacts of the UBI.

14 California Department of Finance estimates of Bay Area vacancies have varied from 3.4% to 6.4% since 2000. Current vacancy rate stands around 3%.

Overall, the Regional Growth Forecast provides enough housing and making it affordable for the in-commuters who today are forced to live outside the region due to high housing cost or a lack of housing choices to move into the region in the future, thereby reducing the number of in-commuters. This amount is more than sufficient to preclude the need for a separate in-commute adjustment. Both the potential in-commuters and many additional potential residents who would have been excluded from living in the region or even the megaregion due to the Bay Area's high housing prices would be accommodated within the nine-county region through strategies in Plan Bay Area 2050.

This section provides a high-level overview of the Bay Area UrbanSim 2 Land Use Model application. The model provides a consistent, theoretically grounded means of forecasting land use change in the Bay Area for the Regional Forecast's household and employment totals and planning strategies that are incorporated into the Plan and EIR Alternatives. In addition, Bay Area UrbanSim 2 is integrated with Travel Model 1.5 to address the interactions between transport system changes and land use changes. This section includes an overview of the model structure, simulation sub-models and a brief introduction to the alternatives. Interactions between the BAUS2 and the other modeling components are described in the Model System Overview.

Bay Area UrbanSim 2 Land Use Model Application

UrbanSim is a modeling system developed to support the need for analyzing the potential effects of land use policies and infrastructure investments on the development and character of cities and regions. UrbanSim has been applied in a variety of metropolitan areas in the United States and abroad, including Detroit, Eugene-Springfield, Honolulu, Houston, Paris, Phoenix, Salt Lake City, Seattle, and Zürich. The application of UrbanSim for the Bay Area (i.e., Bay Area UrbanSim) was originally developed by the Urban Analytics Lab at UC Berkeley under contract to MTC and further refined (up to the current Bay Area UrbanSim 2) by MTC and ABAG modeling staff.[15]

The area included in the Bay Area model application includes all incorporated and unincorporated areas of the nine-county Bay Area.[16] This geographic area defined the scope of the data collection efforts necessary to define the modeling assumptions. Bay Area UrbanSim 2 is based on legal parcels of land drawn from 2010 data and updated with new information to match the 2015 base year used across the model system.

Within Bay Area UrbanSim 2 there are 10 sub-models simulating the real-world choices and actions of households, businesses, and real estate developers within the region, based on assumed public-sector strategies (i.e., policies or investments). Households have particular characteristics such as income that may influence preferences for housing of different types at different locations. Businesses also have preferences that vary by industry for building types and locations. Developers construct new buildings or redevelop existing ones in response to demand and planning constraints, such as zoning. Buildings are located on land parcels that have particular characteristics such as value, land use, topography, and other environmental qualities. Governments set policies that regulate the use of land, through the imposition of land use plans, urban growth boundaries, environmental regulations, or through pricing policies such as development impact fees or subsidies. Governments also build infrastructure, including transportation infrastructure, which interacts with the spatial distribution of households and businesses to generate patterns of accessibility at different locations that in turn influence the attractiveness of these sites for different consumers.

The Bay Area UrbanSim 2 model system simulates these choices through the sub-models described below and shown Figure 7, Figure 8 and Figure 9. These figures also show how the travel model and Bay Area UrbanSim 2 interact. Several of the system models include algorithms that aim to match the total number of units (e.g., jobs, households) included in the Regional Growth Forecast. These totals are checked at the end of each model year run. In each of Bay Area UrbanSim 2's five-year predictions, the model system steps through the following components:

1. The **Employment Transition Model** predicts new businesses being created within or moved to the region, and the loss of businesses in the region – either through closure or relocation out of the region. The role of this model is to keep the number of jobs in the simulation synchronized with aggregate expectations of employment in the region.

2. The **Household Transition Model** predicts new households migrating into the region, the loss of households emigrating from the region, or new household formation within the region. The Household Transition Model accounts for changes in the distribution of households by type over time, using an algorithm analogous to that used in the Employment Transition Model. In this manner, the Household Transition Model keeps Bay Area UrbanSim household counts synchronized with the aggregate household projection.

15 More information on UrbanSim is available at http://urbansim.com.

16 Technical information on Bay Area UrbanSim 2 can be found at https://github.com/BayAreaMetro/bayarea_urbansim.

3. The **Real Estate Development Model** simulates the location, type, and density of real estate development, conversion, and redevelopment events at the level of specific land parcels. This sub-model simulates the behavior of real estate developers responding to excess demand within land use policy constraints. The algorithm examines a subset of parcels each forecast year and builds pro formas comparing development costs and income. New structures are built in profitable locations.

4. The **Scheduled Development Events Model** provides an alternative means for the introduction of new buildings into the region. This component is simply a list of predetermined structures to be built in specific future years. These are from three categories: 1) recently completed development or projects under construction; 2) large, committed but unbuilt, public-private partnership projects (examples shown in Table 9); 3) special strategy-driven developments such as the mall-office park and public land strategies described below.

5. The **Employment Relocation Model** predicts the relocation of business establishments (i.e., specific branches of a firm) within the region each simulation year. The Employment Relocation Model predicts the probability that jobs of each type will move from their current location to a different location within the region or stay in place during a particular year.

6. The **Household Relocation Model** predicts the relocation of households within the region each simulation year. For households, mobility probabilities are based on the synthetic population from Travel Model 1.5. Drawn from Census data, these rates reflect the tendency for younger and lower income households to move more often.

7. The **Government Growth Model** uses a set of rules to project the employment in non-market sectors such as government and schools based on historical employment in those sectors and projected local, sub-regional, and regional population growth.

8. The **Employment Location Choice Model** predicts the location choices of new or relocating establishments. In this model, we predict the probability that an establishment that is either new (from the Employment Transition Model), or has moved within the region (from the Employment Relocation Model), will be located in a particular employment submarket. Each job has an attribute of the amount of space it needs, and this provides a simple accounting framework for space utilization within submarkets. The number of locations available for an establishment to locate within a submarket will depend mainly on the total vacant square footage of nonresidential floor space in buildings within the submarket, and on the density of the use of space (square feet per employee). This sub-model simulates the behavior of businesses moving to suitable locations within the region.

9. The **Household Location Choice Model** predicts the location choices of new or relocating households. In this model, as in the business location choice model, we predict the probability that a household that is either moving into the region (from the Household Transition Model), or has decided to move within the region (from the Household Relocation Model), will choose a particular location defined by a residential submarket. This sub-model simulates the household behavior in selecting a neighborhood based on their sociodemographic preferences.

10. The **Real Estate Price Model** predicts the price per unit of each building. UrbanSim uses real estate prices as the indicator of the match between demand and supply of land at different locations and with different land use types, and of the relative market valuations for attributes of housing, nonresidential space, and location. This role is important to the rationing of land and buildings to consumers based on preferences and ability to pay, as a reflection of the operation of actual real estate markets. Since prices enter the location choice utility functions for jobs and households, an adjustment in prices will alter location preferences. All else being equal, this will in turn cause higher price alternatives to become more likely to be chosen by occupants who have lower price elasticity of demand. Similarly, any adjustment in land prices alters the preferences of developers to build new construction by type of space, and the density of the construction.

Figure 7. UrbanSim model flow: employment focus

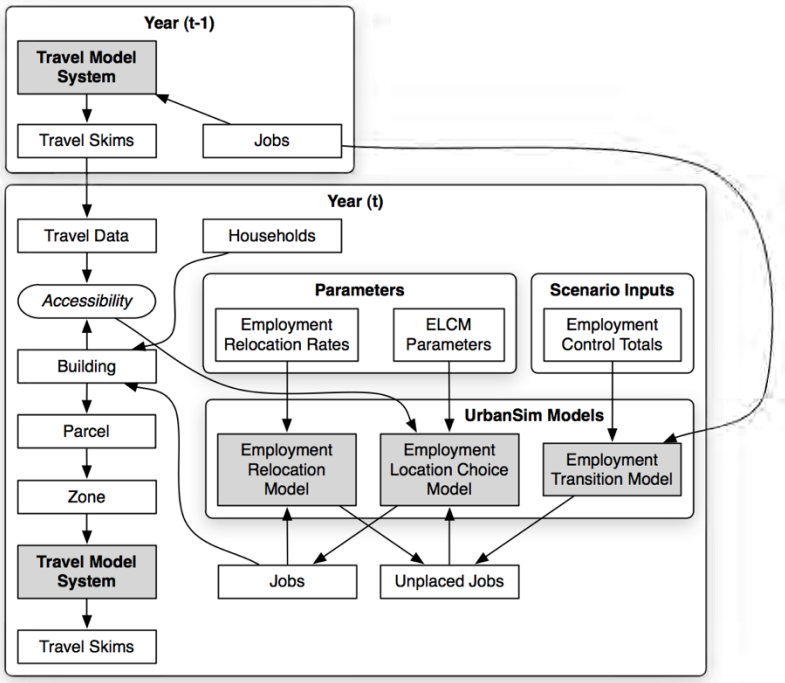


Figure 8. UrbanSim model flow: household focus

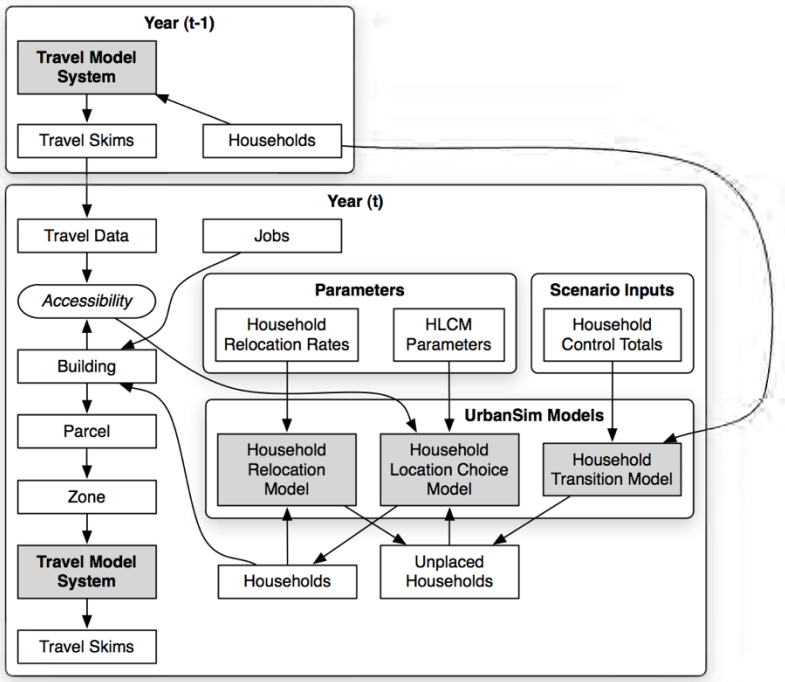


Figure 9. UrbanSim model flow: real estate focus

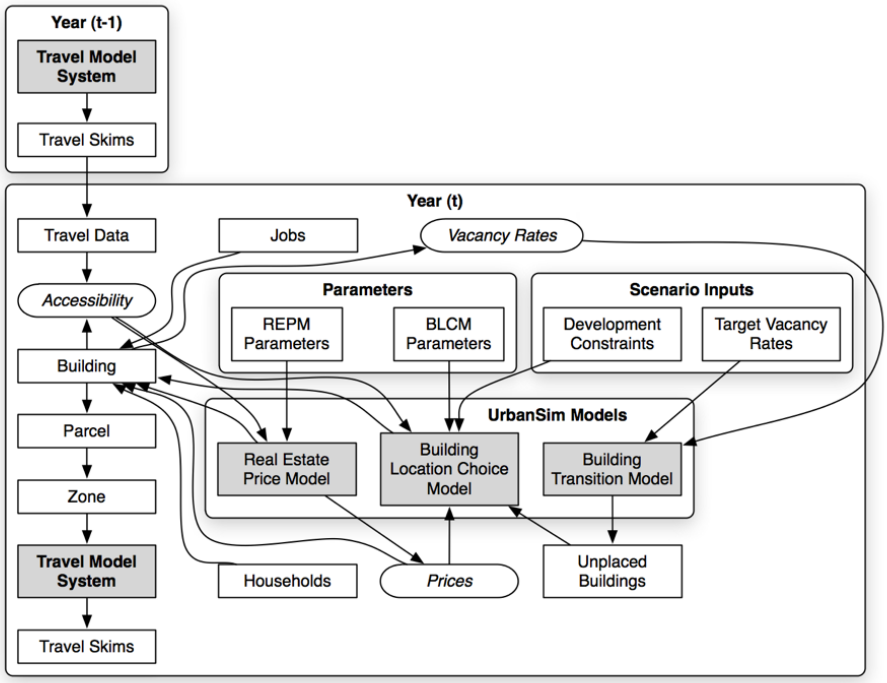


Table 9. Examples of scheduled development events

SCHEDULED DEVELOPMENT EVENT	
MacArthur BART Transit Village Construction	Park Merced Redevelopment
South Hayward BART Transit Village Construction	San Francisco General Hospital Expansion
Concord Community Reuse Construction	Transbay Terminal Redevelopment
Lawrence Berkeley Lab 2 Construction	Treasure Island Construction
Pleasant Hill BART Transit Village Construction	Bay Meadows Construction
Richmond BART Transit Village Construction	Kaiser Redwood City Expansion
Walnut Creek Transit Village Construction	Sequoia Hospital Expansion
Hunters Point Naval Shipyard Construction	Stanford Medical Center Expansion
Mission Bay Construction	Berryessa BART Transit Village Construction
Moscone Center Expansion	

Each of Bay Area UrbanSim 2's components were estimated individually and then assembled into a comprehensive system that is calibrated and reviewed. The household and employment transition models were simply an outcome of the regional totals divided into annual increments. The relocation models probabilities derived from Census and time series establishment data. The household and employment location choice models were estimated using logit models describing current locations as a function of various factors. The real estate price models are hedonic regressions that were built using recent residential transaction records and commercial rents. Finally, the real estate development model was assembled using output from the other components, industry estimates for building costs, and standard financial assumptions.

Once the components were functioning, Bay Area UrbanSim 2 was run. The forecast output was then compared to historical growth patterns and opportunities for feedback by planners at MTC and ABAG, the Regional Modeling Working Group, and local jurisdictions were provided at key points in 2020.

Input Assumptions

This section describes the Bay Area UrbanSim 2 base year database and assumptions for the various EIR Alternatives. Key variables, data sources, and processing steps are described, and selected variables are profiled or mapped to illustrate trends and assess reasonableness. While the year 2015 was selected as the base year for overall model system, the land use forecast begins from the year 2010 because both a complete parcel dataset and high-resolution census data were available for that year. Additional data updates were incorporated within the first model forecast step in 2015. The Bay Area UrbanSim 2 application operates at the level of individual households, jobs, buildings, and parcels. Jobs and households are linked to specific buildings, and buildings are linked to parcels.

In the sections below, there are tables of the base distribution of employment, population, and buildings in the Bay Area. In some cases, incomplete or inconsistent data was imputed using more-aggregate household or employment counts. The base-year database contains around 2.7 million households (not including group quarters), 4.0 million jobs, 1.9 million buildings, and 2 million parcels, based on information from the U.S. Census, Dun & Bradstreet establishment data, the CoStar commercial real estate database, and county assessor parcel files.

Base Year Spatial Database

Bay Area UrbanSim 2 uses a detailed geographic model of the Bay Area. A geographic information system was used to combine data from a variety of sources to build a representation of each building and property within the region. These detailed spatial locations are grouped into TAZs to improve model flow and provide summary output. Because this database represents the current state of the Bay Area's land use pattern, it is used as an identical starting point for all four alternatives.

Bay Area Spatial Information System (BASIS)

The Bay Area Spatial Information System (BASIS)[17], a new Data as a Service (DaaS) initiative operated by MTC and ABAG beginning in 2020, brought key regional datasets onto an industry standard DaaS platform where users internal and external to MTC and ABAG could download it, or access it via API for analysis and modeling purposes. BASIS represents an evolution of past efforts, such as the Local Policy Development Survey (2005), that sought to collect data from local jurisdictions for use in regional forecasts, and long-range planning activities for the nine county San Francisco Bay Area region.

A key component of BASIS included a robust review and feedback system that collected invaluable feedback from local jurisdictions, key regional stakeholders and staff within MTC and ABAG. BASIS presented the data for review by local jurisdictions in an inventory format that allowed local jurisdictions to select a location and retrieve a summary of the data available at that location. The summary was associated with a count of parcels that contain any one or more of the land use, transportation, or development characteristics that are tracked as part of Housing Development Tracking, Transportation and Land Use Modeling (Bay Area UrbanSim 2).

17 Bay Area Spatial Information System (BASIS): https://basis.bayareametro.gov.

The BASIS effort offered four key benefits for MTC and ABAG's understanding of development capacity:

- A secure, accessible database platform for the collection, standardization, discovery, and dissemination of key datasets used in regional planning efforts,
- A well-documented, organized, and definitive source of regional data,
- A single source of information that tracks trends associated with development conditions, land use, and environmental impacts associated with future growth and changes to the physical landscape, and
- A common framework to discuss and plan for future growth in the region.

Parcels

Parcels, or individual units of land ownership, provide a fundamental building block for the Bay Area UrbanSim 2 model: in both the real world and the model they are the entity that is owned, sold, developed, and redeveloped by households and businesses. In a given year, each parcel is associated with 0, 1, or multiple buildings that provide space for activities. The UrbanSim parcel database includes information linking the parcels to zones they are within, buildings that are on them, their size, their monetary value, and their current planning constraints.

Buildings

The base year database contains around 2 million buildings categorized into 14 different types as seen in Table 10. Households and businesses are assigned to buildings and buildings are linked to a parcel. Each building has attribute information on its size, age, and value, among other characteristics. Building attributes are primarily sourced from 2010 parcel assessor's data, updates on new construction provided by the BASIS process, and commercial real estate databases. The building database is modified by the Real Estate Development Model as it tears down buildings and constructs new buildings. Figure 10 and Figure 11 map out illustrative building attributes at the zonal level.

Table 10. Building types and 2015 counts in Bay Area UrbanSim 2

BUILDING TYPE	2015 COUNT
Single Family Detached	1,494,017
Single Family Attached	207,385
Multi-Family	103,423
Office	37,755
Hotel	2437
School	3184
Light Industrial	21,543
Warehouse	11,067
Heavy Industrial	1542
General Retail	43,328
Big-Box Retail	1840
Mixed-Use Residential	7467
Mixed-Use Retail-Focus	1379
Mixed-Use Employment-Focus	736

Figure 10. Percent single family residential buildings by TAZ

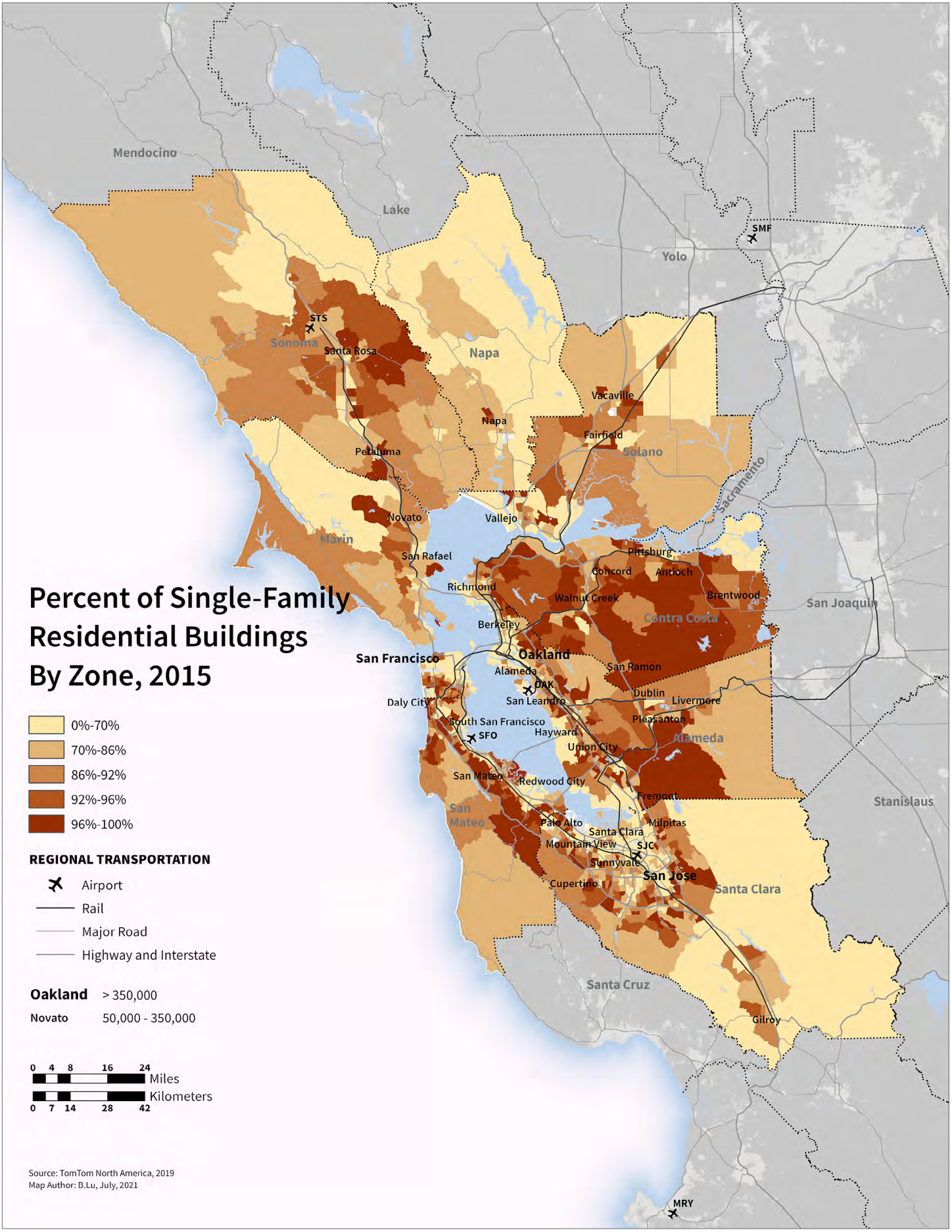


Figure 11. Buildings per acre by TAZ

Because buildings are a fundamental nexus in Bay Area UrbanSim 2 where the physical real estate market interacts with the households and employees who occupy the structures, a variety of key assumptions relate to buildings. While these assumptions greatly simplify the complexity of the region's land use market, they remain identical across EIR Alternatives allowing for consistent comparisons.

Two interrelated factors combine to determine how employees occupy buildings. First, workers in particular sectors use various types of buildings at different rates. For instance, many business service workers will use an office building, but a smaller number will occupy the same amount of light industrial space. The second step looks at the amount of square feet different types of workers use. Both use factors (types and amounts of space) were compiled on average for the entire region and assumed to be constant into the future (except for decreases in square feet per employee due to teleworking as described in the section on Strategy EN7 below). The result is an estimation of the number of jobs that could occupy a particular building, to which the model probabilistically matches employees by job sector. Household capacity, on the other hand, is directly determined by the number of residential units in a building.

Finally, Bay Area UrbanSim 2 provides flexibility in the representation of subsidized construction. Each model simulation begins with a baseline understanding of existing deed-restricted housing by zone. Various affordable housing inventory data sources and project-level data are compiled to represent the amount of deed-restricted housing which get distributed randomly within each zone. A separate component described above (the Scheduled Development Event Model) allows the construction of predetermined buildings in set future years. This list includes three types of projects: 1) buildings built between 2015 (the model forecast start year) and 2020 (the present year when the alternatives were created); 2) larger projects to be built with a mixture of public and private funding, that are currently under construction or funded; or 3) strategy representations. The same list of assumed projects for type 1 and type 2 was used for all EIR Alternatives. Type 3 projects, discussed below, were excluded from the No Project Alternative.

Development Capacity

Current zoning was obtained for all parcels in the region as a representation of the land use controls in place during the base year. Zoning or general plan data was collected for all jurisdictions through BASIS. BASIS offered cities and counties the opportunity to review the data for accuracy, which brought more transparency into the modeling process. Due to time constraints, specific plans were only collected for a limited subset of areas where such information was expected to exhibit a great deal of variation from the other planning information, and zoning and general plan data that was collected was only partially validated. To capture the latest local plans and fully incorporate local input while maintaining data accuracy, a hybrid version of current zoning was developed based on BASIS and Plan Bay Area 2040 zoning data to best represent the base year land use controls. Following the release of the Draft Blueprint, the Plan Bay Area 2050 project team conducted a series of public workshops and office hours to collect feedback from stakeholders, during which a number of jurisdictions provided additional input on BASIS development capacity data (current zoning, for example, prior to adopted strategy implementation). When accurate and appropriate, these were incorporated into the hybrid current zoning data used in Plan phase modeling. In general, constraints on new development were drawn from the information source judged most likely to represent a jurisdiction's long-term expectations for development maximums at each location.

This zoning and related information dictates the uses, residential densities, and building intensities allowed in each parcel within each jurisdiction. Adjustments to zoning were made in some locations to put protected land, government land, and transportation corridors off limits to development. Additionally, parcels containing structures built before 1930 were also deemed non-developable as a rough representation of historical protection ordinances until better data can be obtained.

Annual Business Totals

Forecasts for the region's overall rate of economic and demographic growth were developed as described in the Regional Growth Forecast section. The total number of employees by sector within the region is a result of that process and is input into Bay Area UrbanSim 2 and the resulting forecast must adhere to these totals while building and placing agents within the region. This information is used to generate new business establishments that in turn generate overall demand for commercial real estate. After new establishments are assigned locations by the Business Location Choice Model, the overall spatial distribution of employment provides input into the travel model's representation of personal travel.

Economic projections for the Bay Area are provided for the years 2015, 2020, 2025, 2035, 2040, 2045, and 2050 while intermediate years are interpolated. As seen in Table 8, the overall regional count of employment is projected to grow from around 4.0 million jobs in 2015 to almost 5.4 million jobs by 2050, or 35%. These business totals also project a changing sectoral distribution over the projection period: employment in agriculture and natural resources increases slowly over the period while the fastest growing sectors are professional services and business services.

Annual Household Totals

The total number of households by income category within the region is also forecast as part of the Regional Growth Forecast. This information is used to understand the overall demand for housing. In addition to the new households, the division of existing households into income categories is used to segment the population when considering relocation rates in the Household Transition Model. The forecasted new households and relocating households are allocated among the TAZs using the Household Location Choice Model. This spatial distribution of households is input into the Travel Model's representation of personal travel.

Working from these regional totals, Bay Area UrbanSim 2 forecasts the development of sufficient housing for all the population in the region, including all economic segments of the population. This number considers population growth, household formation, net inter-regional migration, and employment growth. The incorporation of a relaxation of local land use constraints into the regional growth forecast (as described in Findings: Regional Growth Forecast Results) results in no increase in the regional in-commute because all households supplying labor can be accommodated within the region. By forecasting the intra-regional locations for this population, Bay Area UrbanSim 2 also identifies areas within the region sufficient to house an 8-year projection of the regional housing needs under California State's Regional Housing Needs Allocation (RHNA) process.

Demographic projections for the Bay Area are provided for the years 2015, 2020, 2025, 2035, 2040, 2045, and 2050 while intermediate years are interpolated. As seen in Table 8, the overall regional count of households is projected to grow from around 2.7 million households in 2015 to over 4 million households by 2050, or 51.1%. These household totals also project a changing income distribution over the projection period: the share of households in each quartile (from lowest to highest income) is projected to shift from 26%/24%/22%/28% in 2015 to 25%/23%/19%/33% in 2050 (for the Plan and EIR Alternatives; the first two categories are slightly different in 2050 for the No Project as it lacks Strategy EC1, which envisions a statewide universal basic income).

Model Agents

Choices by key actors or agents in the region are the foundation of the Bay Area UrbanSim 2 model. The three classes of agents are households choosing places to live, business establishments choosing locations to do work, and real estate developers choosing places to build new buildings. This section discusses inputs related to each agent. Because these represent the fundamentals of the urban economy, input values are consistent across EIR Alternatives.

Households and People

Bay Area UrbanSim 2 represents each household individually. A 2015 household table with approximately 2.7 million households is synthesized for the region from Census 2010 Public Use Micro-Sample (PUMS) and Summary File 3 (SF3) tables using the PopGen population synthesizer.[18] This process creates a universe of simulated households and gives each household characteristics (such as household person count and income) so that the overall averages for those characteristics conform to the census information provided for that location. These households have a mean persons per household of 2.7, a mean number of household workers of 1.4, mean age of household head of 48.6 years, a mean household income of $81,937, and a mean number of household children of 0.5.

Establishments and Employees

Establishments are the other major class of agent in Bay Area UrbanSim 2. They represent a unique location of employment for a business. For example, a one-off barbershop is one establishment and so is one particular McDonald's restaurant location. Each establishment corresponds to a number of employees. For the Bay Area UrbanSim 2 model, the 2010 distribution of establishments and their employees are used as input. Future year projections are then made by modeling the movement of individual establishments.

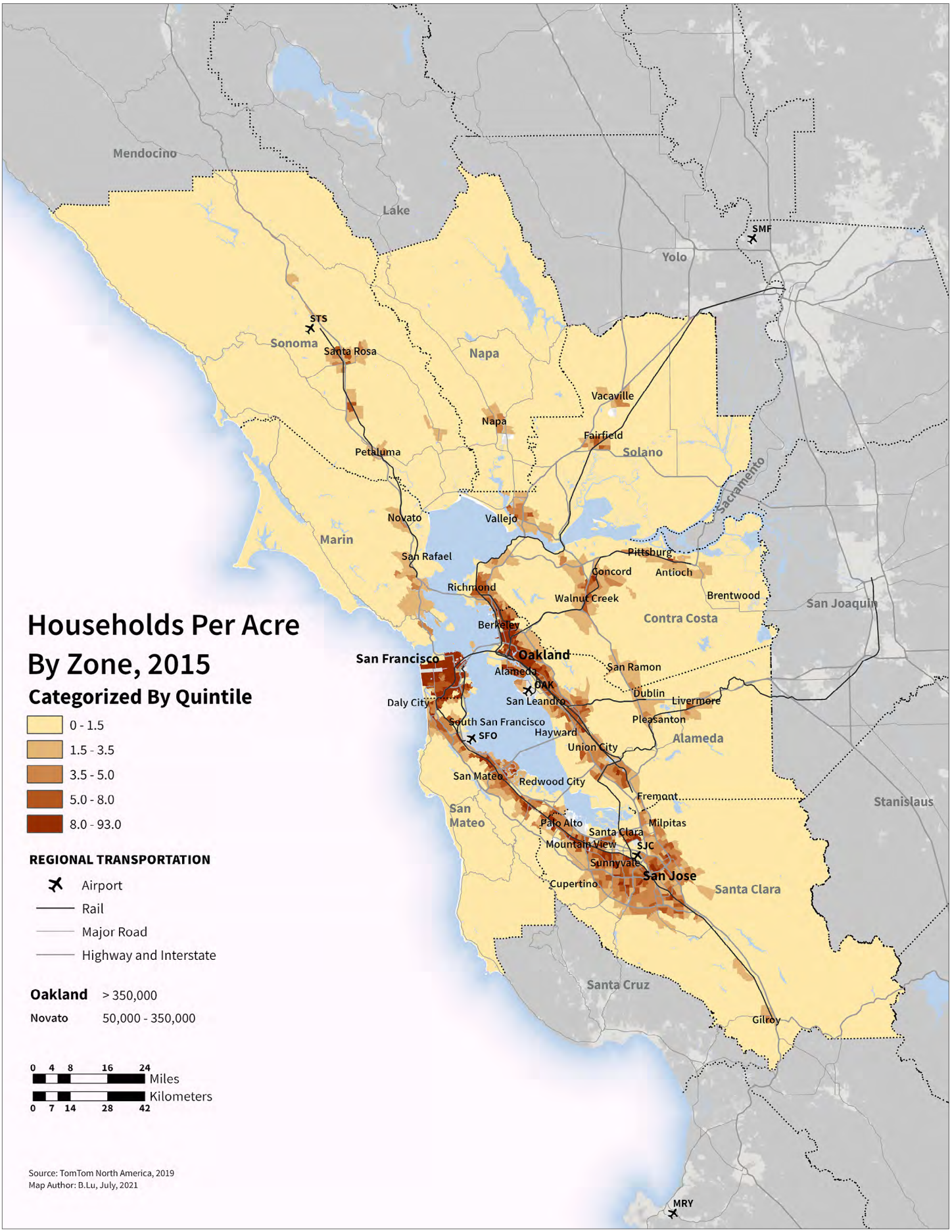
The 2010 establishment database was built by combining establishment data from the Dun & Bradstreet and California Employment Development Department (EDD)[19] datasets and then transforming it to conform to base year 2015 subregional employment totals.[20] Each establishment was assigned to one of the 6 sector classes and associated with an appropriate building. Each of these sectors is modeled separately in the Employment Location Choice Model. Because no clear relocation trends were readily observable in historic data, a 1.9% chance of relocating was assumed for employment each year, regardless of sector. All employment assumptions are the same for all EIR Alternatives.

18 PopGen: http://urbanmodel.asu.edu/popgen.html.

19 California Employment Development Department (EDD): http://www.labormarketinfo.edd.ca.gov.

20 All employment databases contain slightly different counts due to different definitions, data collection strategies, and error. For more information on the regional control totals please see the section, Regional Growth Forecast.

Figure 12. Synthesized households per acre by TAZ



Real Estate Developers

The final Bay Area UrbanSim 2 agent is a special class of business: the real estate developer. Developers monitor the relationship between supply and demand for different types of buildings across the region and attempt to build new structures in locations where they can make a profit. They are driven by market forces, so assumptions related the real estate developers are identical across the four EIR Alternatives.

Bay Area UrbanSim 2 implements the Real Estate Developer Model as a stochastic, or randomly defined, pro forma model that explicitly treats these decisions the same way they are made in the real world. The pro forma combines information on costs and income over a proposed project's lifetime, allowing an assessment of overall profitability. The model examines all parcels each year and tests various project concepts allowed under the site's zoning constraints. The developer chooses the project that maximizes profit and builds the project if it is profitable. After a construction period, these new buildings are available to households and businesses for occupation.

Environmental Factors

Traditionally, Bay Area UrbanSim 2 has focused primarily on model agents and their interaction with housing and job markets in order to study these systems. However, as the impact of the natural environment becomes increasingly apparent, it has become important that the effects on these systems be considered as well.

Prior to the official kickoff of Plan Bay Area 2050, the Horizon initiative considered a wide range of external forces to stress-test strategies amidst an uncertain future. One of these forces is an earthquake, which is likely to occur in the region within the plan's 30-year time horizon. A representative earthquake along the Hayward Fault was modeled in Horizon for the first time in MTC's and ABAG's regional planning, providing an opportunity to understand the impact of this earthquake on the Bay Area's unique housing stock and the displacement of households and jobs. However, due to an inability to pinpoint the location and timing of such an earthquake, and in recognition of the significant demonstrated impacts of the shock on the forecast, the plan does not include the simulation of an earthquake in order to avoid distorting the understanding of future conditions.

The second natural force in the region that was addressed for the first time in Horizon is the rising sea level and subsequent inundation of land. This consistently encroaching force was included in Plan Bay Area 2050. As one of the first efforts to include natural hazards in regional planning, Plan Bay Area 2050 has incorporated a model to address the impacts of sea level rise in the Bay Area.

The representation of sea level rise in Bay Area UrbanSim 2 leverages detailed sea level rise projections from the Adapting to Rising Tides[21] program at the San Francisco Bay Conservation and Development Commission for inundation along the San Francisco Bay, and the National Oceanic and Atmospheric Administration for inundation along the coast. With sea level rise inundation as an input, the land use model recognizes these parcels as locations no longer viable for existing buildings and removes these buildings. Parcels that intersect with inundation were flagged for removal from the input file, and then manually reviewed to remove the designation from parcels with minimal flooding — defined to be a location where the border touches an inundation layer but does not cover a portion of the polygon. Any existing residents or jobs in these buildings are also removed and must find new locations for housing or workspaces along with the other "movers" through the location choice sub-models. After capturing the effects on existing activities, parcels subject to sea level rise are also made ineligible for new development due to the inundation, thus removing them from the total area of potential developable space to accommodate the region's population and employment.

The sea level rise sub-model in Bay Area UrbanSim 2 can represent any future inundation scenario by changing its input files. Both the progression of sea level rise inundation and the height to which the sea level will rise and cover land area are configurable, allowing staff to analyze various futures. As part of Horizon, staff studied multiple sea level rise progression scenarios to capture the widest range of possible futures. Consistent with state guidance, Plan Bay Area 2050 posits a set of progression inputs to incorporate the effects of rising tides: the plan assumes there will be 1 foot of sea level rise by 2035 and 2 feet of sea level rise by 2050.

21 Adapting to Rising Tides: https://www.adaptingtorisingtides.org.

Baseline Policies

In addition to modeling future policy alternatives, Bay Area UrbanSim 2 includes a representation of policies which exist today and are regionally significant. Senate Bill 743 was officially adopted prior to the release of Plan Bay Area 2050 and is therefore included in all simulations; It is described further below. Other policy legislation that has been underway in California but not yet adopted may be found as a strategy in the modeling scenarios. As an example, the element of the strategy to reduce the cost of development discussed in Strategy H3: Allow a Greater Mix of Housing Densities and Types in Growth Geographies has goals similar to the reform of the California Environmental Quality Act (CEQA) development approvals process.

Senate Bill 743

California Senate Bill 743 (SB 743) is an effort to change the way the assessment of significance under CEQA is assessed. Traditionally, CEQA analysis has examined potential transportation impacts using the Level of Service (LOS) concept where impact significance occurs when highway facilities exceed a particular level of congestion. LOS assessments in dense urban areas often reveal high levels of existing congestion leading to frequent finding of significance and expensive mitigation requirements. SB 743 shifts analysis to a Vehicle Miles Traveled (VMT) method that is more likely to find transportation impacts in car-oriented suburban locations. The implementation of SB 743 is represented as having a slight (1% to 2%) increase in costs in suburban locations and a slight (again 1% to 2%) decrease in costs in urban locations with the amount of shift determined by zone level average VMT for commute trips originating in that zone.

EIR Alternatives

For the EIR analysis, Bay Area UrbanSim 2 was used to generate different alternative land use scenarios for future growth in the Bay Area. Each of these alternatives uses identical regional totals (from Table 8) representing future economic and demographic change but employs different policies constraining or promoting particular types and intensities of real estate development in particular locations.

The first alternative is called the No Project and represents the expected trajectory of the region without the implementation of the Plan or any of the alternatives. All policies in the No Project alternative are determined or extrapolated from existing base year plans and policies.

The second alternative is called the Plan, previously referred to as the Final Blueprint, and reflects the spatial distribution of future households and employment resulting from the strategies approved by the MTC and ABAG Executive Boards in fall 2020. The Plan alternative starts with base year plans and policies but modifies them as needed to represent the impacts of the strategies.

Similarly, the other two EIR Alternatives build off of the Plan while modifying existing strategies to provide a range of potential alternatives that aim to accomplish the goals pursued within the proposed plan. EIR Alternative 1 modifies strategies to minimize the development footprint by focusing on an even greater share of regional growth in low-VMT places with high-quality transit options. To a greater degree than the Plan, EIR Alternative 2 promotes housing growth in locations that are jobs-rich and/or are high-resource. Strategies in this alternative are designed to address the regional challenges of displacement and gentrification.

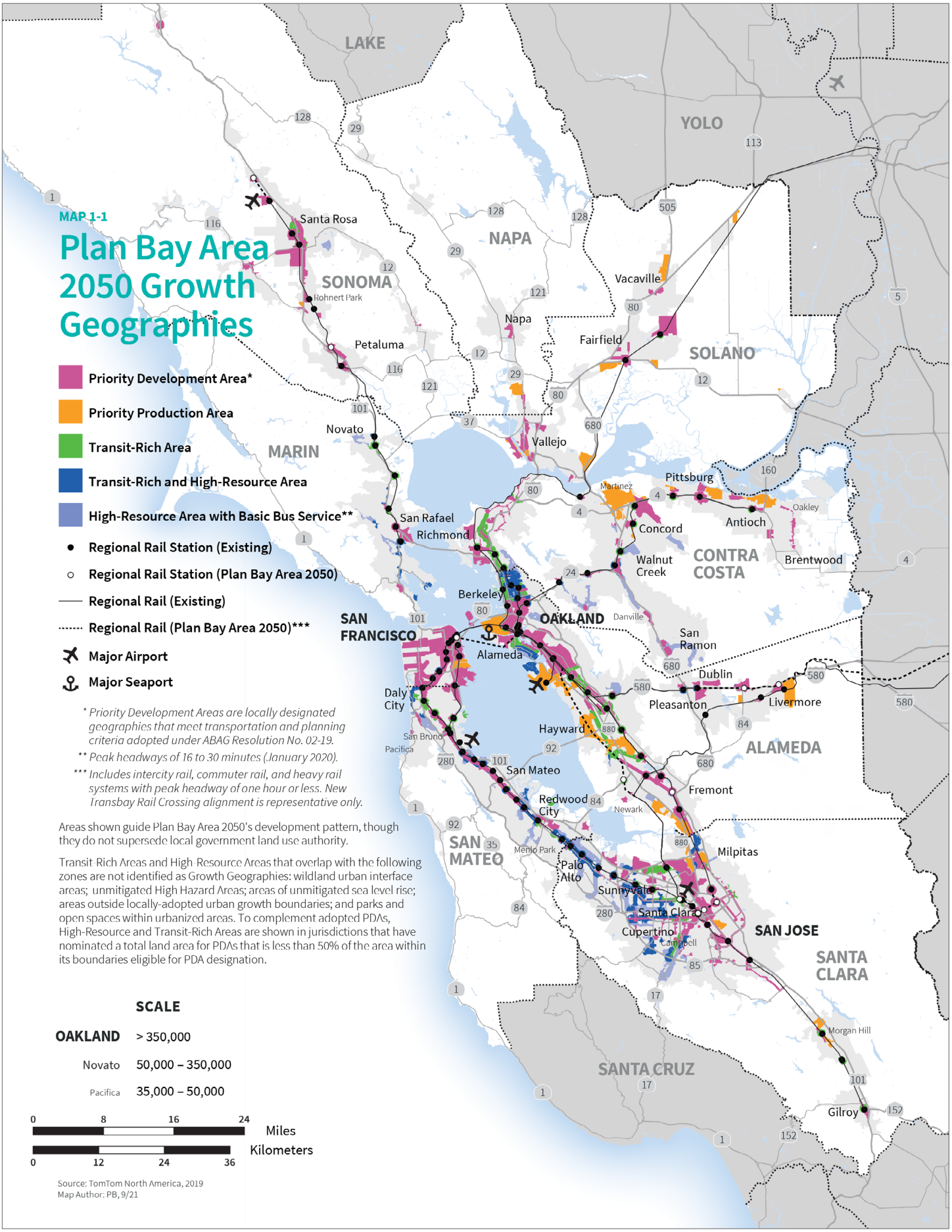
Growth Geography Framework

To advance the various goals of the EIR Alternatives, a spatial framework was established to carry out strategies and evaluate the outcomes of such strategies. The Growth Geographies are places identified for housing and/or job growth either by local jurisdictions or because of their proximity to transit or access to opportunity. For modeling purposes, a series of specific Growth Geographies were established to further define the overall definition of Growth Geographies (GG) adopted by the Commission and Executive Board in September 2020 (mapped in Figure 13). They have been identified spatially according to the following rules and used as the building blocks for several strategies.

Table 11. Growth Geography definitions

GEOGRAPHY NAME	DEFINITION
Growth Geography (GG)	In all local jurisdictions, these areas included locally designated Priority Development Areas (PDAs) and Priority Production Areas (PPAs), as well as Transit-Rich Areas (TRAs) served by BART or Caltrain Baby Bullet routes. In cities that have nominated less than 50% of the land within their boundaries eligible for designation as a PDA, these areas also include: all TRAs not included in a PDA including both High-Resource Areas (HRAs) and places outside HRAs; and HRAs that are outside of a TRA but within ¼ mile of a bus stop with 16- to 30-minute peak period headways
Priority Development Areas (PDAs)	Locally identified places for housing and job growth
Transit-Rich Areas (TRAs)	These are areas within ½ mile of transit, further distinguished by the quality of transit:
TRA1	Rail transit stop served by at least 3 BART routes or 1 BART route and 1 Caltrain Baby Bullet route
TRA2	Rail transit stop that does not meet the TRA1 definition and is served by BART or Caltrain; light rail stop; or bus stop served by a bus rapid transit route with peak headways of 1-9 minutes. Some alternatives divide this category into three sub-categories to more precisely apply the strategies:
TRA2a	Typical BART station or Baby Bullet Caltrain station
TRA2b	Typical Caltrain station or high-frequency light rail station with dedicated right-of-way (e.g., Muni Metro Castro Station)
TRA2c	High-frequency light rail (e.g., Muni Metro J-Church surface stations); moderate-frequency light rail station with dedicated right-of-way (e.g., VTA North 1st corridor); BRT stop or station
TRA3	Rail transit stop that does not meet the TRA1 or TRA2 definition; ferry terminal; or bus stop served by at least one route with a 1-15 minute peak headway
High-Resource Areas (HRAs)	Census Tracts designated “High or “Highest” Resource by the California Departments of Housing and Community Development and Finance, clipped to urban footprint
Priority Production Areas (PPAs)	Locally identified places for middle-wage job growth in industries like manufacturing, logistics, or other trades; must be zoned for industrial use or have a predominately industrial use

Figure 13. Plan Bay Area 2050 Growth Geographies



Policymakers can apply incentives or disincentives — financial or regulatory — in an effort to influence land use. These are referred to as "housing, economy and environment strategies" or "land use strategies" for short. Differences in the land use strategy inputs are the fundamental means of representing the different EIR Alternatives. The strategies represent actions that MTC, ABAG, or partner agencies such as cities and counties could take or seek legislation to allow. These input assumptions vary between alternatives and when combined with the more fundamental Model Agents described above, produce model outputs.

The land use strategies described in this section are applied in the same fashion to all alternatives except the No Project alternative, unless otherwise noted. The variation across alternatives derives mostly from the way these strategies are implemented within the region, or not implemented at all, and will be discussed in relation to each strategy.

Apart from the strategies modeled explicitly in Bay Area UrbanSim 2, economic and transportation strategies act on the land use pattern and enter through the interactions between models. Region-level economic strategies influence the level of demand for housing and job space as well as the characteristics of this demand that may be shaped by factors such as the income levels of households. Transportation strategies influence the accessibility of different locations in the region, which can increase the feasibility of housing or commercial development in these locations in the land use model.

Strategy H1 | Further Strengthen Renter Protections Beyond State Law

Strengthening renter protections across the region builds upon tenant protection laws and limits rent increases, and is thus modeled as a change in the behavior of renter households. The policy is represented as a slowing of the relocation rate of renters and increased stability. Based on PUMS 2013-2017 data, it is estimated that renter households have an 80% likelihood of relocating within five years. This is used to set the probability a modeled household will move and re-enter the search for housing. Renter protections are modeled as a 15% decrease in the rate of relocation for low-income households. The resulting relocation probability is therefore 67% within each five-year model time step. Consequently, low-income renter households remain in their homes longer than other household groups as the region continues to grow and the land use pattern evolves.

Strategy H2 | Preserve Existing Affordable Housing

To maintain the existing affordable housing in the region, funding is used over the plan period to preserve units as permanently deed-restricted housing. In the No Project alternative, only preservation funding from existing federal, state, and local sources is available. Funding levels remain relatively similar to the baseline year and are continued through the plan horizon year to preserve units. This results in 110,050 additional deed-restricted units by 2050: 22,600 in Alameda, 15,000 in Contra Costa, 3,150 in Marin, 1,650 in Napa, 14,950 in San Francisco, 13,500 in San Mateo, 28,150 in Santa Clara, 5,150 in Solano, and 5,900 in Sonoma. In all other alternatives, Bay Area UrbanSim 2 applies affordable housing funds by randomly selecting housing units for preservation. Once an affordable housing unit becomes preserved, the subsidized unit is then prioritized for low-income households in the model.

Housing in the region is selected for preservation and allocated funding if it is located within one of the three following areas: Transit-Rich Areas (TRAs), the Displacement Risk (DR) geographies,[22] or the general Growth Geography (GG) areas. The funding is further specified by county, based on the base year number of low-income households in these geographies and the number of low-income households otherwise expected to leave these areas without the preservation of housing. First, an equal or greater number of units than the number of low-income households in a given county in 2010 were preserved in the "DR+TRA" and "TRA only" geographies. Next, where a net loss in low-income households was projected in Draft Blueprint modeling results between 2010 and 2050 in "DR" geographies,

22 Displacement Risk geographies are derived from the UC Berkeley Urban Displacement Project (https://www.urbandisplacement.org/map/sf). They are within census tracts designated: "At Risk of Gentrification or Displacement (Low Income)", "Ongoing Gentrification / Displacement of Low Income Households (Low Income)", "At Risk of Exclusion (Moderate to High Income)", and "Ongoing Exclusion / Displacement of Low Income Households (Moderate to High Income)".

an equal or greater number of units than the number of low-income households in 2010 was preserved in "DR only" geographies. In counties that had a reduction in the percentage of low-income households between 2010 and 2050, and a deficit in low-income units remained, additional units were preserved to fill in the gap. Lastly, any remaining low-income units to meet the regional target were added to "GG" geographies in each county, proportional to its 2010 share of the region's low-income households. Table 12 details the resulting targets for the number of units to preserve in Bay Area UrbanSim 2 within the Growth Geography combinations in each county.

Table 12. Preservation of affordable housing by county and Growth Geography

	TOTAL PRESERVED UNITS TARGET								
	Alameda	Contra Costa	Marin	Napa	San Francisco	San Mateo	Santa Clara	Solano	Sonoma
DR+TRA	27,500	8,500	5,000	0	27,500	7,500	38,500	500	5,000
DR only	0	0	6,000	0	500	0	0	0	0
TRA only	99,000	12,500	5,000	500	93,000	17,000	64,000	3,000	5,000
GG (any)	2,500	1,000	12,000	0	54,000	41,500	2,000	500	500

Bay Area UrbanSim 2 uses four household income categories, described in Table 7. To give low-income households priority for these units, an initial household location choice model runs which only places low-income households into deed-restricted units. Afterwards, a general household location choice model runs to place remaining households. Once a unit becomes preserved as affordable, low-income households either continue to occupy these units or relocate into them based on historical rates. The time it may take for a low-income household, or a new low-income household, to occupy a preserved unit is reflective of the transaction costs of moving.

Strategy H3 | Allow a Greater Mix of Housing Densities and Types in Growth Geographies

All alternatives start with the basic zoning classification established as the development capacity inputs. For most alternatives, zoning modifications are made for various subsets of parcels in the region. Zoning modifications act on two components: the set of building types allowed on a parcel and the maximum dwelling units per acre (if the modification is not already permitted under the local zoning). Zoning schemas are guided by the regional Growth Geographies which have been used in combination to create the detailed zoning schema. The No Project alternative assumes current land use regulations captured in the base zoning do not change between now and 2050. Further, the No Project alternative assumes that trends in the expansion of the region's urban limits (as discussed below under Maintain Urban Growth Boundaries) continue to accommodate some of the region's growth.

In the Plan, zoning is modified to broaden allowable building types and increase development density in Transit-Rich Areas (TRAs) and High-Resource Areas (HRAs) to encourage growth near transit and in high-resource neighborhoods. Table 13 provides the detail on the zoning modifications in the Plan. Zoning differs between parcels containing single family dwelling (SFD) units and parcels not containing SFD units to account for local context.

Table 13. Residential zoning modifications for the Plan

PLAN			
Zoning Alternative Geography		Maximum Dwelling Units per Acre Applied	
	Broadened Allowable Building Type	Parcels not occupied by Single Family Dwelling (SFD) Units	Parcels occupied by Single Family Dwelling (SFD) Units
GG + TRA1 + HRA	Multifamily Dwelling (MFD)	200	50
GG + TRA1 + nonHRA	MFD	150	50
GG + TRA2 + HRA	MFD	100	50
GG + TRA2 + nonHRA	MFD	75	35
GG + TRA3 + HRA	MFD	50	50
GG + TRA3 + nonHRA	MFD	35	35
GG + nonTRA + HRA	MFD	35	35
GG + nonTRA + nonHRA	n/a	25	25

EIR Alternative 1 increases zoning intensity in all TRAs to a greater amount than the proposed Plan alternative to create a more transit-supportive land use pattern. This alternative further refines the TRA categories to create a schema that enables more development around the regional transportation infrastructure providing the most service. The TRA categories used in EIR Alternative 1 are defined within the Growth Geography framework (Table 11), and the modifications to residential development capacity are detailed in Table 14.

Table 14. Residential zoning modifications for EIR Alternative 1

EIR ALTERNATIVE 1		
Zoning Alternative Geography	Broadened Allowable Building Type	Maximum Dwelling Units per Acre Applied
GG + TRA1	MFD	300
GG + TRA2a	MFD	300
GG + TRA2b	MFD	250
GG + TRA2c	MFD	250
GG + TRA3	MFD	100

EIR Alternative 2 broadens use types and increases residential densities in a selection of HRAs and TRAs in specific jurisdictions to encourage low-income housing in jobs-rich communities. Compared to the Plan, this alternative lowers upzoning for TRA1 and TRA2 to allow more growth in a greater array of jurisdictions. Additionally, within jobs-rich and high resource cities (defined below), as well as within their surrounding jurisdictions, upzoning in transit-rich and Growth Geography areas is higher where these overlap with high-resource areas. This contributes to more potential growth in HRAs to achieve a better jobs-housing balance. Importantly, there is a limitation on upzoning any parcels with multi-family development in Equity Priority Community (EPC) geographies[23], which is included to mitigate potential displacement impacts. The TRA categories used in EIR Alternative 2 are defined within the Growth Geography framework (Table 11), and the modifications to residential development capacity are detailed in Table 15.

Jobs-rich and high-resource cities are those with a job-housing ratio greater than 1.75 in addition to being identified as exclusionary in the final draft 2023-2031 RHNA allocation (via "equity adjustment" calculation). These include St. Helena, Pleasanton, Menlo Park, Palo Alto, Cupertino, and Milpitas. Adjacent cities are defined as jurisdictions within a five-mile of radius of these cities, which include Atherton, Belmont, Calistoga, Campbell, Dublin, East Palo Alto, Fremont, Hayward, Livermore, Los Altos, Los Altos Hills, Los Gatos, Monte Sereno, Mountain View, Newark, Portola Valley, Redwood City, San Carlos, San José, San Ramon, Santa Clara, Saratoga, Sunnyvale, Union City, and Woodside.

23 More information on the Equity Priority Communities framework can be found here: https://github.com/BayAreaMetro/Spatial-Analysis-Mapping-Projects/tree/master/Project-Documentation/Equity-Priority-Communities .

Table 15. Residential zoning modifications for EIR Alternative 2

EIR ALTERNATIVE 2			
Zoning Alternative Geography		Maximum Dwelling Units per Acre Applied	
	Broadened Allowable Building Type	Parcels in Job-Rich and High-Resource Cities and Adjacent Cities	Parcels in All Other Jurisdictions
GG + TRA1 + HRA	MFD	125	125
GG + TRA1 + nonHRA	MFD	125	125
GG + TRA2 + HRA	MFD	100	75
GG + TRA2 + nonHRA	MFD	55	55
GG + TRA3 + HRA	MFD	75	50
GG + TRA3 + nonHRA	MFD	35	35
GG + nonTRA + HRA	MFD	75	50
GG + nonTRA + nonHRA	n/a	35	35

Figure 16 provides an overview of zoning modifications within the Urban Growth Boundaries of incorporated areas across all alternatives.

Figure 14. Plan Bay Area 2050 Growth Geographies: Transit-Rich Area (TRA) details

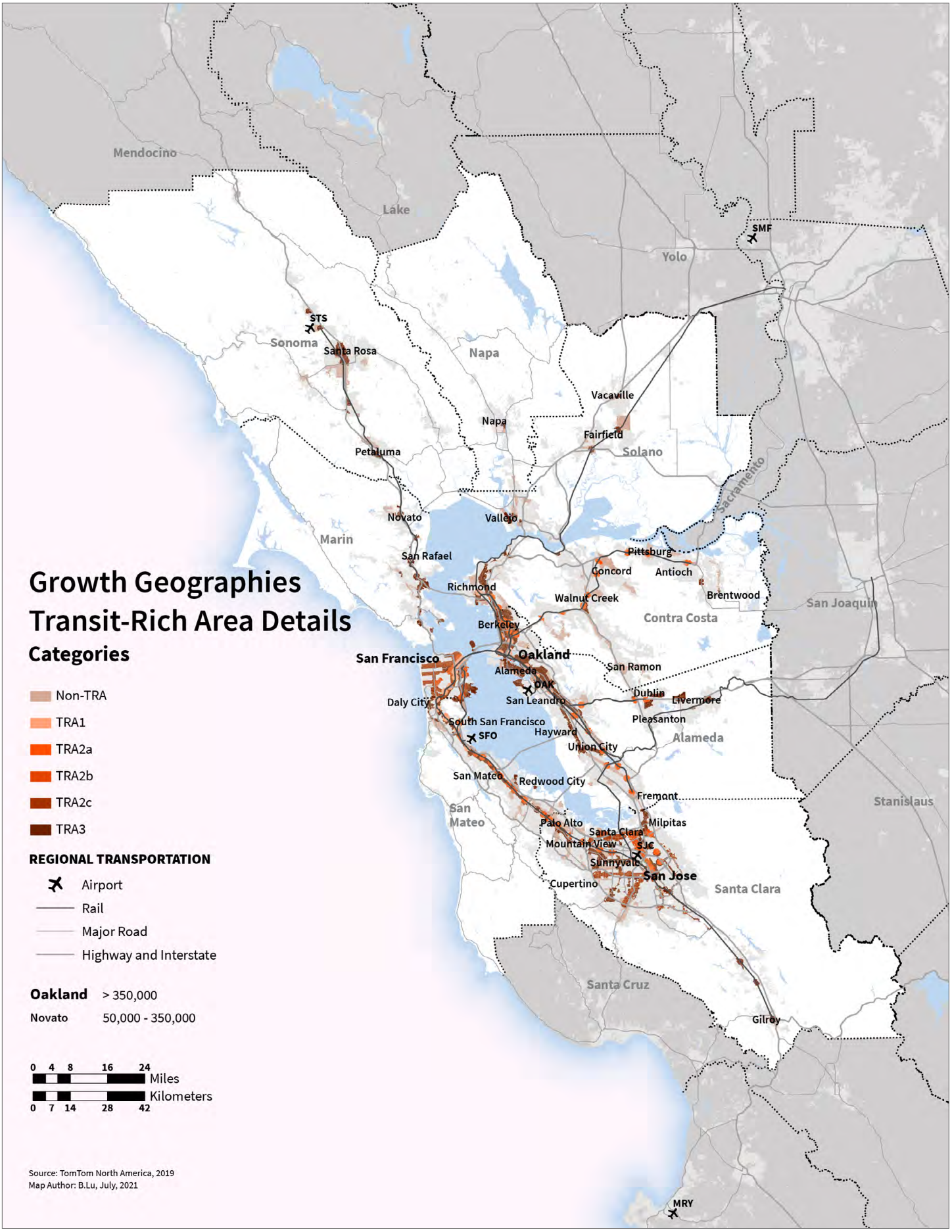


Figure 15. Plan Bay Area 2050 Growth Geographies: High-Resource Area (HRA) details

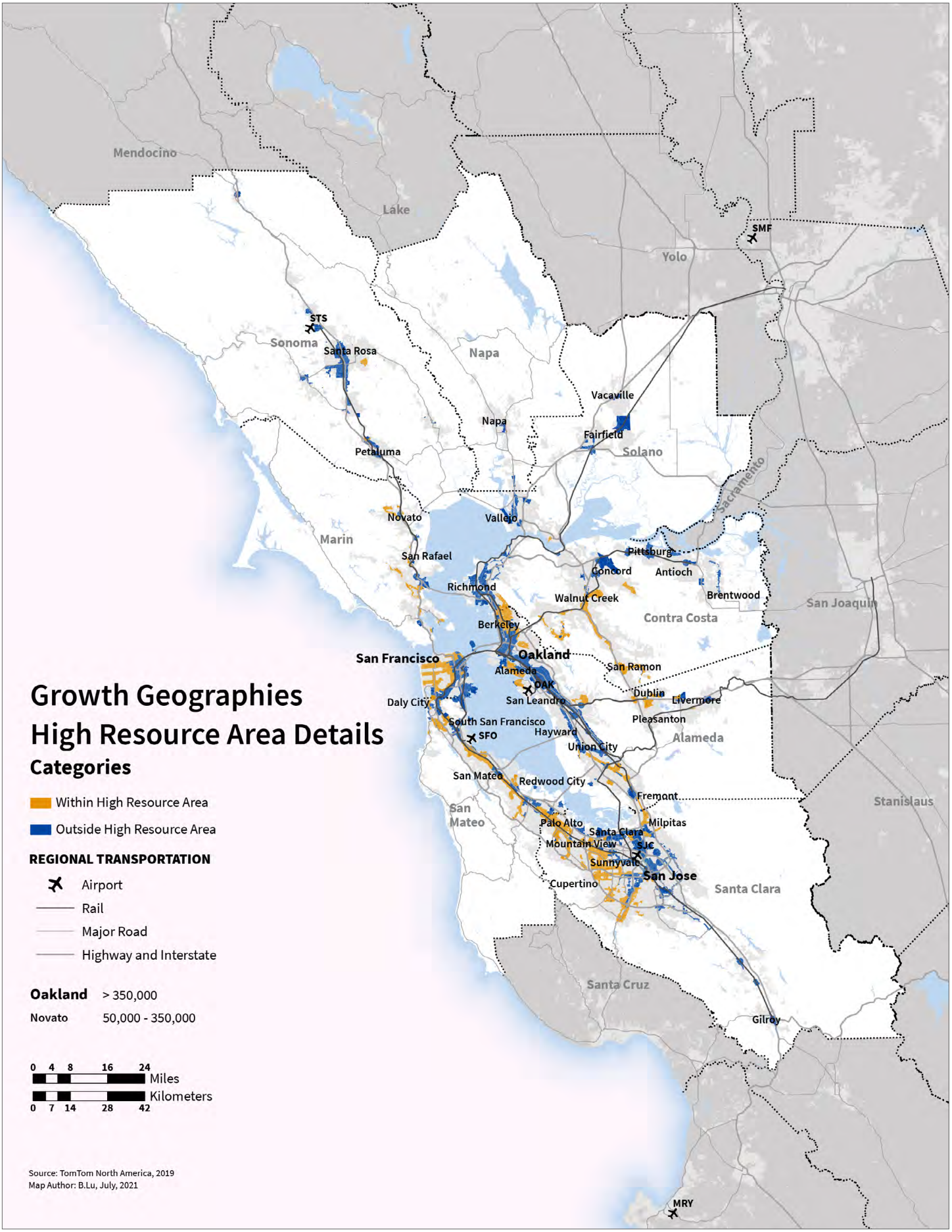
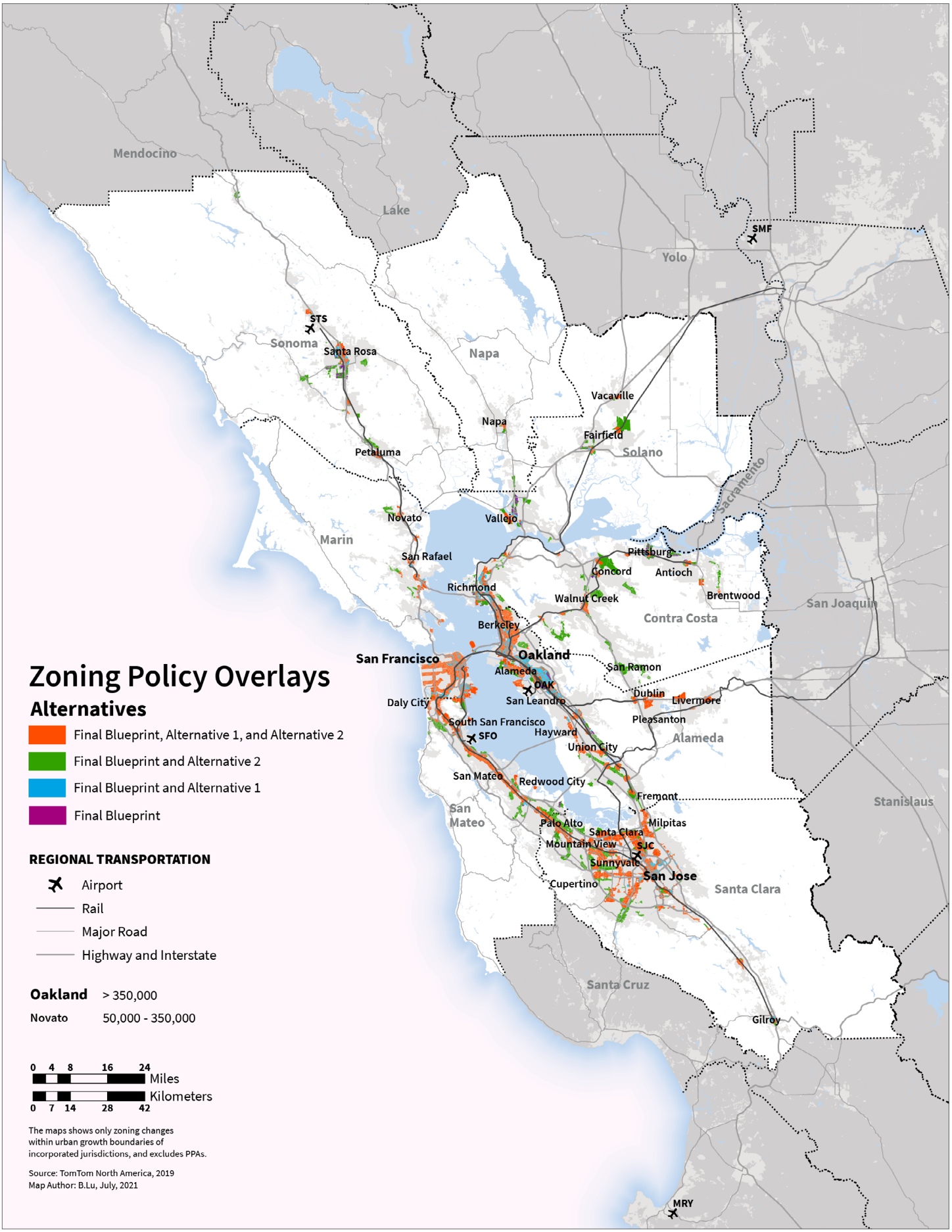


Figure 16. Zoning policy overlays across alternatives



To encourage growth in areas with access to the region's best public transit, schools, and community services, the plan also seeks to remove barriers to housing development in these locations. To do so, certain costs associated with housing development are limited, such as project review times and parking requirements. This is represented in the land use model as an increase in profit for the market-rate developer, thus increasing the feasibility of housing projects. The profit increases are applied using three tiers, determined by their levels of access to transit and resources. The profit increase levels associated with the savings are 1.3%, 1.9% and 2.5%. These amounts are based on estimates of development fees as a share of total housing costs and reflect the impact of reducing a specific share of these development costs.[24]

Strategy H4 | Build Adequate Affordable Housing to Ensure Homes for All

In addition to the preservation of affordable housing in the region, the alternatives also allow for the production of affordable housing to help meet the needs of low-income households. In the No Project alternative, only production funding from existing federal, state, and local sources is available. Funding levels remain similar to the baseline year and are continued through the plan horizon year to create deed-restricted units. This results in 117,000 additional deed-restricted units by 2050: 24,100 in Alameda, 15,900 in Contra Costa, 3,300 in Marin, 1,800 in Napa, 15,900 in San Francisco, 14,300 in San Mateo, 29,900 in Santa Clara, 5,400 in Solano, and 6,400 in Sonoma.

In all other alternatives, funding is used in the land use model to produce new deed-restricted housing over the forecast period. The funding is directed within the region according to the alternative's goals: the Plan uses production money only within the Growth Geographies, EIR Alternative 1 uses money in Transit-Rich Areas within the Growth Geographies, and EIR Alternative 2 splits funding evenly between High-Resource Areas and non-High-Resource Areas within the Growth Geographies. In the model, this production funding is made available for deed-restricted housing in individual counties based upon its share of the region's population, and existing city-and county-generated funding sources. Table 16 details the allocation of available funding by county.

Table 16. Production funding targets for affordable housing by county and Growth Geography: total production funding (millions of $)

	PLAN	EIR ALTERNATIVE 1	EIR ALTERNATIVE 2	
County	GG	GG + TRA	GG + HRA	GG + non-HRA
Alameda	4,000	4,000	2,000	2,000
Contra Costa	2,500	2,500	1,250	1,250
Marin	520	520	260	260
Napa	300	300	150	150
San Francisco	3,000	3,000	1,500	1,500
San Mateo	2,500	2,500	1,250	1,250
Santa Clara	5,000	5,000	2,500	2,500
Solano	850	850	425	425

24 12% is used as a proxy for development fees as a share of total development costs, based upon It All Adds Up: The Cost of Housing Development Fees in Seven California Cities (2018), Terner Center, which found fees in California range between 6%-18% of total development costs.

To build these units, the land use model identifies residential development projects that are close to being financially feasible under market conditions. Subsidizing these projects fills the "feasibility gap" and the financial need of projects is sorted to maximize the number of projects that can become feasible with the given funding. Building these projects creates deed-restricted units, which are only available to low-income households. This is complemented by the direct allocation of additional deed-restricted units through the Transform Aging Malls and Office Parks into Neighborhoods and the Accelerate Reuse of Public and Community-Owned Land for Mixed-Income Housing and Essential Services strategies.

Strategy H5 | Integrate Affordable Housing into All Major Housing Projects

An inclusionary zoning policy is included in Bay Area UrbanSim 2 as a requirement that new residential construction include a set percentage of units that are available exclusively to low-income residents. A default set of inclusionary zoning percentages capture the jurisdictional requirements in place today and these levels remain in place for the No Project. The default percentages came from multiple data sources, including research conducted by MTC and other entities[25], and local zoning ordinance or municipal code of Bay Area jurisdictions. The other EIR Alternatives vary these levels to tailor the requirements by location. Any new residential building must provide the percentage of affordable units required in each of the Growth Geographies, shown in Table 17.

Table 17. Minimum percent of affordable housing units in new development

	INCLUSIONARY PERCENTAGE
GG + TRA1/TRA2/TRA3 + HRA	20%
GG + TRA1/TRA2	15%
GG + HRA	15%
Other Areas	10%

Bay Area UrbanSim 2 reflects the requirement by altering the feasibility of building a new residential project. If a project remains profitable, the affordable units will be constructed. This process captures the challenges of building projects that have lower revenue but the same costs, with some otherwise feasible projects shifting to other locations. Like other affordable units, when projects are built with inclusionary units, only households in the lowest income quantile are prioritized to occupy them.

25 Data compiled by Association of Bay Area Governments in February 2017: https://mtc.maps.arcgis.com/home/item.html?id=4b-77830210d14982a3256fd7b67f68ee; Inclusionary Housing Map & Program Database maintained by InclusionaryHousing.org, a project of Grounded Solutions Network developed with support from the National Housing Conference and the Lincoln Institute for Land Policy: https://inclusionaryhousing.org/map/.

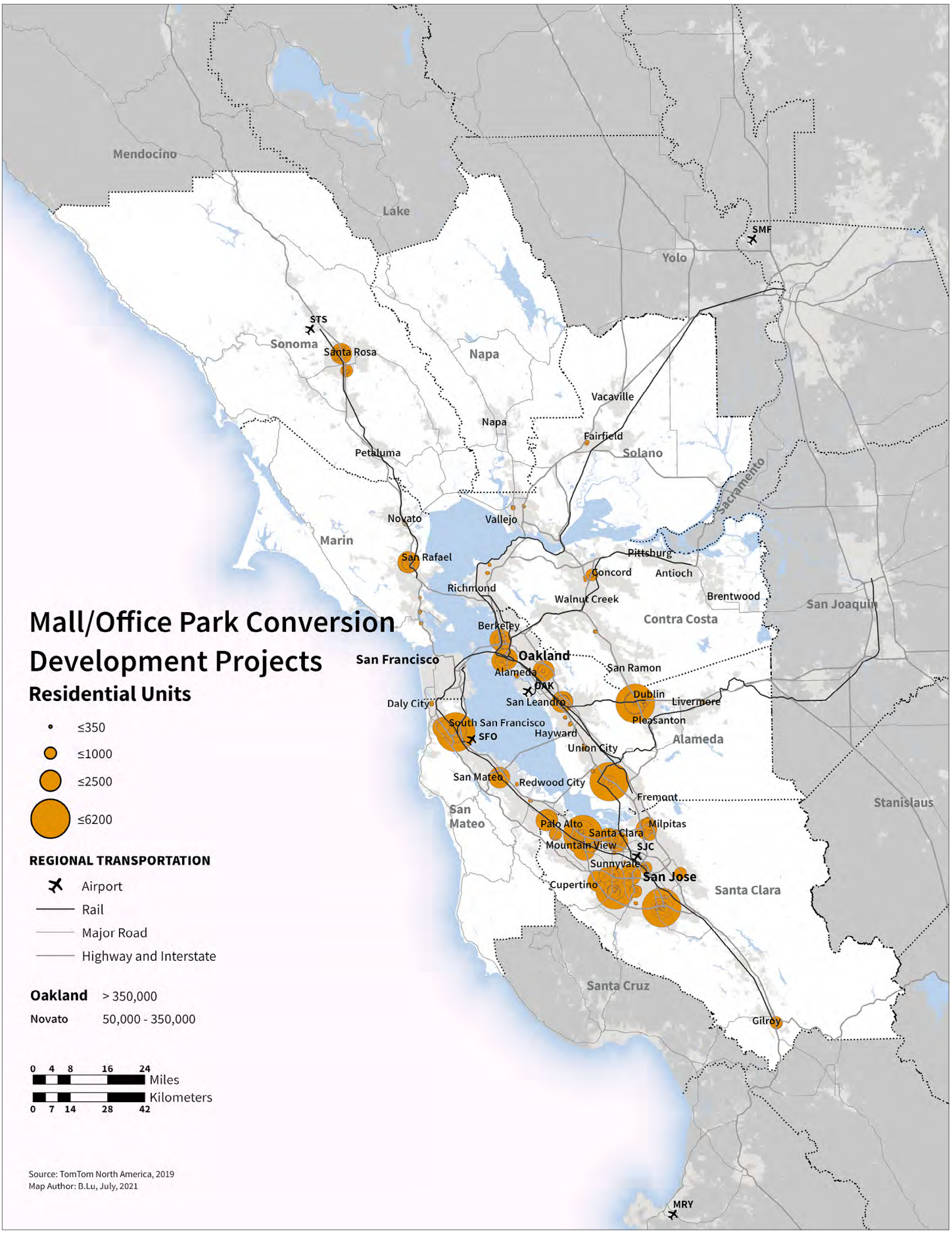
Strategy H6 | Transform Aging Malls and Office Parks into Neighborhoods

The transformation of aging malls and office parks promotes the reuse of land for critical housing, bringing new uses to these sites as neighborhoods with housing at all income levels as well as local and regional services. These projects are implemented through the Scheduled Development Events Model, where staff generate representative new projects that would comprise these sites and the model constructs them.

Malls and office parks in the region were analyzed to understand their likelihood of transitioning to new uses by assessing the age and value of existing buildings and the potential profitability under a new use. To support neighborhood-scale developments, only sites larger than 20 acres were assessed. Sites also needed to be located within a Growth Geography and required access to either transit, social resources, or both. In the Plan, the resulting set of malls and office parks were converted into new neighborhoods. In EIR Alternative 1, only projects within TRAs were built. In EIR Alternative 2, all projects within HRAs were constructed, while projects outside of HRAs were de-prioritized by random selection to achieve the focus of 50% of housing production in HRAs.

To support affordable housing production and capture the value created by rezoning particularly large sites, redeveloped malls and office parks with more than 1,000 new units are assumed to set aside adequate land for affordable housing at a ratio of 0.2:1 (or 20% of the project's housing units, in line with the upper bound of Strategy H4: Build Adequate Affordable Housing to Ensure Homes for All). Deed-restricted units above and beyond the inclusionary requirement contributed to this strategy as well. These are mall and office park transformation projects with 1,000+ dwelling units, which have a "set aside" for additional affordable housing on top of inclusionary requirements.

Figure 17. Mall/office park conversion development projects

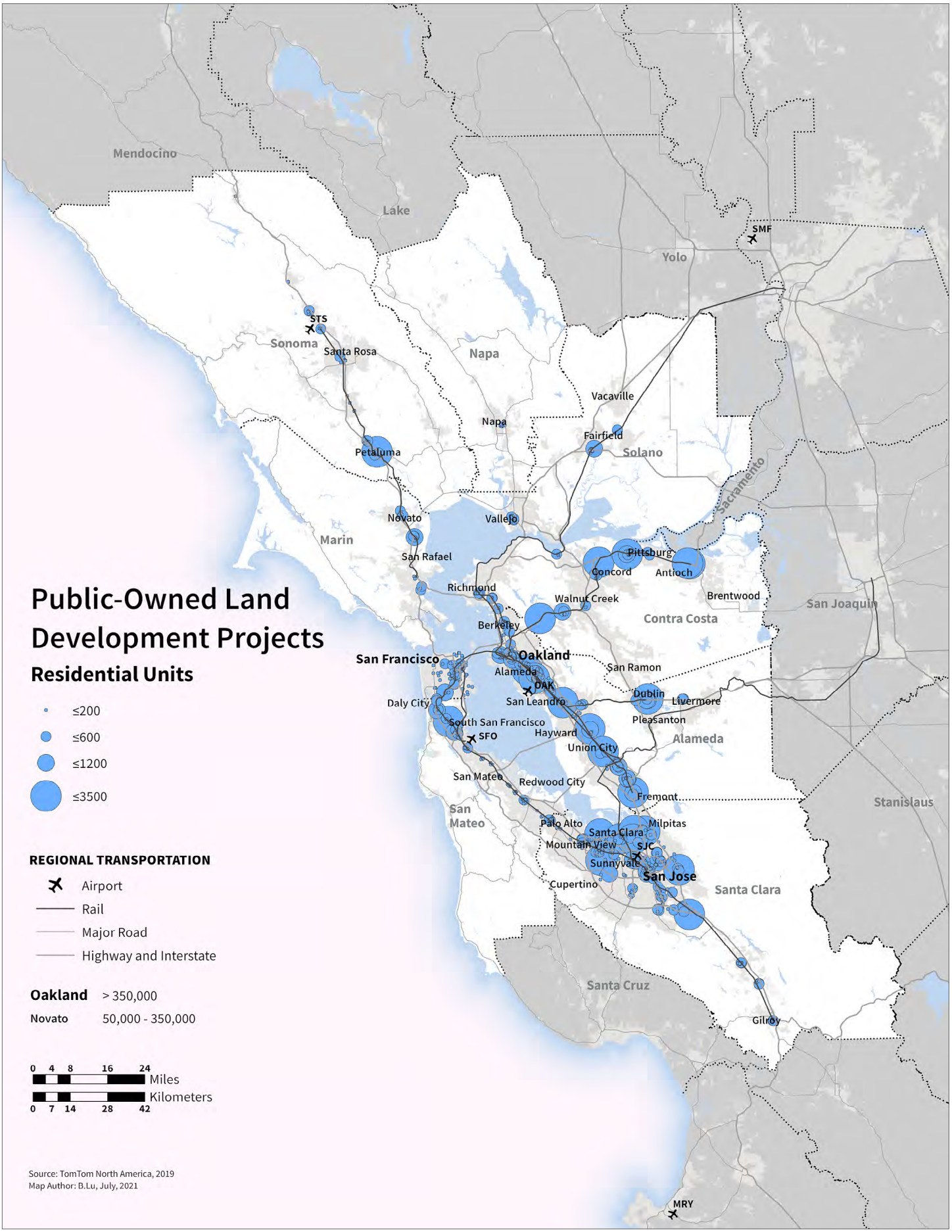


Strategy H8 | Accelerate Reuse of Public and Community-Owned Land for Mixed-Income Housing and Essential Services

Another strategy that makes effective use of land for housing is the development of public and community-owned land. This is accomplished first by identifying sites in the region owned by public agencies, community land trusts, and other non-profit landowners. By opening these sites for development, affordable housing and local services can be constructed. In the same way that mall and office park transformations are added to the development landscape, these projects are developed through the Scheduled Development Events Model. These developments were primarily 100% affordable housing projects, with some mixed-used projects to add commercial space for services. Staff generated projects to fit the building envelope of the parcels while considering appropriate scale for these sites.

All publicly owned sites identified for reuse were prioritized for development in upcoming and future years based upon size, transit proximity, and existing land use, if any. The first built were those on land owned by transit agencies within Transit-Rich Areas. These were followed by vacant sites in Transit-Rich Areas that are less than 10 acres, sites in Transit-Rich Areas that are less than 10 acres and occupied by buildings constructed before 1980, sites in Transit-Rich Areas that are larger than 10 acres and were assessed for viability of their current use, and finally other remaining sites. In the Plan, the full final set of public and community-owned lands were developed. In EIR Alternative 1, only projects in the Growth Geography area and within TRAs were built. In EIR Alternative 2, all projects within HRAs were constructed, while not all projects outside of HRAs were converted.

Figure 18. Public-owned land development projects



Strategy EC2 | Expand Job Training and Incubator Programs

Business incubators are used as an economic development catalyst for the creation of new small businesses and are designed to support training for high-growth, in-demand occupations. This strategy provides funding support for incubators and is modeled as the development of new incubator spaces. Incubators are co-located in select Priority Production Areas (PPAs) specifically in housing-rich locations to encourage job opportunities. Twenty-five jurisdictions nominated 34 PPAs around the region, which were adopted by MTC and ABAG in early 2020. Of these, PPAs with a jobs-housing ratio of less than 1.4 were assumed to receive incubator funding. The following PPAs fall under this criterion:

1. Bayside Industrial PPA
2. Pacific Commons PPA
3. Hayward PPA
4. Oakland Airport PPA
5. San Leandro PPA
6. Union City PPA
7. Northern Waterfront Industrial Corridor
8. Northern Concord PPA
9. Western Concord PPA
10. Oakley Employment Area
11. Pittsburg Northern Waterfront
12. Pacheco Manufacturing Zone
13. Baypoint Industrial Sector
14. American Canyon PPA
15. Northern Palmetto PPA
16. Morgan Hill PPA
17. Monterey Business Corridor
18. Benicia Industrial PPA
19. Dixon Northeast Quadrant
20. Fairfield PPA
21. Rio Vista PPA
22. Suisun City Gentry
23. Vacaville Industrial PPA
24. South Vallejo PPA
25. Cotati PPA

In Bay Area UrbanSim 2, these incubator spaces are represented by adding 450,000 square feet of industrial development within each PPA through the Scheduled Development Events model. Over time, the Employment Location Choice model may choose to locate jobs in these incubator buildings.

Strategy EC4 | Allow Greater Commercial Densities in Growth Geographies

As with residential zoning, commercial land use is treated in each of the alternatives to guide the region's employment growth. The zoning schemas are applied at the parcel level, allowing new building types on a parcel and/or changes to the Floor Area Ratio (FAR) (where not already permitted by local zoning). The commercial land use modifications in the alternatives are guided by the Growth Geographies previously defined in this report. In many situations, increased commercial zoning on a parcel coincides with zoning for denser residential development, meaning that these uses compete with one another, and also work to create mixed-use environments.

The No Project alternative maintains the existing commercial land use allowable intensities present in the base year model inputs. In the Plan, zoning is modified to increase development density in Transit-Rich Areas (TRAs) to encourage transit-supported commercial growth. In EIR Alternative 1, commercial development intensity is also increased in Transit-Rich Areas, with somewhat higher maximum allowed Floor Area Ratios than those in the Plan. In this alternative, TRAs in cities with three or more rail lines with frequent service are given even slightly higher FARs to encourage employment growth in locations with the most robust transit service. San Francisco, Oakland, Daly City, and San Leandro meet the requirements of having three or more rail lines as well as having peak service headways of five minutes or fewer. Since EIR Alternative 2 has a focus on creating housing opportunity in High-Resource Areas, commercial land use was not modified, and the base year zoning is maintained.

Table 18. Commercial density modifications across the alternatives

PLAN			
Zoning Alternative Geography		Maximum Floor Area Ratio (FAR) Applied	
	Broadened Allowable Building Type	Parcels not occupied by Single Family Dwelling (SFD) Units	Parcels occupied by Single Family Dwelling (SFD) Units
GG + TRA1	n/a	9	3
EIR ALTERNATIVE 1			
Zoning Alternative Geography	Broadened Allowable Building Type	Maximum Floor Area Ratio (FAR) Applied	
GG + TRA1 + three or more frequent rail lines	n/a	15	
GG + TRA1	n/a	12	
EIR ALTERNATIVE 2			
Zoning Alternative Geography	Broadened Allowable Building Type	Maximum Floor Area Ratio (FAR) Applied	
All Geographies	n/a	Local Zoning	

Strategy EC5 | Provide Incentives to Employers to Shift Jobs to Housing-Rich Areas Well-Served by Transit

To improve jobs-housing balance, this strategy uses building subsidies to encourage employers to locate in housing-rich areas near existing transit. These subsidies are used to support new office development in the land use model in a way similar to subsidizing housing: the land use model identifies office development projects that are close to being financially feasible under market conditions. Subsidizing these projects fills the "feasibility gap" and allows for office development projects that would not otherwise be built.

To meet the locational objectives of the strategy, the subsidy is only applied in select housing-rich cities, focusing on those with regional rail services (Table 19). These were the 11 cities with frequent rail services and four cities with other regional rail services such as SMART. The first group of cities has job-housing ratios lower than 1.2 at both the county and the jurisdiction levels in the base year; cities in the second group are either city centers or are linked to the New Transbay Rail Crossing. The total amount of $10 billion in subsidy is split between the two groups, with $9.5 billion going to the first group and $500 million going to the second group.

Table 19. Office development subsidies to improve jobs-housing balance

COUNTY	JURISDICTION	QUALIFICATIONS FOR SUBSIDY	SUBSIDY AMOUNT (2020$)
Alameda	Dublin	• 2015 job-housing ratios lower than 1.2 in both the county and the jurisdiction • Frequent rail services	864,000,000
Alameda	Fremont		864,000,000
Alameda	Oakland		864,000,000
Alameda	San Leandro		864,000,000
Alameda	Union City		864,000,000
Contra Costa	Antioch		864,000,000
Contra Costa	Concord		864,000,000
Contra Costa	El Cerrito		864,000,000
Contra Costa	Lafayette		864,000,000
Contra Costa	Pittsburg		864,000,000
Contra Costa	Richmond		864,000,000
Marin	San Rafael	• Other regional rail services • City center	125,000,000
Solano	Fairfield	• Other regional rail services • City center • Connected to New Transbay Rail Crossing	125,000,000
Solano	Vacaville	• Other regional rail services • Connected to New Transbay Rail Crossing	125,000,000
Sonoma	Santa Rosa	• Other regional rail services • City center	125,000,000

Strategy EC6 | Retain and Invest in Key Industrial Lands

This strategy focuses on industrial lands in order support and grow production, advanced manufacturing, distribution, and related businesses and middle-wage jobs. Priority Production Areas (PPAs) served as a basis for identifying the region's industrial land assets. Industrial zoning is maintained in the PPAs that intersect with the Growth Geographies through the allowed building types in the land use model. The zoning was modified to allow industrial use without competition from multifamily use. Development capacity in these PPAs was also increased to a maximum Floor Area Ratio (FAR) of 2 in this schema to accommodate new industrial development.

In addition, a subsidy of $4 billion was applied to allocate funding to jurisdictions with PPAs that are within the Urban Growth Boundaries. The funding is used to subsidize industrial development projects and to promote employment growth, especially in places with otherwise limited forecasted growth. To accomplish this, staff first looked at the BAUS2 model run results without integrating the industrial development subsidy and grouped the jurisdictions with PPAs into two categories based on their allocation of jobs in the manufacturing and wholesale sector as well as the transportation and utilities sector. The first group is jurisdictions with job growth in the these two sectors of over 800 jobs. These jurisdictions receive 15% of the total amount of subsidy, divided equally, and include Benicia, Fremont, Hayward, Livermore, Morgan Hill, Pacifica, San José, and Vacaville. The second group received the remaining 85%, divided equally, and includes American Canyon, Antioch, Concord, Cotati, Dixon, Fairfield, Milpitas, Oakland, Oakley, Pittsburg, Rio Vista, San Francisco, San Leandro, unincorporated Contra Costa County, Union City, and Vallejo.

Staff then converted the PPA funding for each jurisdiction into non-residential development projects using a cost factor of $50 per square foot. These projects were added to PPA parcels in their jurisdictions as scheduled development events, spread equally over 2025, 2030, 2035, 2040, 2045 and 2050. The model then constructed these projects in their respective future years.

Strategy EC7 | Assess Transportation Impact Fees on New Office Developments

This strategy is a fee on new commercial development that reflects transportation impacts associated with such development. The development fee focuses primarily on new commercial spaces anticipated to have high employment-related or residence-related vehicle miles traveled (VMT).

This strategy is used in EIR Alternative 1 to incentivize development inside low-VMT job centers. The fees are applied to new office development, set on a cost per square foot basis. The fees are further specified at the county level. The transportation impact of new development is based on the average VMT per worker by county in 2020, which is based on TAZ-level VMT data from Plan Bay Area 2040. The rationale for the different fees by county is to right-size the fee based on average county VMT. Table 20 below shows the resulting fees by VMT level.

Table 20. New office development fees (dollars per square foot)

	VERY HIGH VMT TAZ	HIGH VMT TAZ	MEDIUM-HIGH VMT TAZ	MEDIUM VMT TAZ
Alameda	40	30	15	4
Contra Costa	40	30	10	n/a
Marin	40	30	8	n/a
Napa	40	30	10	n/a
San Francisco	60	40	20	10
San Mateo	40	30	10	n/a
Santa Clara	40	30	10	4
Solano	40	30	10	n/a
Sonoma	40	30	10	n/a

This strategy is not included in any other EIR Alternatives, including the Plan.

Strategy EC8 | Implement Office Development Caps in Job-Rich Cities

Office Development Caps is a strategy applied in EIR Alternative 2 to help redistribute job growth in the region and to maximize the land availability for housing in job-rich cities. The job-housing ratio is used as a metric for understanding which cities have the greatest imbalance in their number of jobs versus housing units. In cities with at least two jobs per housing unit, or a job-housing ratio of 2 or greater, office development caps were applied in the land use model. Restricting new office development in these locations redistributes the modeled regional job demand. Jobs may move to existing vacant office space or into new office space built by the developer model in feasible locations.

The following cities had jobs-housing ratios of 2 or greater[26]:

- Emeryville
- Brisbane
- Menlo Park
- Santa Clara
- Mountain View
- South San Francisco
- Milpitas
- Burlingame
- Palo Alto
- Colma
- Cupertino

This strategy is not included in any other EIR Alternatives, including the Plan.

26 2016 jobs-housing ratios based on US Census 5-year data.

Strategy EN1 | Adapt to Sea Level Rise

As mentioned in the section on Environmental Factors, Plan Bay Area 2050 assumes a future with one foot of sea level rise by 2035 and two feet of sea level rise by 2050. To reduce the impact of associated inundation, the Plan, EIR Alternative 1 and EIR Alternative 2 include efforts to mitigate sea level rise by addressing adaptation needs. Protective measures are funded in most locations that are permanently inundated. Equity Priority Communities and areas with high benefit and low cost are prioritized for protection. In the No Project alternative, mitigation is much more limited; only committed mitigation project locations are protected from sea level rise. The committed mitigation projects are: San Francisco Airport Shoreline Protection Program, Foster City Levee Project, South Bay Shoreline Project, and Oakland Airport Sea Level Rise Adaptation.

In the land use model, protected areas become spared from inundation. This is done by altering the input files that specify inundated parcels. When a parcel is removed from the inundation set, households and jobs are no longer displaced from that parcel, and the land is available for new development that can accommodate the region's growth.

Strategy EN4 | Maintain Urban Growth Boundaries

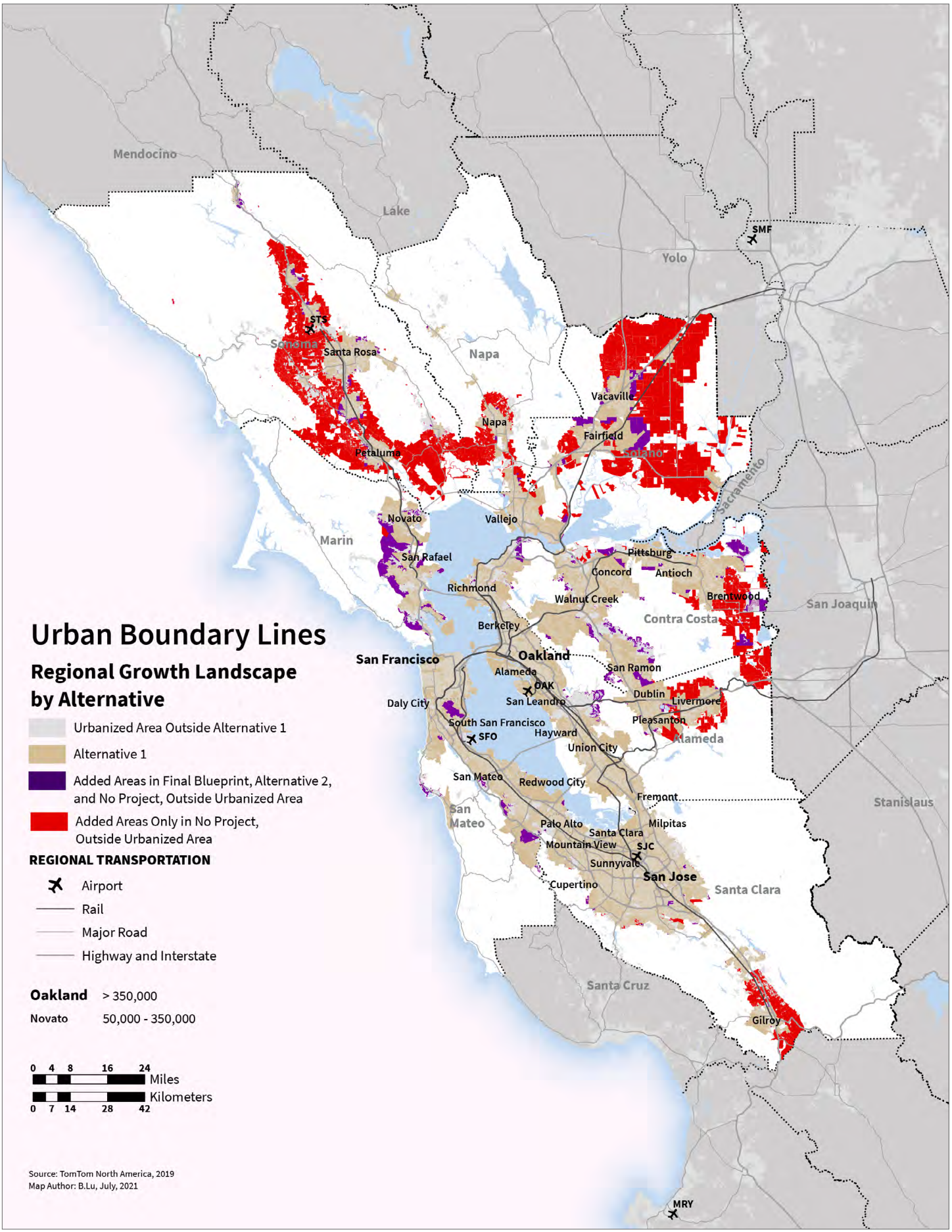
For the purpose of building EIR Alternatives, a consistent set of Urban Boundary Lines surrounding each city was established. These are meant to function like Urban Growth Boundaries in the EIR Alternatives. In some cases, the Urban Boundary Lines are drawn from true urban growth boundaries or urban service areas. In other cases, existing city boundaries are used to establish the Urban Boundary Line for EIR analysis.

The Urban Boundary Lines are treated in two different ways across EIR Alternatives. In the No Project alternative, they are assumed to be weakly enforced, meaning that suburban growth will be allowed to spill out past them. In the Plan and in EIR Alternative 2, the enforcement is assumed to be strict, meaning suburban growth is not allowed beyond them. In EIR Alternative 1, the boundaries limiting outward expansion are assumed to be the current city limits in all cases. Currently unincorporated land and any additional land within the Urban Boundary Line in each alternative is zoned to allow typical single-family development if not already permitted.

In the No Project alternative, the amount and location of growth beyond the Urban Boundary Lines must be determined. In the forecast, this can be thought of as land that is expected to become incorporated during the next three decades, either through city expansion or the formation of new cities. This is done by changing the zoning to allow suburban densities in particular locations and letting Bay Area UrbanSim 2 decide how much growth to place in those locations based on its representation of the regional land market. A total of 697 square miles of land was updated to allow typical suburban densities based the ratio of new incorporated land to population growth during the past three decades. Land was identified using a simple rule-based model that prioritized parcels that were near divided highways and had low slope within a five-mile radius (i.e., areas posited as most likely to incorporate). All land in this area was considered available in the base year.

The differential enforcement of Urban Boundary Lines across the alternatives results in different amounts of land being open for development by Bay Area UrbanSim 2's Real Estate Development sub-model. As seen in Figure 19, these potential "expansion areas" emphasize different degrees of regional compactness.

Figure 19. Urban boundary lines across alternatives



Strategy EN7 | Expand Commute Trip Reduction Programs at Major Employers

Modeling the strategy to expand commute trip reduction programs is primarily carried out through Travel Model 1.5 (see Strategy EN7: Expand Commute Trip Reduction Programs at Major Employers in that section). In the travel model, fewer trips are taken by auto and are substituted with an increase in the rate of telecommuting. Within Bay Area UrbanSim 2, the reduced number of employees going to their office on a given day results in an increase in building space efficiency. This strategy was represented in the same manner for the Plan and Alternatives 1 and 2. The resulting shift in building capacity was estimated by combining two factors at the super district zone level:

The share of workers likely to telework on a given day. Recent data on current workers was analyzed across all combinations of industry and occupation to understand the general compatibility of particular jobs (and their set of task requirements) for telework. These numbers were adjusted upward within Travel Model 1.5 to reflect the impacts of this strategy. Sub-areas of the Bay Area with larger shares of workers who were judged more likely to telework saw a larger change in this factor. By 2050 the superdistrict share of teleworkers ranged from 9% in Northwestern San Francisco to 25.5%. The largest increases in the share of teleworkers were in the Tri-Valley and the portion of the Inner East Bay from San Leandro to Hayward.

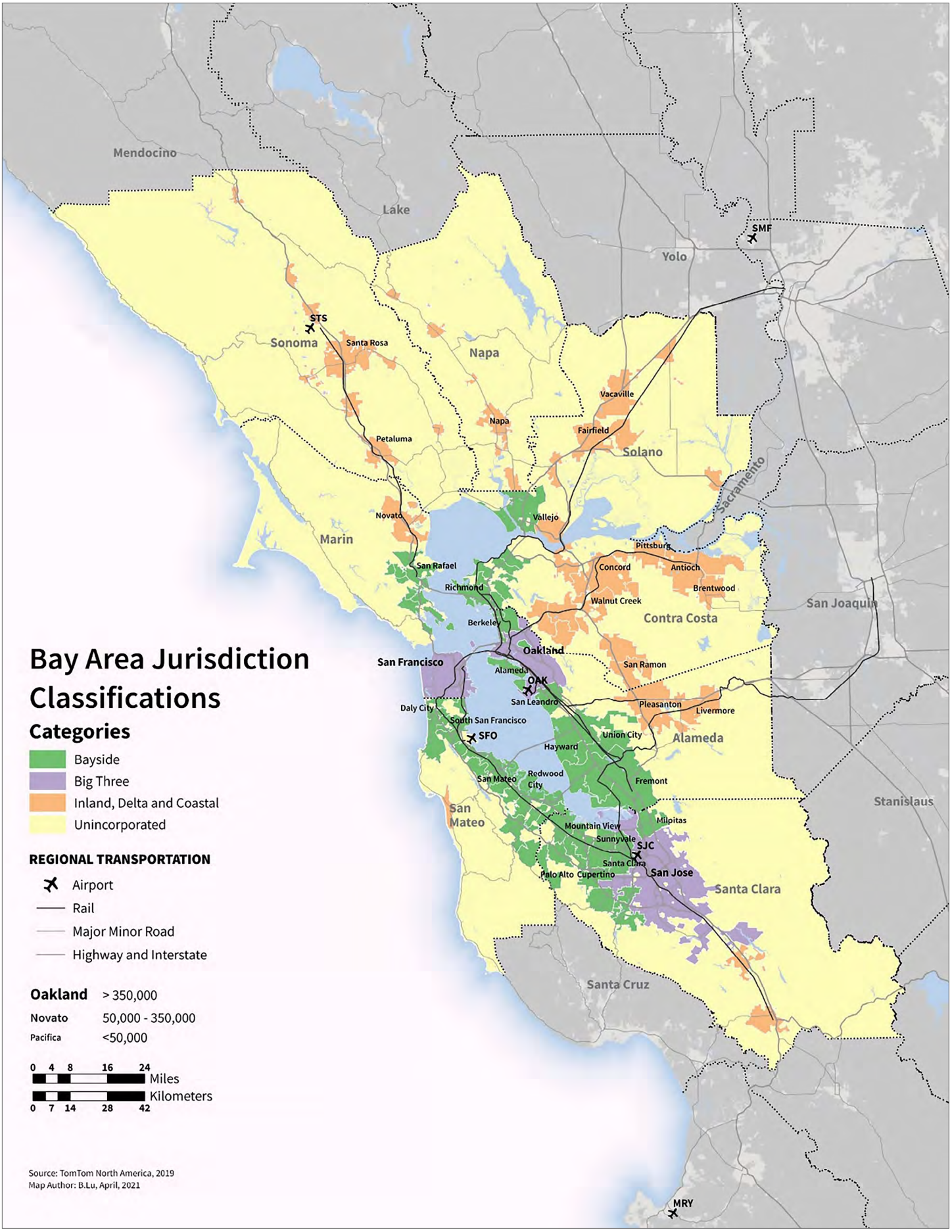
The "hoteling rate" at which it was assumed these workers could share their office workspaces. As a larger share of workers telework some days but continue to work in person on other days, firms are likely to re-arrange their offices by increasing the number of shared workspaces, often referred to as "hoteling". While some anecdotal data exists on this shift historically, it is difficult to forecast the degree to which offices will reduce their average square feet of rented space per employee. For the forecast, it is assumed that the hoteling rate (as applied to the share of workers that are teleworking) will range from 1/3 shared space in more expensive locations to no sharing in less expensive areas.

This strategy is then represented by applying each super district's hoteling rate to the share of workers expected to telework in a future year. This resulted in a reduced demand for commercial square feet of 7% by 2050 with the largest reductions occurring in San José and Oakland and very little expected change in most the North Bay. Overall, this tended to increase the tendency for employment growth in existing major job centers such as the San Francisco Central Business District and Silicon Valley because a greater number of employees can be accommodated by the large amount of existing space.

Findings

Selected land use model results are summarized and discussed here. The output presented is partial and intended to give a general sense of expected behavioral change across the alternatives and through the projection years. Emphasis is given to results that 1) influence the Travel Model, 2) affect Plan Bay Area 2050 results, and 3) provide a context for understanding the regional development change predicted by each alternative.

Figure 20. Map of Bay Area jurisdiction classification categories



Regional Land Use Outcomes

The share of regional population and employment growth provides a simple means of comparing the land use model outcomes for the four EIR Alternatives. For comparison, Figure 20 assigns the region's jurisdictions into four large categories: the Big Three Cities (San José, San Francisco, and Oakland); Bayside Cities; Inland, Delta and Coastal Cities; and Unincorporated Areas.

Table 21 shows the share of regional household growth for each alternative through 2050. Table 22 shows the share of regional employment growth for each alternative through 2050.

Table 21. Share of regional household growth across alternatives

AREA	2050 ALTERNATIVE			
	No Project	Plan	EIR Alternative 1	EIR Alternative 2
Big Three Cities	41%	43%	44%	37%
Bayside Cities	24%	34%	40%	40%
Inland, Delta and Coastal Cities	21%	18%	15%	18%
Unincorporated	15%	5%	1%	4%

NOTE: results may not total to 100% because of rounding.

Table 22. Share of regional employment across alternatives

AREA	2050 ALTERNATIVE			
	No Project	Plan	EIR Alternative 1	EIR Alternative 2
Big Three Cities	44%	39%	37%	47%
Bayside Cities	40%	45%	44%	36%
Inland, Delta and Coastal Cities	13%	13%	16%	14%
Unincorporated	3%	3%	4%	3%

Small Zone Outcomes

While the regional distribution of households and employment will influence travel behavior, a more micro-level understanding of growth is also fundamental in understanding each alternative's ability to achieve plan goals. As described above, the three small zones employed in the plan process are Priority Development Areas (PDAs), Transit-Rich Areas (TRAs), and High-Resource Areas (HRAs). Figure 13, above, shows these zones as well as additional Growth Geographies and areas of overlap. Table 23 provides the share of regional household growth in PDAs, TRAs, and HRAs for the alternatives through year 2050. Table 24 shows similar information for employment growth shares.

Table 23. Small zone share of household growth across alternatives

AREA	2050 ALTERNATIVES			
	No Project	Plan	EIR Alternative 1	EIR Alternative 2
PDAs	51%	72%	76%	66%
TRAs	63%	82%	91%	79%
HRAs	24%	28%	29%	39%

NOTE: results may not total to 100% because of rounding and/or overlapping zone definitions.

Table 24. Small zone share of employment growth across alternatives

AREA	2050 ALTERNATIVES			
	No Project	Plan	EIR Alternative 1	EIR Alternative 2
PDAs	51%	48%	50%	51%
TRAs	65%	63%	63%	63%
HRAs	18%	14%	15%	5%

NOTE: results may not total to 100% because of rounding and/or overlapping zone definitions.

Jobs-Housing Balance Outcomes

The jobs-housing balance is an ongoing topic of interest in the Bay Area, given wide variation between job-rich and housing-rich counties. The regionwide jobs-to-housing ratio decreases from 1.50 in 2015 to 1.34 by 2050, reflecting a higher ratio of housing to job production to accommodate pent-up demand for housing. Overall, the Plan results in counties converging toward the regional jobs-housing ratio of 1.34. The North Bay and East Bay subareas, while still below the regional average, are both moving closer to regional average. Similarly, the traditional jobs-rich Peninsula and South Bay subareas remain jobs-rich, but are moving closer to the regional jobs-housing ratio.

Table 25. Jobs-housing balance across alternatives

		2050 ALTERNATIVES			
COUNTY	2015	No Project	Plan	EIR Alternative 1	EIR Alternative 2
Regionwide	1.50	1.34	0.1.34	1.34	1.34
Alameda	1.58	1.40	1.40	1.37	1.43
Contra Costa	1.06	0.74	0.97	1.17	1.00
Marin	1.25	0.90	0.80	0.84	0.88
Napa	1.42	1.51	1.56	1.56	1.61
San Francisco	1.86	1.91	1.59	1.44	1.94
San Mateo	1.47	1.26	1.28	1.15	1.32
Santa Clara	1.78	1.56	1.51	1.52	1.32
Solano	0.93	0.95	1.14	1.30	1.12
Sonoma	1.18	1.21	1.14	1.14	1.12

Housing Affordability Outcomes

Housing affordability is another issue of great regional concern. As seen in Housing affordability is another issue of great regional concern. As seen in Table 26, households spend much more on housing than typically considered healthy (i.e., not more than 30% of income). Across all income categories, households have been spending 33% of income on housing while for the lowest quartile of households this figure has been around 68% in recent years. All alternatives contain higher levels of market rate construction in future years and this additional housing is forecast to decrease costs by the amount seen in the No Project results. The other alternatives also add a large amount of low-income, deed-restricted housing where subsidies cover costs above 30% of household income. These alternatives see a great deal of reduction in housing costs., households spend much more on housing than typically considered healthy (i.e., not more than 30% of income). Across all income categories, households have been spending 33% of income on housing while for the lowest quartile of households this figure has been around 68% in recent years. All alternatives contain higher levels of market rate construction in future years and this additional housing is forecast to decrease costs by the amount seen in the No Project results. The other alternatives also add a large amount of low-income, deed-restricted housing where subsidies cover costs above 30% of household income. These alternatives see a great deal of reduction in housing costs.

Table 26. Share of income spent on housing across alternatives

	ALTERNATIVE 2050				
	2015	No Project	Plan	EIR Alternative 1	EIR Alternative 2
Low-Income Households	68%	44%	29%	29%	29%
All Households	33%	25%	21%	21%	21%

Travel Modeling Suite

MTC and ABAG use an analytical tool known as a travel model (also known as a travel demand model or travel forecasting model) to first describe the reaction of travelers to transportation projects and policies and then to quantify the impact of cumulative individual decisions on the Bay Area's transportation networks and environment. MTC's and ABAG's travel modeling suite is comprised of three main analytical tools: a population synthesizer, a travel model, and a vehicle emission model. Each tool is described in turn below. While the travel model is able to represent most of the strategies and policy interventions in the plan, some elements of transportation strategies are not captured, and the calculations performed to analyze these policies are described in the section on Off-Model Calculations.

Population Synthesizer

MTC and ABAG's travel model is an agent-based simulation. The "agents" in this case are individual households, comprised of the people who form each household. In this way, the travel model attempts to simulate the behavior of the individuals and the households who carry out their daily activities in a setting described by the input land development patterns and input transportation projects and policies. To use this type of simulation, each agent must be characterized in a fair amount of detail.

Software programs that create lists of households and persons for travel model simulations are known as population synthesizers. For Plan Bay Area 2050, MTC and ABAG began using the population synthesizer, PopulationSim.[27] The population synthesizer attempts to sample households described in the 2007-2011 Census Public Micro-sample (PUMS) data in such a way that when looking at the population along specific dimensions spatially (at a level of detail below which the PUMS data is reported), the aggregate sums more or less match those predicted by other Census summary tables (when synthesizing historical populations) or the land use projections made by the Land Use Model (when forecasting populations). For example, if Bay Area UrbanSim 2 forecasts that 60 households containing 100 workers and 45 children will live in spatial unit X in the year 2035, the population synthesizer will locate 60 PUMS households in spatial unit X and will select households in such a way that, when summing across households, the number of workers is close to 100 and the number of children is close to 45.

The population synthesizer "controls" (i.e., minimizes the discrepancy between the synthetic population results and the historical Census results or the land use forecasts) at the travel analysis zone (TAZ) along the following dimensions:

1. Number of total households (individuals living in non-institutionalized group quarters, e.g. college dorms, are counted as single-person households);
2. Number of total households by size (four categories: 1, 2, 3 or 4+);
3. Number of households by income quantile (four income quantiles as defined in Table 7);
4. Number of households by number of workers (four categories: 0, 1, 2, 3+);
5. Number of persons by age (five categories: 0-4, 5-19, 20-44; 45-64; 65+) and,
6. Number of persons living in non-institutionalized group quarters by type (three categories: college dorm, military, and other non-institutional group quarters)

27 PopulationSim: https://activitysim.github.io/populationsim/.

Travel Model

Travel models are frequently updated. As such, a bit of detail as to which version of a given travel model is used for a given analysis is useful. The current analysis uses MTC's Travel Model 1.5 (version 1.5.2.3), released in December 2020, calibrated to year 2015 conditions, and validated against year 2010 and 2015 conditions.[28] Travel Model 1.5 will also be referred to as TM1.5 for the purposes of this report.

Travel Model 1.5 is of the so-called "activity-based" archetype. The model is a partial agent-based simulation in which the agents are the households and people who reside in the Bay Area. The simulation is partial because it does not include the simulation of individual behavior of passenger, commercial, and transit vehicles on roadways and transit facilities (though the model system does simulate the behavior of aggregations of vehicles and transit riders). In regional planning work, the travel model is used to simulate a typical weekday – when school is in session, the weather is pleasant, and no major collisions or incidents disrupt the transportation system.

The model system operates on a synthetic population that includes households and people representing each actual household and person in the nine-county Bay Area – in both historical and prospective years. Travelers move through a space segmented into travel analysis zones (TAZs)[29] and, in so doing, use the transportation system. The model system simulates a series of travel-related choices for each household and for each person within each household. These choices[30] are as follows (organized sequentially):

1. **Usual workplace and school location** — Each worker, student, and working student in the synthetic population selects a travel analysis zone in which to work or attend school (or, for working students, one zone to work and another in which to attend school).
2. **Household automobile ownership** — Each household, given its location and socio-demographics, as well as each member's work and/or school locations (i.e., given the preceding simulation results), decides how many vehicles to own.
3. **Daily activity pattern** — Each household chooses the daily activity pattern of each household member, the choices being (a) go to work or school, (b) leave the house, but not for work or school, or (c) stay at home.
4. Work/school tour[31] frequency and scheduling — Each worker, student, and working student decides how many round trips they will make to work and/or school and then schedules a time to leave for, as well as return home from, work and/or school.
5. **Joint non-mandatory[32] tour frequency, party size, participation, destination, and scheduling** — Each household selects the number and type (e.g., to eat, to visit friends) of "joint" (defined as two or more members of the same household traveling together for the duration of the tour) non-mandatory (for purposes other than work or school) round trips in which to engage, then determines which members of the household will participate, where, and at what time the tour (i.e., the time leaving and the time returning home) will occur.
6. **Non-mandatory tour frequency, destination, and scheduling** — Each person determines the number and type of non-mandatory (e.g., to eat, to shop) round trips to engage in during the model day, where to engage in these tours, and at what time to leave and return home.

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28 Additional information is available here: https://github.com/BayAreaMetro/modeling-website/wiki/Development.

29 Map of TAZs: https://mtc.maps.arcgis.com/home/item.html?id=b85ba4d43f9843128d3542260d9a2f1f

30 These "choices", which often are not really choices at all (the term is part of travel model jargon), are simulated in a random utility framework – background information is available here: https://en.wikipedia.org/wiki/Choice_modelling.

31 A "tour" is defined as a round trip from and back to either home or the workplace.

32 Travel modeling practice use the term "mandatory" to describe work and school travel and "non-mandatory" to refer to other types of travel (e.g., to the grocery store); this terminology is used to communicate efficiently with others in this space. Staff neither assume nor believe that all non-work/school-related travel is non-mandatory or optional.

7. Tour travel mode — The tour-level travel mode choice (e.g., drive alone, walk, take transit) decision is simulated separately for each tour and represents the best mode of travel for the round trip.

8. Stop frequency and location — Each traveler or group of travelers (for joint travel) decides whether to make a stop on an outbound (from home) or inbound (to home) leg of a travel tour, and if a stop is to be made, where the stop is made, all given the round trip tour mode choice decision.

9. Trip travel model — A trip is a portion of a tour, either from the tour origin to the tour destination, the tour origin to a stop, a stop to another stop, or a stop to a tour destination. A separate mode choice decision is simulated for each trip; this decision is made with awareness of the prior tour mode choice decision.

10. Assignment — Vehicle trips for each synthetic traveler are aggregated into time-of-day-specific matrices (i.e., tables of trips segmented by origin and destination) that are assigned via the standard static user equilibrium procedures to the highway network. Transit trips are assigned to time-of-day-specific transit networks.

Travel Model 1.5 is a major update to Travel Model One v0.6, which was used for the previous long-range plan (Plan Bay Area 2040). Developed to support the needs of Plan Bay Area 2050, Travel Model 1.5 added representation for ride-hailing (or Transportation Network Company - TNC) and taxi modes, as well as for autonomous vehicles.[33]

The Travel Model 1.5 system inherits without significant modification the representation of interregional and commercial vehicle travel from MTC's previous travel model system (commonly referred to as BAYCAST or BAYCAST-90). Specifically, commercial vehicle demand is represented using methods developed for Caltrans and Alameda County as part of the Interstate 880 Intermodal Corridor Study conducted in 1982 and the Quick Response Freight Manual developed by the United States Department of Transportation in 1996. When combined, these methods estimate four classes of commercial travel, specifically: "very small" trucks, which are two-axle/four-tire vehicles; "small" trucks, which are two-axle/six-tire vehicles; "medium" trucks, which are three-axle vehicles; and, "combination" trucks, which are truck/trailer combinations with four or more axles.

Reconciling travel demand with available transportation supply is particularly difficult near the boundaries of planning regions because little is assumed to be known (in deference to efficiency – the model must have boundaries) about the land development patterns — the primary driver of demand — or supply details beyond these boundaries. The typical approach to representing this interregional travel is to first estimate the demand at each location where a major transportation facility intersects the boundary and to then distribute this demand to locations either within the planning region (which results in so-called "internal/external" travel) or to other boundary locations ("external/external" travel). MTC uses this typical approach and informs the process with the Census Transportation Planning Product (CTPP) based on 2006-2010 5-year American Community Survey Data, which are allocated via simple method to represent flows to and from MTC's travel analysis zones and 21 boundary locations, as well as the flows between boundary locations.

The travel of air passengers to and from the Bay Area's airports is represented with static (across alternatives), year-specific vehicle trip tables. These trip tables are based on air passenger survey data collected in 2006 and planning information developed as part of MTC's Regional Airport Planning Study.

Similarly, the travel of high-speed rail (HSR) passengers to and from the Bay Area's expected HSR stations is represented with static (across those alternatives for which HSR is assumed to be implemented), year-specific vehicle trip tables. The HSR demand estimates are derived from the California High Speed Rail Authority's 2016 Business Plan[34] with modifications to delay service based on the 2020 Business Plan.[35] The update assumes that the Gilroy and San Jose stations open around 2035, and the Millbrae and San Francisco stations open by 2040 [opening years rounded to nearest five-year increment; opening contingent on high-speed rail investments in Period 2 of Plan Bay Area 2050].

33 For more detail about Travel Model 1.5, see: https://github.com/BayAreaMetro/modeling-website/wiki/TravelModel1.5.

34 https://hsr.ca.gov/docs/about/business_plans/2016_BusinessPlan.pdf.

35 https://hsr.ca.gov/docs/about/business_plans/2020_Business_Plan.pdf.

Vehicle Emissions Model

The MTC travel model generates spatially- and temporally-specific estimates of vehicle usage and speed for a typical weekday. This information is then input into an emissions model to estimate on-road mobile source criteria pollutants as well as carbon dioxide emissions (used as a proxy for all greenhouse gases). For the current plan air quality analyses, MTC and ABAG used the California Air Resource Board's EMissions FACtor (EMFAC) 2014 for SB 375 calculations, EMFAC 2017 for Plan Bay Area 2050 Equity Analysis calculations, CT-EMFAC 2017 for Plan Bay Area 2015 EIR mobile source air toxic emission inventory estimation, and EMFAC 2021 for Plan Bay Area 2050 EIR criteria pollutant emission inventory estimation.

Input Assumptions

Analysis work was done to simulate historical conditions, conditions in future years should no action be taken, and conditions in future years under a variety of planned modifications representing the Plan and EIR Alternatives. Historical scenarios are labeled by their year and include Year 2005 and Year 2015. Planned actions include varying sets of strategy packages. As described in EIR Alternatives section of Chapter 3: Land Use Model, there are three planned sets of strategy actions: the Plan as well as EIR Alternative 1 and EIR Alternative 2. These simulations were performed for 2025, 2030, 2035, 2040 and 2050. The no action alternative is referred to as No Project; No Project simulations were performed for the same years as the Plan and EIR Alternatives 1 and 2, but this report will focus on Year 2050 for the No Project, the Plan and the EIR Alternatives. The various simulation years serve different purposes: historical years demonstrate the model's ability to adequately replicate on-the-ground conditions[36] and provide the reader data for a familiar scenario; the California Air Resources Board established greenhouse gas targets for 2035; the regional plan, as guided by federal regulations, extends to 2050. Interim year (2025, 2030 and 2040) modeling is performed primarily for air quality conformity analysis.

The above strategy packages differ across four dimensions, namely land use, roadway supply, transit supply, and prices. Land use refers to the locations of households and jobs (of different types). Roadway supply is the physical network upon which automobiles, trucks, transit vehicles, bicycles, and pedestrians travel. Transit supply refers to the facilities upon which public transit vehicles travel (the roadway, along rail lines, ferry routes, and other dedicated infrastructure), as well as the stop locations, routes, and frequency of transit service. Prices include the monetary fees users are charged to board transit vehicles, cross bridges, operate and park private vehicles, and use express lanes (also known as high occupancy toll lanes).

36 Details of this "validation" process are available here: https://github.com/BayAreaMetro/modeling-website/wiki/Development.

Table 27. Travel model simulations by year and alternative

	SIMULATION YEAR						
Scenario	2005	2015	2025	2030	2035	2040	2050
Historical	✓	✓					
No Project			✓	✓	✓	✓	✓
Plan			✓	✓	✓	✓	✓
Incremental Progress Assessment					✓		
EIR Alternative 1					✓		✓
EIR Alternative 2					✓		✓

In the remainder of this chapter, each of the six scenarios (the rows in Table 27) are discussed, organized by the above four dimensions; additional notes on "other assumptions" concludes the section. This organization should allow the reader to compare the input assumptions across scenarios.

Land Use

Additional information regarding the land development patterns is available in Chapter 3: Land Use Model. Here, we provide a handful of details regarding the transformation of these land use inputs into the information needed by the travel model.

Prior to executing the travel model, the land development inputs provided by the Regional Growth Forecast (Table 8) and by Bay Area UrbanSim 2 (distribution details) are run through the population synthesizer as described above. The journey from control totals through the modeling system introduces minor inconsistencies between the estimated regional control totals, which are carried through Bay Area UrbanSim 2, and the totals implied by the synthetic population. These inconsistencies are presented in Table 28 confirm this matches final EIR runs.

Table 28. Demographic statistics of control and simulated populations

		HOUSEHOLDS				POPULATION		
Year	Alternative	Regional Forecast Households	Group Quarters	Synthetic Population	Percent Difference†	Regional Forecast Results	Synthetic Population	Percent Difference
2015	Historical	2,677,000	91,000	2,792,000	0.9%	7,656,000	7,581,000	-1.0%
2025	Plan	2,952,000	149,000	3,056,000	-1.4%	8,231,000	8,235,000	0.0%
2030	Plan	3,209,000	158,000	3,321,000	-1.4%	8,553,000	8,602,000	0.6%
2035	Incremental Progress	3,495,000	165,000	3,658,000	0.0%	9,003,000	9,009,000	0.1%
2035	No Project	3,495,000	167,000	3,613,000	-1.3%	9,003,000	9,168,000	1.8%
2035	Plan	3,495,000	167,000	3,613,000	-1.3%	9,003,000	9,167,000	1.8%
2035	EIR Alt1	3,495,000	167,000	3,613,000	-1.3%	9,003,000	9,168,000	1.8%
2035	EIR Alt2	3,495,000	167,000	3,613,000	-1.3%	9,003,000	9,170,000	1.9%
2040	Plan	3,711,000	176,000	3,836,000	-1.3%	9,487,000	9,546,000	0.6%
2050	No Project	4,043,000	176,000	4,183,000	-0.9%	10,325,000	10,367,000	0.4%
2050	Plan	4,043,000	176,000	4,183,000	-0.9%	10,325,000	10,368,000	0.4%
2050	EIR Alt1	4,043,000	176,000	4,183,000	-0.9%	10,325,000	10,367,000	0.4%
2050	EIR Alt2	4,043,000	176,000	4,183,000	-0.9%	10,325,000	10,363,000	0.4%

† – Individuals living in group quarters are considered individual households in the synthetic population and, subsequently, the travel model.

A key function of the population synthesizer is to identify each member of the representative populous with one of eight "person type" labels. Each person in the synthetic population is identified as a full- time worker, part-time worker, college student, non-working adult, retired person, driving-age student, non-driving-age student, or child too young for school. The travel model relies on these person type classifications, along with myriad other variables, to predict behavior.

Figure 21. Historical and forecasted person type distributions for Plan

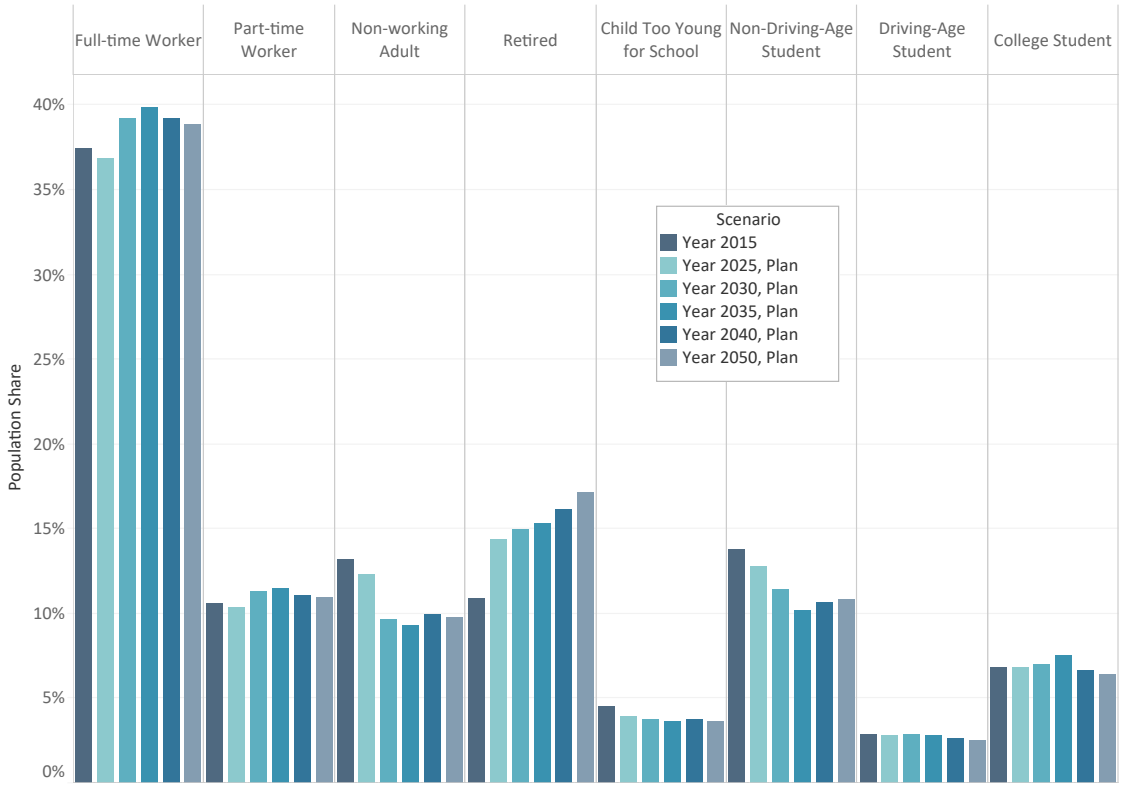
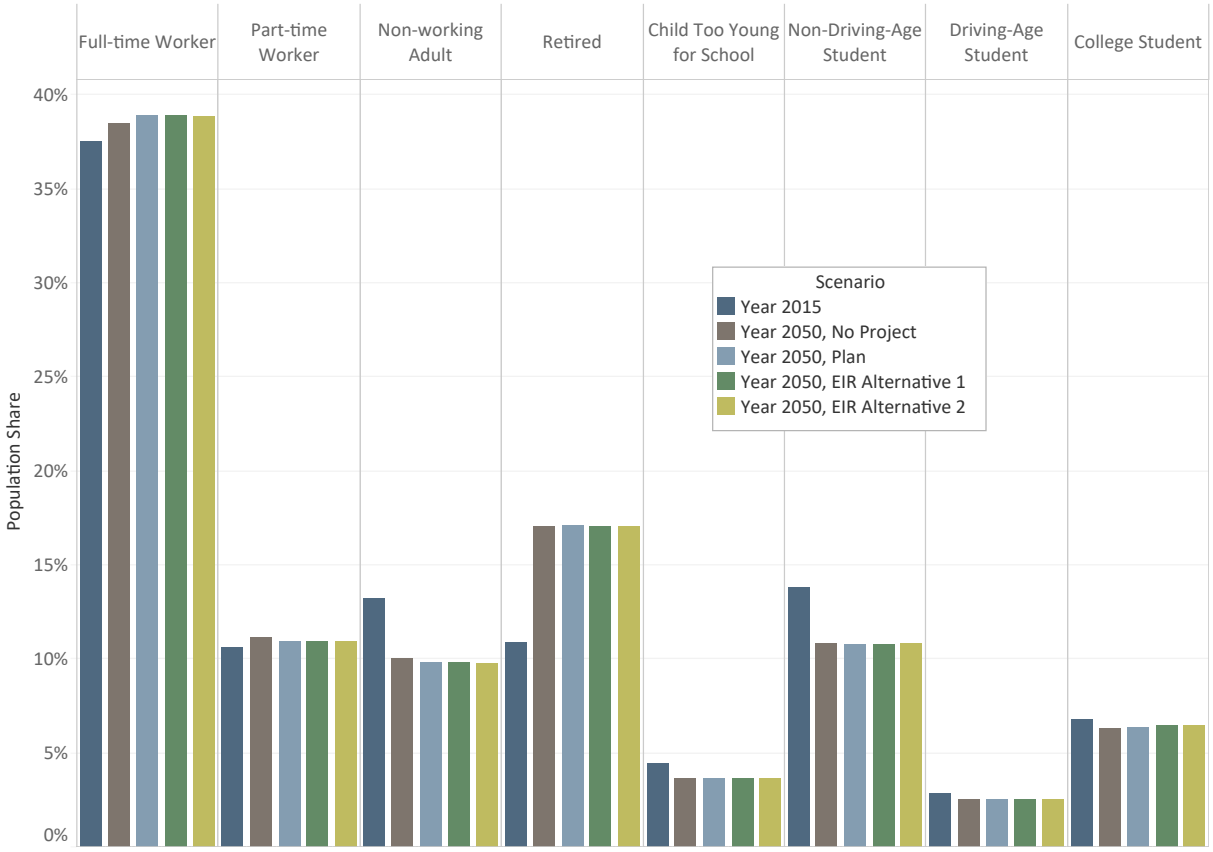


Figure 21 shows the distribution of person types for the historical scenarios and the Plan, from years 2015 to 2050. Interesting aspects of these distributions, which are driven by assumptions embedded in the regional forecast, are as follows:

1. The share of full-time workers peaks in 2035;
2. The share of retired workers steadily increases from 2015 to 2050; and
3. The person types don't change dramatically.

Figure 22 shows the distribution of person types across the four forecast year alternatives for year 2050.

Figure 22. Person type distributions across alternatives



Road Network

The historical scenarios for 2005 and 2015 have a representation of roadways that reflect infrastructure that was in place in 2005 and 2015.

The No Project alternative includes projects that are either in place in 2016 or are "committed" as defined by MTC Resolution No. 4182. The Plan (and EIR Alternatives 1 and 2) builds upon these networks, adding in the roadway projects included in the transportation investment strategies, which is discussed in more detail in Strategy Implementation. Finally, because the No Project alternative does not include EN1: Adapt to Sea Level Rise, the networks built for No Project lose some lane miles due to flooding.

A graphical depiction of the changes in the roadway network is presented Figure 23. The chart shows the change in lane-miles (e.g., a one-mile segment of a four-lane road is four lane-miles) available to automobiles in year 2050 relative to year 2015. San Francisco County shows a decrease in lane-miles, primarily due to the Market Street closure that started in 2020 as well as some conversions of roadway segments to dedicated bus ways. Figure 24 shows the change in lane-miles over time for the Plan.

Figure 23. Growth in roadway lane miles (relative to 2015) available to automobiles across alternatives

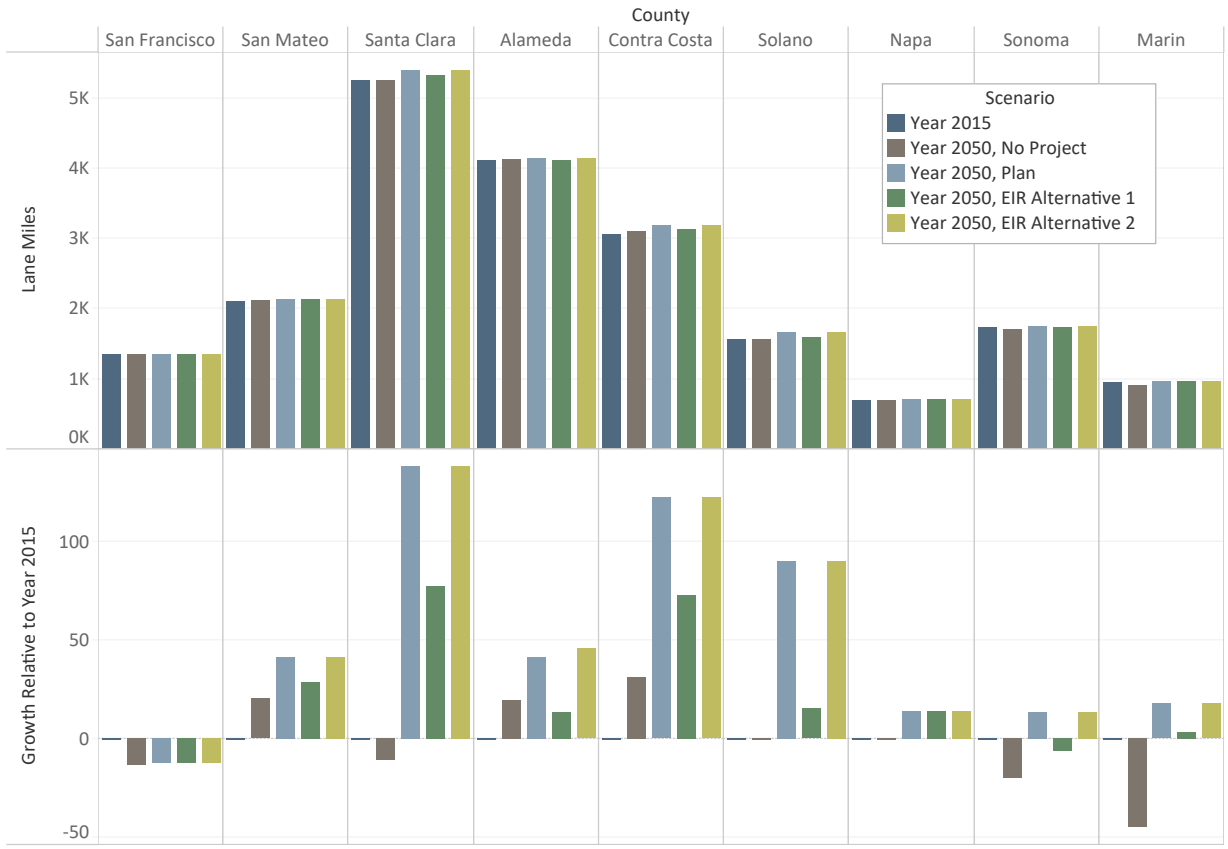
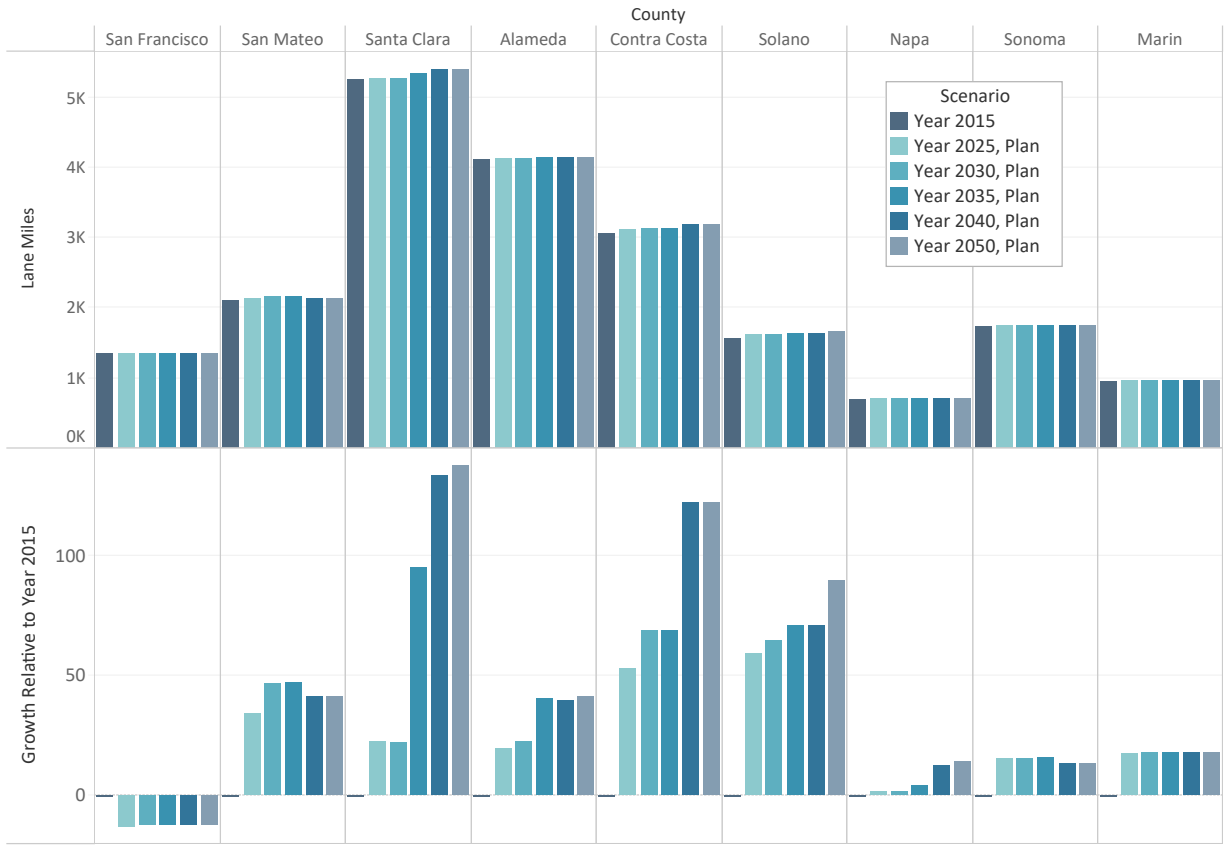


Figure 24. Growth in roadway lane miles (relative to 2015) available to automobiles in the Plan



Transit Network

The historical scenarios for 2005 and 2015 reflect service in these years.

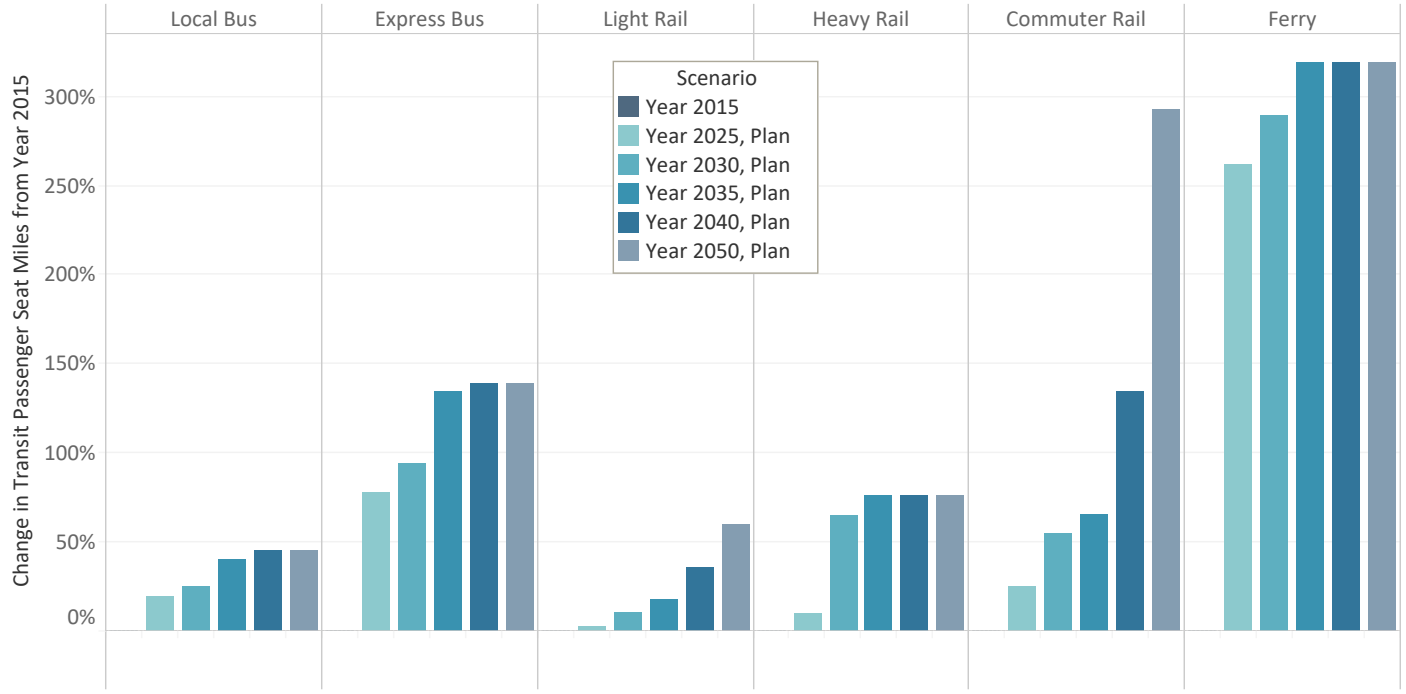
The No Project alternative begins with 2015 service levels and adds projects that are committed as defined by MTC Resolution No. 4182. The Plan alternative begins with 2015 service levels and adds both the committed projects as well as those included in the transportation investment strategies, described in more detail in the Strategy Implementation section below.

The onset of the COVID-19 pandemic in early 2020 significantly altered on-the-ground service provision and created uncertainty around the levels of transit service provision in near-term future model years (2025, 2030 and 2035). While current and future funding availability and service levels continue to evolve, modeling work for Plan Bay Area 2050 used a conservative approach to represent transit service provision in the No Project Alternative. It was assumed that transit headways would increase in 2025, 2030 and 2035 commensurate to the expected percentage decrease in future funding available for transit operations. Headways were increased across all operators by 8% in the No Project for years 2025, 2030 and 2035. As planned projects increase the total service hours in the Plan and EIR Alternatives, a smaller percentage increase was applied to all transit service so that the total service hours cut were equivalent between the No Project, Plan and EIR Alternatives in 2025 and 2030. This translated to a 6.7% increase in service hours (once planned service increases from projects were applied) in the 2025 Plan and a 6.4% increase in the 2030 Plan. The plan includes an investment to return transit service levels to 2019 levels no later than 2035, so no percentage increase in headways was modeled in the Plan and EIR Alternatives for 2035. Headways in the No Project were assumed to return to the pre-pandemic baseline starting in 2040.

A graphical depiction of the changes in transit service is presented in Figure 25 below. The chart shows the change in seat-miles (e.g., a one-mile segment of a bus with 40 seats is 40 seat-miles) by mode in year 2050 compared to year 2015 across alternatives. Figure 26 shows the change in seat-miles over time by technology for the Plan.

Figure 25. Change in transit passenger seat miles (relative to year 2015) by technology across alternatives

Figure 26. Change in transit passenger seat miles over time (relative to 2015) by technology in the Plan



Prices

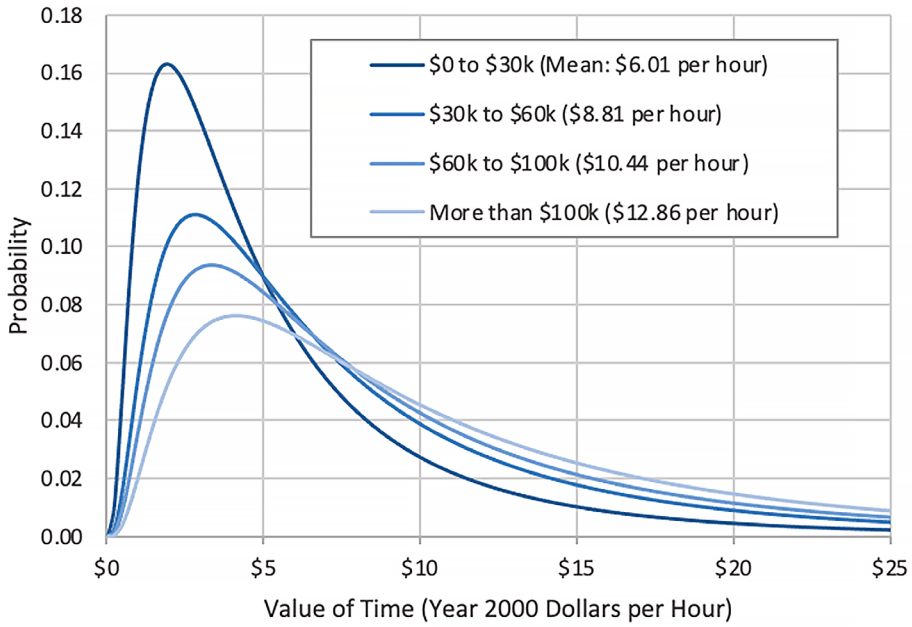
The travel model system includes probabilistic models in which travelers select the best travel mode (e.g., automobile, transit, bicycle, etc.) for each of their daily tours (round trips) and trips. One consideration of this choice is the trade-off between saving time and saving money. For example, a traveler may have two realistic options for traveling to work: (i) driving, which would take 40 minutes (round trip) and cost $10 for parking; or (ii) taking transit, which would take 90 minutes (round trip) and cost $4 in bus fare ($2 each way). The mode choice model structure, as estimated in the early 2000s, includes coefficients that dictate how different travelers in different contexts make decisions regarding saving time versus saving money. These model coefficients value time in units consistent with year 2000 dollars, i.e., the model itself – not an exogenous input to the model – values time relative to costs in year 2000 dollars. Because re-estimating model coefficients is "expensive" (in terms of staff time and/or consultant resources), it is done infrequently, which in effect "locks in" the dollar year in which prices are input to the travel model. To use the model's coefficients properly, all prices must be input in year 2000 dollars. In the remainder of this document, prices are presented both in (close to) 2020 dollars, to give the reader an intuitive sense of the magnitude of the input prices, as well as year 2000 dollars, which are the units required by the model coefficients.

Six different types of prices are explicitly represented in the travel model: (i) bridge tolls; (ii) express lane or per-mile roadway tolls; (iii) transit fares; (iv) parking fees; (v) perceived automobile operating cost; and (vi) cordon tolls. A brief discussion on how the model determines each synthetic traveler's value of time is presented next, after which the input assumptions across each of these price categories are presented.

Value of Time

The model coefficients that link the value of time with the other components of decision utilities remain constant between the baseline and forecast years, with the one exception of the coefficients on travel cost. These coefficients are a function of each synthetic individual's value of time, a number drawn, in both the historical and forecast year simulations, from one of four log-normal distributions (see Figure 27). The means of these distributions are a function of each traveler's household income (see Table 7). The value of time for children in a household is equal to two-thirds that of an adult. The means and shapes of these distributions remain constant across forecast years and scenarios.

Figure 27. Value of time distribution by household income category



Bridge Tolls

The bridge tolls assumed in 2015 and 2050 are shown below in Table 29. The bridge tolls for future years (all alternatives) follow the scheduled increase in in Regional Measure 3.[37]

Table 29. Common peak period bridge tolls in 2015 and 2050

	TOLLS IN YEAR 2015				TOLLS IN YEAR 2050			
	In 2015 Dollars		In 2000 Dollars		In 2020 Dollars		In 2000 Dollars	
Bridge	Base Toll	Carpool Toll	Base Toll	Carpool Toll	Base Toll	Carpool Toll	Base Toll	Carpool Toll
Antioch Bridge	5.00	2.50	3.50	1.75	8.00	4.00	4.29	2.15
Bay Bridge	6.00	2.50	4.20	1.75	9.00	4.00	4.83	2.15
Benicia - Martinez Bridge	5.00	2.50	3.50	1.75	8.00	4.00	4.29	2.15
Carquinez Bridge	5.00	2.50	3.50	1.75	8.00	4.00	4.29	2.15
Dumbarton Bridge	5.00	2.50	3.50	1.75	8.00	4.00	4.29	2.15
Golden Gate Bridge	6.75	4.75	4.72	3.32	8.75	6.75	4.70	3.62
Richmond - San Rafael Bridge	5.00	2.50	3.50	1.75	8.00	4.00	4.29	2.15
San Mateo - Hayward Bridge	5.00	2.50	3.50	1.75	8.00	4.00	4.29	2.15

Express Lane and Per-Mile Roadway Tolls

MTC's travel model explicitly represents the choice of travelers to pay a toll to use an express lane (i.e., a high-occupancy toll lane) in exchange for the time savings offered by the facility relative to the parallel free ("general purpose") lanes. To represent this functionality, MTC staff assigns a toll price by time of day and vehicle class on each tolled link in the network. To simulate the impacts of the tolled lanes efficiently and transparently on behavior, the tolled lane network is segmented within each scenario into logical segments, with each segment receiving a time-of-day-specific per mile fee. To illustrate the detail involved in this coding, Figure 28 (abstractly) presents the morning commute period price for the year 2050 simulations. Please note that the simulated prices are not perfectly optimal, although staff modeled the Plan iteratively to find the prices that meet a pre-defined operational goal – an average speed of 45mph or higher in any time period. The logic used in the toll optimization script is described in Table 30 below. Importantly, the prices are held constant over four-hour morning (6 to 10 a.m.) and evening (3 to 7 p.m.) commute periods. MTC's travel model makes the simplifying assumption that congestion is uniform over the entire four-hour commute periods. The peak one-hour within the four-hour commute period would require a higher toll than those simulated in the model.

37 https://mtc.ca.gov/sites/default/files/BATA%202019%20Toll%20Schedule%20Dec%202018.pdf

Figure 28 also depicts the roadways that comprise the per-mile tolling strategy in the Plan. More details are provided in the section on Strategy T5 to Strategy T5: Implement Means-Based Per-Mile Tolling on Congested Freeways with Transit Alternatives. Additionally, the figure shows the SR-37 corridor, which would be tolled to fund sea level rise adaptation measures on the corridor in the Plan.

Figure 28. Morning commute express lane tolls (in 2000$) for the No Project and Plan alternatives in 2050

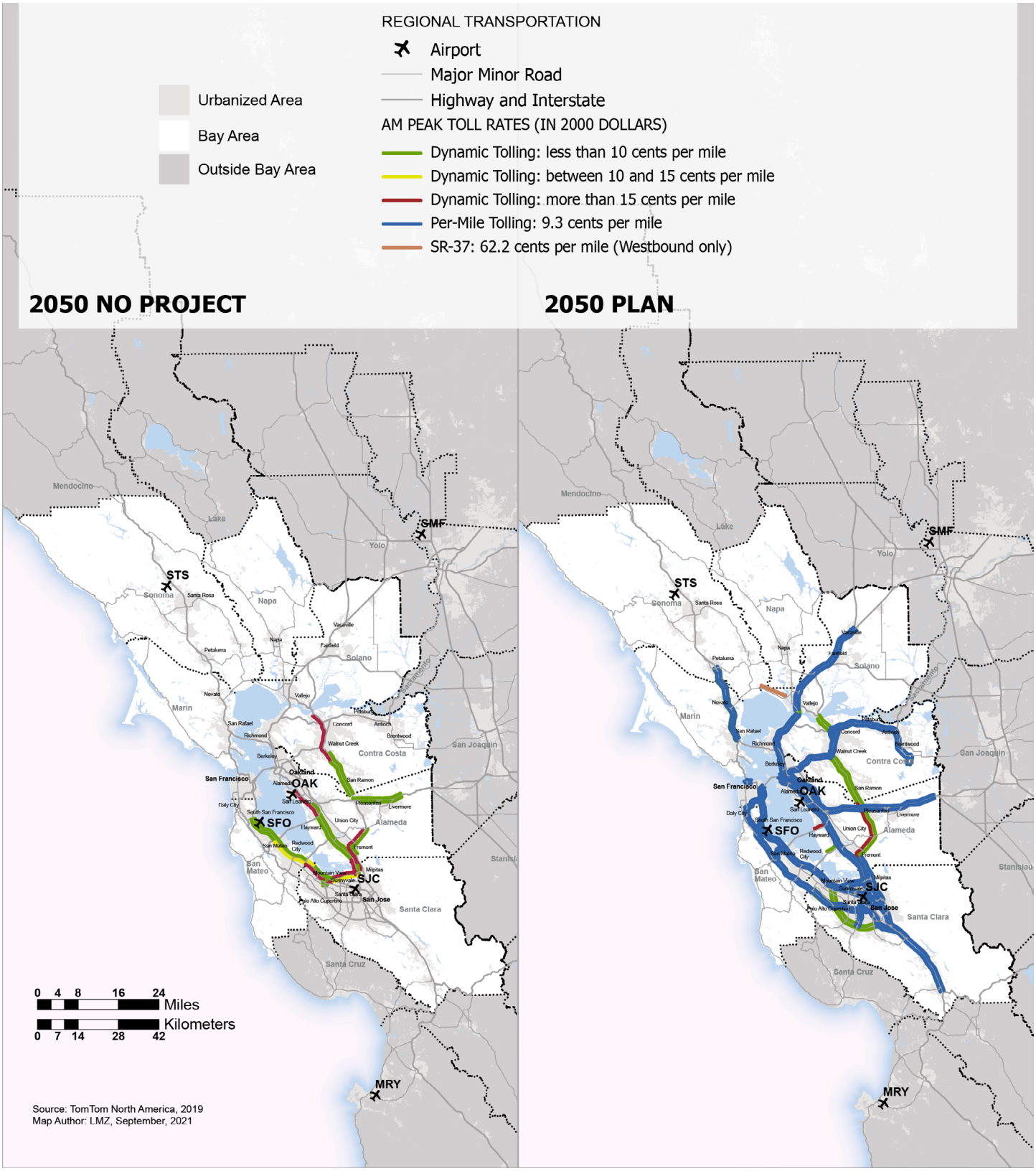


Table 30. Logic used in the toll optimization process

CASE #	EXPRESS LANE (EL) SPEED (MPH)	GENERAL PURPOSE LANE (GP) SPEED (MPH)	INTERPRETATION AND ACTION
Case 1	<=48*	any	EL too slow; increase toll rate.
Case 2	>48	<=40	GP too slow; decrease toll rate.
Case 3	48-60	40-60	OK; no change in toll rate.
Case 4	>60	40-60	GP speed can be improved; decrease toll rate.
Case 5	>48	>60	Set toll to minimum, i.e. 3 cents (2000$) per mile in morning peak, midday, and afternoon peak for drive alone

*Note: The threshold used in the toll optimization script is 48mph, which is slightly higher than the performance target of 45mph. This is because average speeds in toll optimization runs (which only execute only CTRAMP and highway assignment) can be slightly different from the full model run (which includes transit assignment). Setting the threshold slightly higher than the actual performance target makes sure the average speeds in the full model run do not go below 45mph.

Transit Fares

The forecast year transit networks pivot off a year 2015 baseline network (i.e., the alternatives begin with 2015 conditions and add/remove service to represent the various alternatives in future years). The transit fares in 2015 are assumed to remain constant (in real terms) in all forecast years. Staff are therefore explicitly assuming transit fares will keep pace with inflation and that transit fares will be as expensive in the forecast year as they are today, relative to parking prices, bridge tolls, etc. As a simplification, we assume travelers pay the cash fare to ride each transit service. Table 31 includes year 2015 fare prices expressed in both year 2000 and year 2015 dollars.

Table 31. Fare prices (in 2015$ and 2000$) by operator in 2015

OPERATOR	FARE IN 2015 DOLLARS	FARE IN 2000 DOLLARS
West Berkeley Shuttle	Free	Free
Broadway Shuttle	Free	Free
Emery Go-Round	Free	Free
Stanford Shuttles	Free	Free
Caltrain Shuttles	Free	Free
VTA Shuttles	Free	Free
Palo Alto/Menlo Park Shuttles	Free	Free
WHEELS Ace Shuttles	Free	Free
Amtrak Shuttles	Free	Free
Burlingame Shuttle	Free	Free
MUNI - Cable Cars	7.00	4.74
MUNI - Local	2.25	1.52
SamTrans Local	2.00	1.35
VTA - Community Bus	1.25	0.85
VTA - Regular and Limited	2.00	1.35
AC Transit Local	2.00	1.35
WHEELS - Local	2.10	1.42
Union City Transit	2.00	1.35
County Connection (CCCTA) - Local	2.00	1.35
Tri Delta Transit	2.00	1.35
WESTCAT Local	1.75	1.19
SolTrans - Local	1.75	1.19
Fairfield And Suisun Transit - Local	1.75	1.19

OPERATOR	FARE IN 2015 DOLLARS	FARE IN 2000 DOLLARS
American Canyon Transit	1.00	0.68
Vacaville City Coach	1.60	1.08
VINE (Napa County) - Local	1.60	1.08
Sonoma County Transit - Local	1.50	1.02
Santa Rosa CityBus	1.50	1.02
Petaluma Transit	1.50	1.02
Golden Gate Transit - Local	1.80	1.22
SamTrans - Express	2.00	1.35
VTA - Express	4.00	2.71
Dumbarton Express	2.10	1.42
AC Transit - Transbay	4.20	2.84
County Connection (CCCTA) - Express	2.25	1.52
Golden Gate Transit - Express	5.00	3.39
Golden Gate Transit - Richmond	4.40	2.98
WESTCAT - Express	5.00	3.39
SolTrans - Express	1.75	1.19
Fairfield and Suisun Transit - Express	2.75	1.86
VINE (Napa County) - Express	3.25	2.20
MUNI Metro	2.25	1.52
VTA - Light Rail	2.00	1.35

For SamTrans Express and SolTrans Express, the local fare is initially applied. An additional fare is paid as the Express lines traverse screen lines outside the service area for local bus service. For rail and ferry service, the fares vary based on posted fares between individual stations/terminals.

Parking Prices

The travel model segments space into travel analysis zones (TAZs). Simulated travelers move between TAZs and, in so doing, burden the transportation network. Parking costs are applied at the TAZ level: travelers going to zone X in an automobile must pay the parking cost assumed for zone X.

The travel model uses hourly parking rates for daily/long-term (those going to work or school) and hourly/short-term parkers. The long-term hourly rate for daily parkers represents the advertised monthly parking rate, averaged for all lots in a given TAZ, scaled by 22 days per month, then scaled by 8 hours per day; the short-term hourly rate is the advertised hourly rate — generally higher than the rate daily parkers pay — averaged for all lots in a given TAZ. Priced parking in the Bay Area generally occurs in greater downtown San Francisco, downtown Oakland, Berkeley, downtown San Jose, and Palo Alto.

When forecasting, it is assumed that parking prices change over time per a simple model: parking cost increases in line with employment density. Across the scenarios, therefore, the parking charges vary with employment density according to their land use input. For the Plan and EIR Alternatives 1 and 2, additional parking pricing is included, as described in more detail in the following Strategy Implementation section.

Perceived Automobile Operating Cost

When deciding between traveling in a private automobile or on a transit vehicle (or by walking, bicycling, etc.), the modeling process assumes travelers consider the cost of operating and maintaining, but not owning and insuring, their automobiles. The following three inputs are used to determine the perceived automobile operating cost: average fuel price, average fleet-wide fuel economy, and non-fuel related operating and maintenance costs.

To improve consistency among regional planning efforts across the state, the Regional Targets Advisory Committee (formed per Senate Bill 375) recommended that California's metropolitan planning organizations (MPOs) use consistent assumptions for fuel price and for the computation of automobile operating cost in long range planning. The assumptions for Plan Bay Area 2050 build off the multi-agency methodology developed by the four largest MPOs for the previous round of regional plans, as well as resources provided by the California Air Resources Board (CARB). The fuel price forecasts use projections generated by the United States Department of Energy (DOE) and California Energy Commission (CEC). Gas tax rates are added to base fuel price forecasts to project total fuel cost rates. The average fleet-wide fuel economy implied by CARB's EMFAC2017 model is used to represent the average fleet-wide fuel economy. Non-fuel operating and maintenance costs are based on data from AAA and forecasted using growth assumptions developed in the multi-MPO methodology. A summary of assumptions is presented in Table 32. Note that the prices in the table are presented in year 2017 dollars, year 2010 dollars (the units used in the above referenced documentation), and year 2000 dollars (the units of the travel model).

Table 32. Perceived automobile operating cost assumptions

MEASURE	ANALYSIS YEAR	
	2015	2050
Average fuel price (Year 2000 dollars per gallon)	$2.19	$3.22
Average fuel price (Year 2010 dollars per gallon)	$2.77	$4.06
Average fuel price (Year 2017 dollars per gallon)	$3.35	$4.91
EMFAC-implied fuel economy (miles per gallon)	23.48	44.23
Non-fuel-related operating cost ($2000 per mile)	$0.04	$0.10
Non-fuel-related operating cost ($2010 per mile)	$0.06	$0.13
Non-fuel-related operating cost ($2017 per mile)	$0.07	$0.16
Perceived automobile operating cost ($2000 per mile) †	$0.14	$0.17
Perceived automobile operating cost ($2010 per mile) †	$0.17	$0.22
Perceived automobile operating cost ($2017 per mile) †	$0.21	$0.27

† – Sum of the fuel-related operating cost (fuel price divided by fuel economy) and non-fuel-related operating cost.

New Model Features and Associated Assumptions

Ride-Hailing

Since Plan Bay Area 2040, a key enhancement made to the Travel Model is the explicit representation of ride-hailing modes, including Taxi and Transportation Networking Companies (TNCs) such as Uber and Lyft. Specifically, the tour and trip-based mode choice models have been modified to include a new ride-hailing nest.[38] This new nest has three sub-alternatives: traditional taxi, non-pooled TNC (e.g. UberX) and pooled TNC (e.g. UberPool).

Tour and Trip Mode Choice Utilities

For all three ride-hailing modes, the tour and trip mode choice utilities are specified as a function of in-vehicle time, wait time, cost (including fares, bridge tolls, road tolls), an alternative-specific constant, and a "TNC availability adjustment" constant. Table 33 below summarizes the assumptions used in these utility components in the Plan and EIR Alternatives.

38 The mode choice model is a nested logit model. Choices within the same "nest" in a model are closer substitutes to one another than other choices.

Table 33. Taxi and TNC utility components in Plan Bay Area 2050 modeling

UTILITY COMPONENTS	VARIABLE	COEFFICIENTS
In-vehicle time	For taxi and non-pooled TNC: travel time is generated from the network modeling component of the Travel Model. For pooled TNC: a multiplier of 1.5 is applied to the travel time of non-pooled TNC, to reflect detours taken to pick-up or drop-off additional customers.[39]	Generic in-vehicle coefficient (i.e., same coefficient used in drive alone and other modes)
Wait time	Simulated from distribution Taxi and TNC mode wait times are simulated from distributions that were estimated based on a survey of actual taxi and TNC wait times conducted in the Portland region in 2015.[40] Lognormal distributions were estimated from this observed data for each mode according to the land-use density of the tour or trip origin.	1.5 times the in-vehicle time coefficient (to represent that time spent on waiting is more onerous than time spent in vehicle)
Fares	A function of minimum cost, initial cost, cost per mile, distance, cost per minute, in-vehicle time Based on 2015 data.[41]	Generic cost coefficient (i.e., same coefficient used in drive alone and other modes)
Bridge tolls	Based on Regional Measure 3[42] Additionally, based on current TNC policies, it is assumed that TNC users are being charged bridge toll both ways.[43] For example, even though Golden Gate Bridge (Northbound) is free, TNC users who cross the bridge still must pay for the toll for the driver's return trip.	Generic cost coefficient (i.e., same coefficient used in drive alone and other modes)
Roadway tolls	Based on Plan tolling strategy inputs described in the section,	Generic cost coefficient (i.e., same coefficient used in drive alone and other modes)
Alternative-specific constant	Different constant for the three ride-hailing modes and for different household car-sufficiency level (0 car, fewer cars than workers, or more cars than workers)	Calibrated based on 2015 data. See detail in Travel Model 1.5 Calibration and Validation documentation[44]
TNC availability adjustment	A user-defined parameter to account for presumed wider availability compared to base year. Expressed in terms of minutes of "in-vehicle travel time equivalent"	Base year = calibrated Future-year (2050) = asserted to be 15 minutes of in-vehicle travel time equivalent (deducted from the utility, making TNCs more attractive)

39 For shared TNCs, an in-vehicle time multiplier of 1.5 is applied to reflect detours taken to pick-up or drop-off additional customers. The factor of 1.5 was used in the Plan run, based on data collected in Chicago between November 2017 to March 2018 (Schwieterman and Livingston (2018) available on https://las.depaul.edu/centers-and-institutes/chaddick-institute-for-metropolitan-development/research-and-publications/Documents/Uber%20Economics_Live.pdf).

40 See: https://www.portlandmercury.com/images/blogimages/2015/07/10/1436550157-uber_taxi_report.pdf). The only modification to the empirical distribution was that for the highest density area type we reduced the mean wait time slightly, from 4.7 minutes to 3 minutes, to represent presumed shorter wait time in the highest density areas in San Francisco compared to Portland.

41 See details in: https://github.com/BayAreaMetro/modelingwebsite/wiki/TravelModel1.5#Ridehailing_and_Taxi_Modes.

42 See: https://mtc.ca.gov/sites/default/files/BATA%202019%20Toll%20Schedule%20Dec%202018.pdf.

43 See the "Return Charges" section in https://help.lyft.com/hc/en-us/articles/115012927227.

44 See: https://github.com/BayAreaMetro/modeling-website/wiki/Development.

Vehicle Occupancy Assumptions and Autonomous TNCs

After mode choice and other demand model components are run, ride-hailing trips are assigned in the network modeling component of TM1.5. The total trips in each ride-hailing mode are multiplied by their vehicle occupancy factors, which determine the number of ride-hailing trips to be assigned as single-occupant, double-occupant, or 3+ occupant trips.

The vehicle occupancy factors were developed using data collected from the pilot phase of the Bay Area Transportation Study,[45] since the full survey was not available at the time of this model development work. The pilot was conducted in Fall 2018, with close to 1,300 ride-hailing trips collected.

The vehicle occupancy factors applied in the Plan are described in Table 34 below. According to data collected from the pilot of the Bay Area Transportation Study, 53% of the non-pooled TNC trips were 2-person occupancy and 47% were 3+ person occupancy in 2018 (there were no single occupancy taxi or TNC trip because each trip should have at least one driver and one passenger, except for out-of-service movement which is considered separately and will be explained in the "deadheading" section below). For future years (2035 onwards), it is assumed that TNC vehicles will become autonomous, and therefore the 53% that were 2-person occupancy are assumed to be single occupancy, and the 47% of that were 3+ person occupancy are assumed to be 2+ person occupancy. Similarly, for pooled TNC trips, the data suggests that 18% of the pooled TNC trips were 2-person occupancy (one driver plus one passenger, as the TNC did not successfully match an additional passenger for that trip) and 82% were 3+ person occupancy (one driver plus at least 2 passengers) in 2018. For future years (2035 onwards), since it is assumed that TNC vehicles will become autonomous, some percentage of the pooled TNC trips will become single occupancy. Staff assumed 9% (lower than the 18% that were 2-person occupancy in the base year) to reflect improvement in ride-matching.

45 See: https://mtc.ca.gov/our-work/plans-projects/other-plans/bay-area-transportation-study.

Table 34. TNC vehicle occupancy assumptions

		SHARE OF TRIPS BY OCCUPANCY	
Mode	Occupancy	2015	2035 and 2050
Taxi	single	0%	0%
	double	53%	53%
	three or more	47%	47%
TNC non-pooled	single	0%	53%
	double	53%	29%
	three or more	47%	18%
TNC pooled	single	0%	9%
	double	18%	29%
	three or more	82%	62%

Deadheading

Deadheading, or out-of-service movement, is the movement of a vehicle without a passenger. TNCs and taxis cruise around to look for fares and reposition before or after a paid trip. Modeling deadheading is a new area in the field of travel modeling. During the Plan Bay Area 2050 model upgrade effort, very little data about taxi and TNC deadheading behavior was available and so staff could not justify the development of a detailed deadheading model. Therefore, a simple approach was implemented, involving the application of a multiplier (a "zero-passenger vehicle-mile factor") to the transpose of the taxi and TNC trip origin-and-destination matrices to represent deadheading trips.

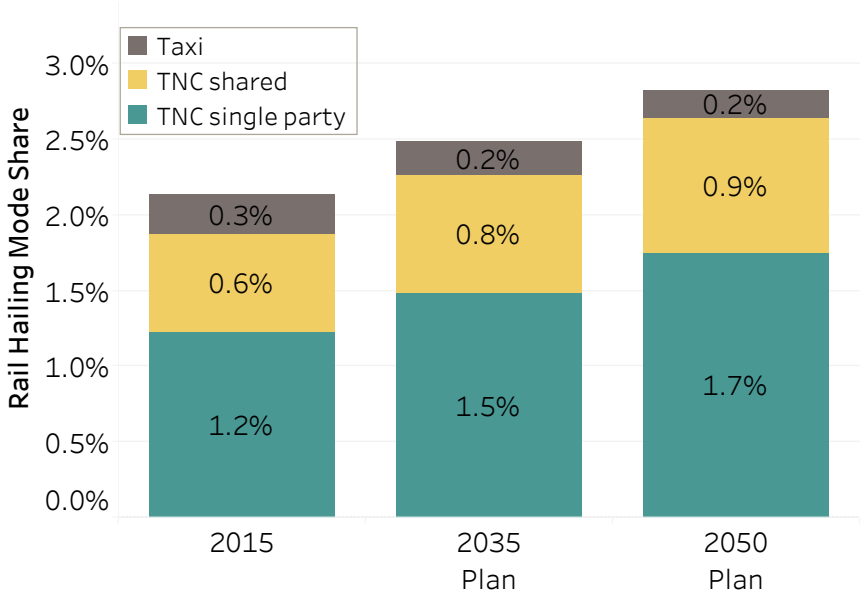
The zero-passenger vehicle-mile factor is a user-defined parameter in the model and can be easily updated when better data becomes available. Based on data from the California Public Utilities Commission (CPUC), the current assumption is that for every mile driven with passengers, a ride-hailing vehicle drives another 0.7 miles without passengers.[46] While simplistic, this method allows the model to represent the pollution and greenhouse gas emissions from the additional VMT generated from deadheading.

46 Source: aggregated statewide data released by the California Public Utilities Commission: http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/About_Us/Organization/Divisions/Policy_and_Planning/PPD_Work/PPD_Work_Products_(2014_forward)/Electrifying%20the%20Ride%20Sourcing%20Sector.pdf.

Modeled TNC Shares in Base and Future Years

As shown in Figure 29, future TNC mode share is expected to grow but remains a small share of the overall market, growing from 1.8% in 2015 to 2.5% in 2050 regionwide. Much of the growth is driven by the assumption that TNCs will be more widely available (via a user-defined input known as "availability adjustment" described in Table 33).

Figure 29. Modeled TNC shares



At the time of Travel Model 1.5 development for Plan Bay Area 2050, there was a dearth of available data for the calibration of TNC mode shares. Therefore, staff focused model calibration on meeting conventional calibration targets (including achieving estimated transit boardings within 10% of what is observed for each operator, and 20% percent root mean square for high volume roadway links), since reliable data about transit boardings and traffic counts exist. The underlying logic is that as long as transit boardings are within 10% of observed, then the number of TNC trips would not be too far off.

Another MTC effort, the Bay Area Transportation Study, was underway at the same time as the Plan Bay Area 2050 effort. The survey fieldwork was conducted in spring 2019. The data from the Bay Area Transportation Study was not available in time for model calibration but became available at the time of this report writing. Some key numbers from the Bay Area Transportation Study are shown in Table 35, along with a couple other key references for a retrospective model validation. Staff found that the 2015 TNC mode share erred on the high side, especially in the mode share outside San Francisco. While staff acknowledges this caveat, it is not expected to have a significant impact on the modeling GHG results since TNC represents a small share of the overall mode share. More detailed validation results (e.g., trip lengths and county-to-country trip matrices) are available in the Travel Model 1.5 Calibration and Validation documentation.

Table 35. Key references for retrospective model validation

VALIDATION DATA	VALIDATION DATA DETAIL	TM1.5	REMARK
Combined mode share for TNC and Taxi	NHTS 2017 data suggest that the combined mode share for Taxi and TNC was 0.91% on a typical weekday for the Bay Area.	2015 base year has a combined mode share for TNC and Taxi = 2.1%	Note that the NHTS data is more recent. One would expect TNC usage was lower in 2015 than 2017. Combined mode share for TNC and Taxi probably too high in the base year of TM1.5 (2015).
Vehicle trips within San Francisco	"On a typical weekday, ride-hail vehicles make more than 170,000 vehicle trips within San Francisco, approximately 12 times the number of taxi trips, representing 15 percent of all intra-San Francisco vehicle trips." (from the report TNCs Today, published in 2017, with data reflecting November and December 2016 situation)[47] CPUC data suggests that the year-on-year growth for TNC trip miles was 122% statewide between 2015 and 2016. Assuming the statewide data applies to vehicle trips within San Francisco, a rough estimate of intra-SF ride-hail trips is 77,000.	Intra-SF TNC trips = 71,000 in 2015	TNC Today's data includes TNC trips made by non-residents, and data for scaling the number to residents only is unavailable. Thus, the TNC Today number should be treated as an upper bound.
Trip mode share (San Francisco and non-SF)	San Francisco = 3.0% Non-San Francisco = 0.6% Reported in Bradley et al. (2021), Spring 2019 data. San Francisco refers to all trips to, from or within San Francisco.	San Francisco = 2.3% Non-San Francisco = 1.7%	Trip mode share for TNC in TM1.5 is probably too high outside of San Francisco.

47 SFCTA. 2017. TNCs Today — A Profile of San Francisco Transportation Network Company Activity. Draft Report. San Francisco, CA: San Francisco County Transportation Authority.

Autonomous Vehicles

One main difference between Travel Model One and the enhanced Travel Model 1.5 is the ability to incorporate different levels of autonomous vehicle (AV) market penetration. The enhancements include:

- **Auto ownership:** extended to consider ownership of both autonomous (AV) and human driven (HV) vehicles
- **AV allocation:** a simulation model was added to determine, for AV-owning households, whether an AV is allocated for a tour
- **Tour and trip mode choice:** user-defined coefficients to represent AV scenario assumptions are added
- **Zero passenger vehicle module:** a multiplier, known as the zero-passenger vehicle factor, is applied to the transpose of the AV and TNC trip matrices to represent zero passenger vehicle trips
- **Traffic assignment:** AVs (together with TNCs) are assigned as a separate vehicle class from the existing vehicle classes. This allows analysts to generate summaries specific to AVs and TNCs. Also, to represent potential increases in effective roadway capacity due to closer vehicle spacing, the traffic assignment module of TM1.5 is updated such that the passenger-car equivalent[48] of AVs is configurable by facility type.

Detailed documentation about these enhancements is available on the Travel Model 1.5 documentation wiki.[49] This report will focus on the user-defined coefficients used in Plan Bay Area 2050 modeling.

Since fully autonomous vehicles are still a nascent technology that is not available to the public yet, there is considerable uncertainty around its operational characteristics and the associated traveler behavioral responses. TM1.5 allows users to define different coefficients that represent different AV modeling assumptions. The user-defined coefficients in Plan Bay Area 2050 modeling were informed by the outcomes of a literature search, a series of presentations, a workshop and a survey of Regional Modeling Working Group[50] participants that took place in late 2018 as part of the Horizon process. These coefficients and assumptions are presented in Table 36.

Given these assumptions, the incorporation of AV use and their deadheading miles in Plan Bay Area 2050 modeling shows that the emergence of AVs has an adverse impact on the Bay Area's ability to meet its VMT and GHG reduction goals. In a test run, in which AV market penetration was set to zero while holding all else the same as the 2050 Plan scenario, the VMT per capita was 9% lower than the Plan (14.9 in the test, compared to 16.3 in the Plan).

48 PCE rates are generally determined prior to the assignment step, with values of 1.0 given to passenger vehicles and values greater than 1.0 to trucks. To simulate increase in roadway capacity due to AVs, PCEs of less than 1.0 can be assigned to the vehicles that are assumed to be autonomous.

49 Travel Model 1.5 Documentation wiki: https://github.com/BayAreaMetro/modeling-website/wiki/TravelModel1.5#Autonomous_Vehicles.

50 The Regional Modeling Working Group is comprised of planners and modelers working for transportation agencies in the San Francisco Bay Area. In 2018-2020, the working group has more than 20 active members who regularly attend the group's monthly meetings.

Table 36. Autonomous vehicle modeling assumptions

VARIABLE	VARIABLE DESCRIPTION	ASSUMPTION
Fleet Penetration	Share of total passenger vehicle fleet that is autonomous	2035: 5% 2050: 20%
Auto Ownership Likelihood by Households	Coefficients representing different likelihood of AV ownership by household types	Based on recent research for FHWA[51]
Household Use Allocation	Probability boosts representing that, for AV-owning households, AVs are more likely to be used than human-driven vehicles	The probability boost is set to 1 (i.e., the assumption was that AV and human driven vehicles are equally likely to be used within an AV owning households)
In-Vehicle Time Coefficient for Mode Choice	The marginal disutility of in-vehicle travel time	Same as human driven vehicles
Parking Cost, Per-mile Auto Operating Cost and Terminal Time	Parking and per-mile auto operating costs are self-explanatory. Terminal Time refers to the time it takes to park the vehicle and walk from the parking location to the actual destination.	Same as human driven vehicles
Zero-Passenger Vehicle Factor	Factor reflecting that every AV mile driven with passengers yields additional mileage without passengers	0.7 (i.e., for every mile driven with passengers, an AV drives another 0.7 miles without passengers)[52]
Effective Roadway Capacity	Passenger-car equivalent reflecting improved vehicle spacing	1.0 (i.e., no effective roadway capacity increased is expected given the low AV market penetration assumed in the Plan)

Telecommuting

The implementation of telecommuting was updated slightly for Travel Model 1.5 to better represent Strategy EN7: Expand Commute Trip Reduction Programs at Major Employers, described in more detail below. In the previous version of the model, telecommuting was represented by dampening the likelihood of making a mandatory tour within the Coordinated Daily Activity Pattern sub-model for workers. The Coordinated Daily Activity Pattern sub-model was estimated and calibrated for Travel Model One v0.3, which was released in April 2012. As described in that version's Calibration and Validation Technical Report,[53] the model specification was transferred from the Atlanta Regional Commission (ARC) model, and the Travel Model One calibration was based on targets from the Bay Area Travel Survey (BATS) 2000, with adjustments to offset respondents' underreporting of travel. For the modeled base year of 2015, 80.8% of full-time workers made a work tour and 19.2% of full-time workers did not make a work tour in the modeled day. When looking at all workers (including part-time), this grew to 24.2% of workers who did not make a work tour on an average workday.

51 https://www.fhwa.dot.gov/planning/tmip/publications/other_reports/model_impacts_cavs/.

52 Same factor as TNC deadheading is used. SOURCE: aggregated statewide data released by the California Public Utilities Commission: http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/About_Us/Organization/Divisions/Policy_and_Planning/PPD_Work/PPD_Work_Products_(2014_forward)/Electrifying%20the%20Ride%20Sourcing%20Sector.pdf.

53 Travel Model Development: Calibration and Validation - Technical Report, May 17, 2012: https://mtcdrive.box.com/s/7crr7bwhromi2au42jnpp11fqe5l24xq.

In updating the telecommuting implementation in Travel Model 1.5 for this plan, staff looked further into the data and assumptions previously made around teleworking. Workers who do not make a work tour on an average weekday may do so because they have an alternate work schedule, or because they are taking a vacation, personal or sick day, or because they are telecommuting. It is therefore necessary to assume what portion of workers who are not making work tours are doing so because they are telecommuting versus not working that day. Initially, staff looked at estimates of telecommuting from the American Community Survey's Table B08301: Means of Transportation to Work, which included data for "Worked at home." The ACS 1-year Estimates for 2015 dataset estimated that 5.6% of Bay Area workers aged 16 years and over worked at home. However, the ACS data under-represents telecommuting as defined for travel modeling, stating that the "principal means of transportation to work refers to the mode of travel used to get from home to work most frequently" (emphasis added). Therefore, this estimate does not include workers who telecommute regularly but less than the majority of the work week. Thus, staff looked at the results of the Bay Area Transportation Study[54], which surveyed Bay Area residents about their travel behavior in the fall of 2018 and the spring of 2019. This survey asked whether respondents traveled to work and/or teleworked on each day of survey participation. Using weighted data representing a "typical" (here, Monday through Thursday) weekday, the survey results of full-time workers showed dramatically higher rates of not-working, 19.9%, as well as telecommuting (with no work tours), 15.6%, with only 64.4% of workers making a work tour.

Since recalibration of the Coordinated Daily Activity Pattern sub-model was out of scope, staff did not alter the overall assumption of workers not making work tours in the 2015 base year. Therefore, staff applied the proportion from the survey: that 56.1% of full-time workers who did not go to work did not work that day, and the remainder teleworked; for part-time workers, 55.3% of workers who did not go to work did not work that day. Applying this assumption resulted in a telecommute rate assumption of 8.5% of full-time workers and 16.6% of part-time workers in the 2015 base year, and 10.3% across all full- and part-time workers. Doing a similar summary of the 2005 base year model run resulting in a telecommute rate assumption of 7.8% of full-time workers and 17.0% of part-time workers, and 9.5% across all full- and part-time workers. Staff fit an exponential curve to these two base years to extrapolate No Project telecommute rates for future years.

Table 37. Baseline telecommute rate assumption, 2005-2050, as a percentage of full- and part-time workers (including those not working on a given day)

MODEL YEAR	OVERALL TELECOMMUTE RATE ASSUMPTION
2005	9.5%
2015	10.3%
2025	11.0%
2030	11.4%
2035	11.8%
2040	12.3%
2050	13.2%

For future years, this base level of telecommute increase was represented by increasing the magnitude of a constant which would reduce the likelihood of a full-time worker making a work tour in the Coordinated Daily Activity Pattern sub-model. Because telecommuting eligibility is correlated with higher-wage occupations and occupation/industry is not attached to any individual worker in the model, this constant was applied only to workers with a household income of $50,000 or higher (in 2000 dollars). The methodology used for representing telecommuting remained unchanged from Plan Bay Area 2040; the only update made was the distinction between workers not working and workers telecommuting described above, which affected the telecommute rate estimation from model runs as well as the telecommute assumption used in future (No Project) model years.

54 https://mtc.ca.gov/our-work/plans-projects/other-plans/bay-area-transportation-study.

Several transportation strategies comprised of programmatic expenditures on projects exempt from air quality conformity analysis, such as state of good repair investments or transit stop improvements, were not evaluated in the travel model. This affected the following strategies:

- **Strategy T1:** Restore, Operate and Maintain the Existing Transportation System: the only modeled component of this strategy was the restoration of transit headways to baseline levels in the Plan after 2030 from the reduced service levels described in the Transit Network section above.
- **Strategy T2:** Support Community-Led Transportation Enhancements in Equity Priority Communities: the specific projects that would be funded under this strategy would be defined later, through a collaborative process allowing residents of Equity Priority Communities to prioritize projects. Existing community-engaged planning work at MTC and ABAG suggests that community recommendations would likely focus on improvements that do not increase transit or road capacity, such as bus shelters, sidewalk improvements or traveler information services. As such, this strategy was not modeled.
- **Strategy T7:** Advance Other Regional Programs and Local Priorities: in general, investments nested within this strategy include improvements to local streets not represented within the travel model network or ongoing programs that do not increase capacity on roads or transit systems. As such, this strategy was not modeled.

Strategy T3 | Enable a Seamless Mobility Experience

The goal of this strategy is to reduce the friction of taking multi-operator or multi-modal trips. It encompasses several different elements, such as a smartphone app for trip planning and payment, real-time passenger information, wayfinding signage and cross-operator schedule coordination. The modeling approach focuses on the cross-operator schedule coordination element.

Cross-operator schedule coordination is expected to be implemented in 15 strategic locations (see Figure 30). In the model, a maximum transfer time was applied at these locations (i.e., transit nodes in modeling terminology). The transit nodes are classified as either a regional-to-regional node or a regional-to-local node. Regional-to-regional nodes are given a maximum transfer time of 3 minutes, whereas regional-to-local nodes are given a maximum transfer time of 5 min (see summary in Table 38 below).

Transfer time is one of the travel time components in the mode choice model. Reduced transfer times make transit a more attractive choice to travelers. In TM1.5, the model coefficient for transfer time is twice the magnitude of the model coefficient for in-vehicle time, to represent travelers' perception that a minute spent on transferring is more onerous than a minute spent sitting in a vehicle.

Figure 30. Seamless nodes

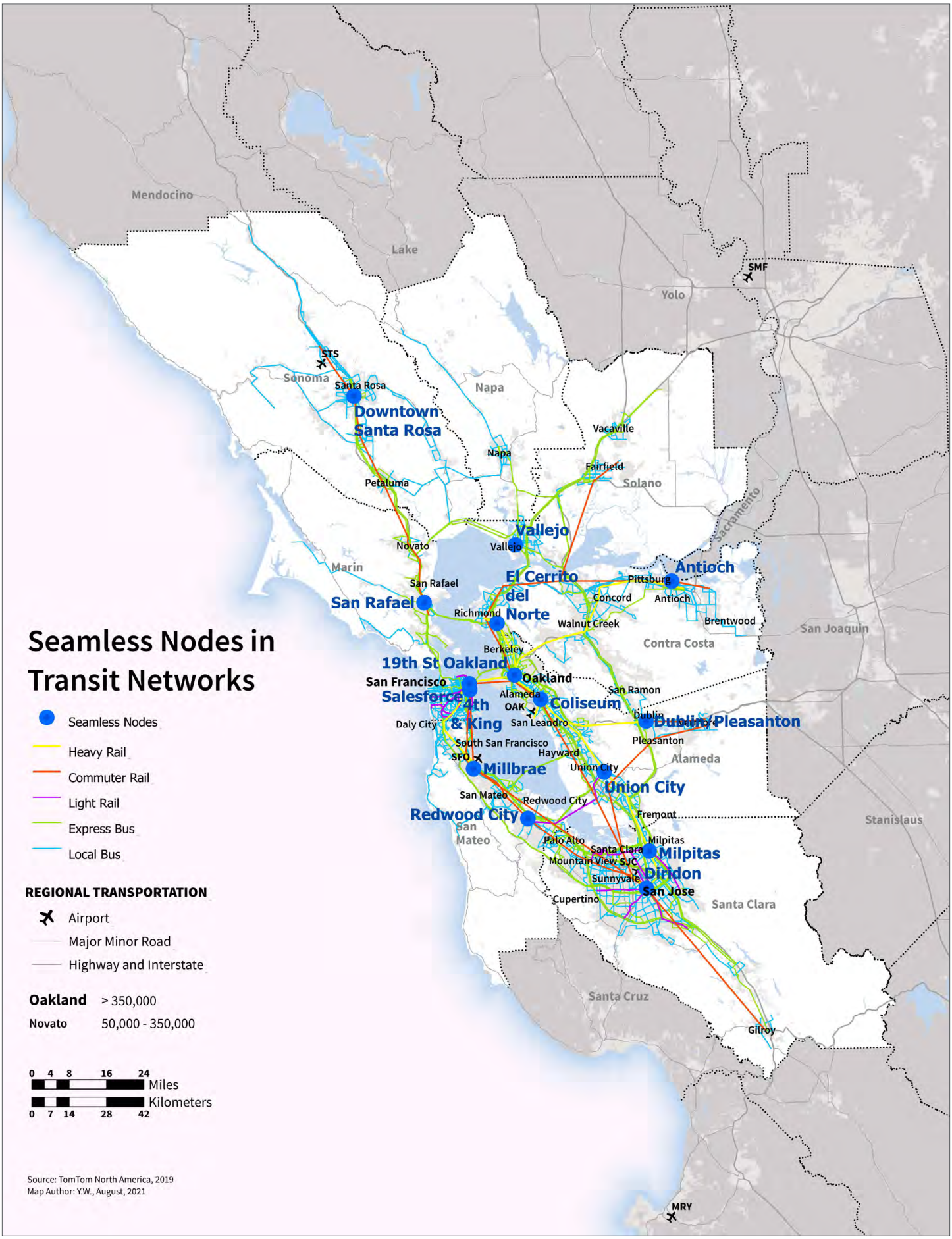


Table 38. Maximum transfer time at seamless nodes

CLASSIFICATION	TRANSIT NODE	TRANSIT SERVICE
Regional-to-local node (maximum transfer time = 5 minutes)	19th St Oakland	BART ↔ ReX, BRT
	4th and King	Caltrain ↔ Muni
	Antioch	BART ↔ BRT
	Diridon	Caltrain ↔ BART, ReX, VTA
	Downtown Santa Rosa	SMART ↔ Bus
	Milpitas	BART ↔ VTA
	Salesforce	Caltrain ↔ Muni
	Vallejo	ReX ↔ Bus
Regional-to-regional node (maximum transfer time = 3 minutes)	Coliseum	BART ↔ Bus
	Dublin/Pleasanton	BART ↔ Valley Link
	El Cerrito del Norte	BART ↔ ReX
	Millbrae	Caltrain ↔ BART
	Redwood City	Caltrain ↔ ReX, Dumbarton
	San Rafael	SMART ↔ Bus
	Union City	BART ↔ Dumbarton

Strategy T4 | Reform Regional Transit Fare Policy

The regional transit fare reform has two parts: (i) a streamlined fare structures across the region's 27 transit operators and replace existing operator-specific discount fare programs with an integrated fare structure across all transit operators; and (ii) a means-based fare discount for low-income riders.

Regional transit fare reform was implemented in Travel Model 1.5 by effectively overriding the fares calculated by the normal methods. During the normal course of a travel model run, fares are calculated from a variety of methods, including flat, operator-based fares; stop-to-stop based fares for some operators (such as BART and Caltrain); transfer fares and discounts, etc. To represent a regional integrated fare structure, these fares were calculated normally, but then swapped out with an integrated fare structure before being used by the travel model core, where simulated travelers make decisions about their travel. The integrated fares included were as follows: for travelers who used only local buses (including light rail), a flat fare of $2.55 (in 2020 dollars) was assumed. For travelers who used other modes (ferry, express bus, commuter rail or heavy rail), a fare was assumed based upon the total distance traveled on transit.

Table 39. Reform Regional Transit Fare Policy assumptions for distance-based regional transit fares

DISTANCE TRAVELED	FARE (IN 2020 DOLLARS)	FARE (IN 2000 DOLLARS)
0-10 miles	$3.62	$2.17
10-20 miles	$4.68	$2.80
20-30 miles	$5.71	$3.42
30-40 miles	$6.75	$4.04
40-50 miles	$7.78	$4.66
Over 50 miles	$8.82	$5.28

A means-based fare discount of 50% was given in the model to individuals in households with annual incomes less than $30,000 (in 2000$). Modeling of this discount was implemented through a simple change in the fare input to the mode choice component, in which lower fares make transit a more attractive choice to low-income travelers.

While the means-based fare discount is reflected in the mode choice component of TM1.5, it is not reflected in the transit route choice component of the model. This is because the transit assignment component of TM1.5 does not have income segmentation. Adding income segmentation to the transit assignment component would require a significant level of effort to upgrade the model. More importantly, adding income segmentation to transit assignment would greatly increase model run time. Given these resource constraints and potential run time issues, MTC staff decided not to pursue such an upgrade. This means discounted fares would not be a factor affecting transit route choice in the model, but MTC staff judged this a minor caveat that would not have a significant impact on the modeling results – especially since all operators/routes would have the same discount level.

This strategy was modeled consistently across the Plan and EIR Alternatives with one key exception. In EIR Alternative 2, the means-based fare discount was extended to passengers with a household income in quantile 2 (under $100,000 in 2020 dollars) to better advance equity outcomes.

Strategy T5 | Implement Means-Based Per-Mile Tolling on Congested Freeways with Transit Alternatives

This strategy involves implementing a per-mile charge on auto travel on congested freeway corridors where transit alternatives exist (BART, Caltrain, SMART, Valley Link, VTA Light Rail, and Regional Express Bus). Drivers on these corridors would pay a higher charge during the morning and evening peak periods, with discounts for off-peak travel, carpools with three or more occupants, or travelers with a qualifying disability (although disability is not modeled). Toll rates would be 15 cents per mile (9.3 cents per mile in 2000$) for solo travel in the morning (6am to 10am) and afternoon (3pm to 7pm) peak periods and 5 cents per mile (3.1 cents per mile in 2000$) for travelers in discount categories above. To support equity goals and reduce the potentially regressive impact of this pricing measure, lower-income drivers (i.e., those in households with annual income lower than $100,000 in 2020$, or $60,000 in 2000$) would be charged only half of the per-mile tolling rate. Bridge tolls would remain in effect, with no per-mile toll on the bridges. Existing express lanes on corridors without a transit alternative would continue to operate, while existing express lanes on corridors with per-mile tolling would be converted to carpool lanes on an all-lane tolling corridor. Figure 28 shows a map of the per-mile tolling corridors in the Plan (and EIR Alternatives 1 and 2) in 2050 in red. The figure also shows other priced corridors, including other express lanes that would be tolled but not part of the per-mile tolling system and the SR-37 priced corridor which would be tolled to fund sea level rise adaptation measures.

Strategy T6 | Improve Interchanges and Address Highway Bottlenecks

This strategy includes a set of capacity expansions or operational improvements on highway corridors and at interchanges throughout the region. This includes improvements at key regional interchanges like the I-80/I-680/SR-12 interchange in Solano County, the I-680/SR-4 interchange in Contra Costa County, and more. Widenings are highly limited and include the widening of SR-4, the construction of a new connector facility between SR-4 and Byron Highway, and a direct connector between US-101 and I-580. The complete set of projects included in this strategy can be found in the Draft Plan Bay Area 2050 Transportation Project List.

The Plan and the EIR Alternatives included the same projects nested under this strategy, with a few key exceptions. For EIR Alternative 1, the following projects were removed to minimize environmental impacts:

- SR-37 Interim Project
- SR-37 Ultimate Project
- SR-262 Safety and Interchange Improvements | Phase 1
- I-680/SR-4 Interchange Improvements Phases 1, 2, 4 and 5
- SR-4 Operational Improvements (Eastbound and Westbound)
- Widening of SR-4 and Vasco Road
- US-101/I-580 Direct Connector
- I-80/I-680/SR-12 Interchange and Widening Phases 3-7
- Vasco Road Byron Highway Connector Road

Strategy T8 | Build a Complete Streets Network

This strategy involves enhancing streets to promote walking, biking, and other micro-mobility by (1) building out a contiguous regional network of 10,000 miles of bike lanes or multi-use paths; (2) providing support to local jurisdictions to maintain and expand car-free slow streets; and (3) supporting other amenities like improved lighting, safer intersections, and secure bike parking at transit stations. This strategy would emphasize Complete Streets improvements near transit to improve access and in Equity Priority Communities to advance equity outcomes (although the geographical aspect of this strategy is not clearly determined yet and is not modeled).

Travel Model 1.5 does not include a detailed bike and pedestrian network, and it is not designed to represent traveler responses to improvement in safety and comfort that may result from a Complete Streets network or expanded bike infrastructure. Therefore, to predict this strategy's potential impacts, staff estimated the effect of this strategy based on available literature and integrated this effect into the modeled mode choice.

Three research studies, Dill and Carr (2003), Marshall and Garrick (2010), and Buehler and Pucher (2011), were identified by CARB in the Final Sustainable Communities Strategy Program and Evaluation Guidelines Appendices (November 2019) as providing elasticities that can be used to determine the relationship between bike infrastructure supply (e.g., miles of bike lane per square mile of land, or miles of bike) and bike usage (e.g., percent commuting by bicycle). Based on GIS analysis, MTC staff determined that the Complete Streets Network strategy is expected to add 5,600 miles of new bicycle infrastructure between 2015–2035 and another 6,000 miles between 2036-2050. Given this input, staff used the relationships inferred from the three research studies cited above and calculated the expected mode shift. The expected impact on walking is not modeled, as the existing literature does not provide enough evidence to estimate these impacts.

The bicycle mode choice constant was increased to represent improvement in several unmeasured characteristics of the mode such as perceived safety, comfort and convenience resulting from the bike infrastructure expansion. Without the constant adjustment, the cycling mode share in the Plan would have been 2.6% in both 2035 and 2050. Based on literature-based estimates of increased bicycle-trip making, the bicycle mode choice constant was calibrated to result in a cycling mode share of approximately 4.6% and 7.0% in 2035 and 2050 respectively.

EIR Alternative 2 includes an additional reserve for pedestrian improvements, which was not modeled.

Strategy T9 | Advance Regional Vision Zero Policy through Street Design and Reduced Speeds

Travel Model 1.5 represents maximum roadway speeds based on a lookup using the area type and facility type of that link.[55] For example, a link with facility type of freeway would have a maximum speed of 65 mph in rural and suburban areas, 60 mph in urban areas, and 55 mph in central business districts (CBD) and the regional core.

To represent this strategy, the lookup was modified to reduce speed limits to between 20 and 35 mph on arterials and local streets, and 55 mph on freeways. The following table shows the relationship between area type, facility type and maximum speed, with and without this strategy. Note that the maximum speed reduction for freeways is assumed to be implemented in 2030, while the maximum speed reduction for major arterials is assumed to be implemented in 2025.

Table 40. Strategy to Advance Regional Vision Zero Policy, speed reductions by facility type and area type

FACILITY TYPE	AREA TYPE	MAXIMUM SPEED, BEFORE STRATEGY	MAXIMUM SPEED, WITH STRATEGY
Freeway	Urban Business	60 mph	55 mph
	Urban	60 mph	
	Suburban, Rural	65 mph	
Major Arterial	CBD	25 mph	20 mph
	Urban Business	30 mph	20 mph
	Urban	30 mph	25 mph
	Suburban	35 mph	30 mph
	Rural	40 mph	35 mph

Strategy T10 | Enhance Local Transit Frequency, Capacity and Reliability

Projects within this strategy aim to make local bus and light rail service faster and more frequent. Network frequency boosts on AC Transit, Muni, Sonoma County Transit and more provide a more frequent baseline on some of the region's highest ridership routes. Additionally, capital projects that increase the speed and reliability of transit maximize the throughput of existing service. Example projects include light rail grade separation in downtown San Jose, BRTs on Geary Boulevard and San Pablo Avenue, and transit signal priority in Napa, among others.

Cordon Tolls

Two cordon tolls are also part of this strategy. The Plan, as well as EIR Alternatives 1 and 2, include two cordon tolls: one in downtown San Francisco, and another on Treasure Island. The downtown San Francisco scheme, which is expected to be implemented in 2025 in the Plan, requires all vehicles to pay a $6 (in 2010$, which is $7.92 in 2020$ or $4.76 in 2000$) fee to enter or leave the greater downtown San Francisco area during the evening commute period. The cordoned area is bounded by Laguna and Guerrero Streets to the west, 18th Street to the south, and San Francisco Bay to the north and east.

55 For more on Facility Type and Area Type definitions, see https://github.com/BayAreaMetro/modeling-website/wiki/MasterNetworkLookupTables#facility-type-ft.

The Treasure Island cordon toll, which is expected to be implemented in 2035 in the Plan, is set at $5 in 2021$ (which is $4.93 in 2020$ or $2.99 in 2000$) during the morning and afternoon peak, $1.50 in 2021$ (which is $1.48 in 2020$ or $0.89 in 2000$) in midday. There is not expected to be a toll in the evenings and early mornings.
The toll is charged to all vehicles entering Treasure Island from I-80 in either the westbound or eastbound direction.

Local Transit Projects

The Plan and the EIR Alternatives included the same projects nested under this strategy, with a few key exceptions.

EIR Alternative 1 further improves local transit frequencies to encourage mode shift away from driving, focusing on core bus service that was overcrowded in the Plan. This includes doubling the peak frequency of select routes on AC Transit local bus service, Muni local bus service and VTA local bus service. EIR Alternative 1 also includes a reserve for transit signal priority capital improvements, which was not modeled.

EIR Alternative 2 also improves local transit service beyond the Plan investments. The VTA Orange Line serving northern Santa Clara County receives a frequency boost to better serve jobs-rich Growth Geographies. There is also a reserve for grade separations on this line that is not modeled. Across the region, all Growth Geographies not adjacent to rail, ferry or bus service with peak headways of 15 minutes or greater see local bus frequency upgrades. Jobs-rich Growth Geographies that were identified for more intensive development in EIR Alternative 2 see even greater investments in local transit service to align with projected growth.

Strategy T11 | Expand and Modernize the Regional Rail Network

Investments nested under this strategy include key extensions to existing rail networks, including the extension of BART to downtown San Jose, the Caltrain Downtown Extension and Valley Link, among others. Additionally, a new rail link between downtown Oakland and downtown San Francisco provides additional capacity to the transbay corridor. These extensions are complemented by modernization projects that increase frequencies on rail networks, including South Bay Connect, improving Capitol Corridor service in Alameda County, BART Core Capacity, and projects boosting ACE and Caltrain frequencies. Ferry projects are also nested within this strategy, including new service to Berkeley, the Seaplane Lagoon in Alameda, Redwood City, and more. The full list of projects included in this strategy can be found in the Plan Bay Area 2050 Transportation Project List.

The Plan and the EIR Alternatives included the same projects nested under this strategy, with a few key exceptions. For EIR Alternative 2, regional rail projects are delayed one period to free up fiscal capacity for local transit improvements. The following projects are delayed to open after 2035 in EIR Alternative 2:

- Caltrain Downtown Extension
- South Bay Connect
- Valley Link

The following projects open after the year 2035 in the Plan. In EIR Alternative 2, they are delayed to open after 2050, meaning they are not modeled:

- Caltrain/High-Speed Rail Electrification and Grade Separation: Tamien to Pacheco Pass
- Dumbarton Group Rapid Transit
- Link21 New Transbay Rail Crossing

Strategy T12 | Build an Integrated Regional Express Lanes and Express Bus Network

To maximize the time-competitiveness of express bus and carpool trips in comparison to single-occupancy vehicles, this strategy includes a full build-out of the express lanes network, the introduction of new express bus routes throughout the region, and frequency increases on select existing express bus service. The full list of projects included in this strategy can be found in the Draft Plan Bay Area 2050 Transportation Project List.

The Plan and the EIR Alternatives included the same projects nested under this strategy, with a few key exceptions. For EIR Alternative 1, all express lanes projects that required the construction of a new lane were modified to instead convert a lane of general purpose travel to an express lane, except for the proposed express lane on SR-85, where there are only two lanes of travel in either direction. Staff determined that converting this facility to have just a single lane for general purpose travel was not feasible.

In EIR Alternative 2, the Plan project list is modified to include additional capital improvements and frequency boosts on AC Transit transbay routes; add express bus service along I-580 in eastern Alameda County prior to the delayed opening of Valley Link in model year 2040; to improve frequencies on ReX Green Line and Blue Line; and to implement capital upgrades to ReX Blue Line stations to provide a premium service.

Strategy EN1 | Adapt to Sea Level Rise

The plan assumes a future with two feet of sea level rise by 2050. To reduce the impact of associated inundation, the Plan, EIR Alternative 1 and EIR Alternative 2 include efforts to mitigate sea level rise by addressing adaptation needs. Protective measures are funded in most locations that are permanently inundated. Equity Priority Communities and areas with high benefit and low cost are prioritized for protection. In the No Project alternative, mitigation is much more limited; only committed mitigation project locations are protected from sea level rise. The committed mitigation projects are: San Francisco Airport Shoreline Protection Program, Foster City Levee Project, South Bay Shoreline Project, and Oakland Airport Sea Level Rise Adaptation.

This degree of sea level rise would inundate several major rail and highway corridors, removing them from the travel model network. One component of this strategy is to prevent inundation from sea level rise on SR-37, segments of US-101 on the Peninsula and in the North Bay, I-580 in Marin County, and other key facilities.

The Plan and the EIR Alternatives included the same projects nested under this strategy, with a few key exceptions. For EIR Alternative 1, the SR-37 Ultimate Project — which includes additional highway capacity and contributes to the project footprint — was removed to minimize environmental impacts, resulting in inundation and removal from the model network.

Table 41 shows the impacts of sea level rise for each alternative, listing affected alternatives and the level of future protection. The inundation levels are assumed to be 12 inches by 2035 and 24 inches by 2050, which affect mostly the No Project alternative because the other alternatives assume some inundation protection. Bus bridges were created to fill the gap between transit stations in the No Project alternative, including the following:

- between Fremont and San Jose Diridon serving Capitol Corridor,
- between Martinez and Suisun City serving the Capitol Corridor, and
- between the Marin Civic Center and downtown Petaluma stations, serving SMART.

Additionally, Tasman station is closed for VTA light rail; as a result, the Blue and Green lines stop at River Oaks, while the Orange line bypasses Tasman. All other alternatives have protection measures that will mitigate inundation through 2050, except for SR-37 which floods in EIR Alternative 1.

Table 41. Impact of sea level rise by alternative

CORRIDOR	COUNTY	FROM	TO	NO PROJECT		PLAN	EIR ALTERNATIVE 1	EIR ALTERNATIVE 2
				2035	2050			
US-101	MRN	Sir Francis Drake Blvd.	Tamalpais Drive Interchange	×	×	✓	✓	✓
I-580	MRN	Bellam Blvd.	Sir Francis Drake Blvd.	×	×	✓	✓	✓
SR-37	MRN, NAP, SOL, SON	US-101 Interchange	Mare Island Interchange	×	×	✓	×	✓
US-101	MRN	Bellam Blvd.	2nd St.	×	×	✓	✓	✓
Seaport Blvd.	SM	US-101	(Entire Road)	✓	×	✓	✓	✓
University Ave.	SM	O'Brien Dr.	Bayfront Expy.	✓	×	✓	✓	✓
N Mathilda Ave.	SCL	Lockheed Martin Way	W Caribbean Dr.	✓	×	✓	✓	✓
E Caribbean Dr.	SCL	Borregas Ave.	N Mathilda Ave.	✓	×	✓	✓	✓
Union City Blvd.	ALA	Smith St.	Alvarado Blvd.	✓	×	✓	✓	✓
Doolittle Dr.	ALA	Bay Farm Island Bridge	OAK and Island Dr.	✓	×	✓	✓	✓
Webster/ Posey Tubes	ALA	City of Alameda		✓	×	✓	✓	✓
Lakeville Hwy.	SON	Gate 9	SR-37	×	×	✓	✓	✓
Irwin St.	MRN	US-101	Woodland Ave.	×	×	✓	✓	✓
Shoreline Hwy.	MRN	Pohono St.	Almonte Blvd. and US-101	×	×	✓	✓	✓
Shoreline Hwy.	MRN	Van Pragg	Stinson Beach	×	×	✓	✓	✓
ACE	ALA, SCL	Fremont	San Jose	×	×	✓	✓	✓
Capitol Corridor	ALA, SCL	Fremont	San Jose	×	×	✓	✓	✓

CORRIDOR	COUNTY	FROM	TO	NO PROJECT		PLAN	EIR ALTERNATIVE 1	EIR ALTERNATIVE 2
				2035	2050			
Capitol Corridor	CC, SOL	Martinez	Suisun City	✗	✗	✓	✓	✓
Ferries	ALA, SF	San Francisco	Alameda/ Oakland	✓	✗	✓	✓	✓
Ferries	ALA, SM	South San Francisco	Alameda/ Oakland	✓	✗	✓	✓	✓
SMART	MRN, SON	Marin Civic Center	Downtown Petaluma	✗	✗	✓	✓	✓
VTA LRT	SCL	Tasman Station		✗	✗	✓	✓	✓

NOTE: a check mark (✓) indicates the facility was protected from inundation and an x (✗) indicates the facility was inundated. Plan Bay Area 2050 assumes 1 foot of sea level rise by 2035 and 2 feet of sea level rise by 2050.

Strategy EN7 | Expand Commute Trip Reduction Programs at Major Employers

This strategy entailed setting a sustainable commute target for all major employers, such that by the year 2035, no more than 40% of each employer's workforce would be eligible to commute by auto on an average workday. To represent the effects of this strategy in Travel Model 1.5, staff first estimated the effects of this strategy on the modeled workforce. This was done using the following steps:

1. Starting with National Establishment Time Series (NETS) dataset which includes establishment, establishment sizes and industry, staff filtered to the 2015 establishments in the Bay Area counties
2. This dataset was then joined with firm data (also from the NETS dataset) based on the headquarters ID to segment the workforce into large firms and exclude small businesses, which would not be affected by the strategy.
3. Each establishment corresponds to one industry (for example, NAICS 54110, Legal Services), but that industry consists of a mix of occupations (for example, Lawyers and Judicial Law Clerks, Computer Support Specialists, Human Resources Workers, Building Cleaning Workers, etc). Using the May 2019 National Industry-Specific Occupational Employment and Wage Estimates[56], worker tallies by industry were translated to worker tallies by occupation.
4. Each occupation was assumed to be able to telework based a crosswalk from Dingel's and Neiman's research.[57]
5. Combining the above steps, maximum telecommute rates were developed for employment in each Bay Area county based on the forecasted employment for that county by industry category. Note that staff do not forecast firm sizes, so the percentage of employees excluded due to small firm size in 2015 was carried forward into future years.

56 May 2019 National Industry-Specific Occupational Employment and Wage Estimates: https://www.bls.gov/oes/current/oessrci.htm.

57 Jonathan I. Dingel and Brent Neiman, 2020. "How many jobs can be done at home?," Journal of Public Economics, vol 189.

Using the maximum telecommute rates, staff then calibrated a telecommute constant for each employment super district using the following logic: If the commute tour auto mode share for the super district was already less than the 40% target, then no additional telecommuting was modeled beyond the baseline estimate described in the section on . If the commute tour auto mode share to the super district exceeded 40%, the telecommute constant was calibrated upwards until telecommuting approached the maximum rates described above. As staff strived to be conservative about strategy benefits, note that this resulted in many workplace super districts continuing to exceed their 40% commute mode share target. Staff assumes that many of these workplaces would institute other measures to shift workers to alternative modes to reach their targets, but these are not captured in the model. Therefore, this representation likely underestimates the effect of this strategy on travel.

Strategy EN9 | Expand Transportation Demand Management Initiatives

This strategy included several components, most of which were not represented in the Travel Model. The analysis for these initiatives is described in the Off-Model Calculations section following. However, this strategy also included a parking pricing component, which was implemented in Travel Model 1.5.

As described in the above section on Parking Prices, Travel Model 1.5 represents parking pricing based on the tour and trip destination's travel analysis zone (TAZ), as well as the tour and trip purpose and the activity duration. Additionally, Travel Model 1.5 includes a simple Free Parking model to capture the fact that some employers subsidize employee parking even in areas with non-zero long term parking pricing.

In order to model the parking pricing component of this strategy, staff expanded the set of TAZs with non-zero parking pricing, assuming that TAZs within the Growth Geographies would have a minimum hourly cost (both for long-term and for short-term parking) of $0.25 per hour (in 2000 dollars), thereby expanding the set of TAZs with non-zero parking pricing.[58] Additionally, staff assumed a parking price increase of 25% above the No Project hourly cost for all TAZs within both Growth Geographies and Transit Rich Areas. Since Travel Model 1.5 TAZs do not match well with Growth Geographies and Transit Rich Areas, qualified TAZs were determined using a threshold approach, where a TAZ was defined as being "within" the relevant geography if 20% or more of the TAZ area intersected with the geography. Finally, this strategy assumed that employer subsidy of employee parking costs has been disallowed, and the Free Parking model was disabled.

Off-Model Calculations

Travel Model 1.5 is not sensitive to the full range of policies MTC and ABAG may choose to pursue in Plan Bay Area 2050. Marketing and education campaigns, as well as non-capacity-increasing transportation investments like bikeshare programs, are examples of strategies with the potential to change behavior in ways that result in reduced vehicle emissions. Travel Model 1.5 and EMFAC do not estimate reductions in emissions in response to these types of changes in traveler behavior. As such, MTC and ABAG use "off-model" approaches to quantify the GHG reduction benefits of these important climate initiatives, which constitute most of the key subcomponents of Strategy EN8: Expand Clean Vehicle Initiatives and Strategy EN9: Expand Transportation Demand Management Initiatives.

The following are the initiatives requiring off-model analysis included in Strategy EN8: Expand Clean Vehicle Initiatives or Strategy EN9: Expand Transportation Demand Management Initiatives of Plan Bay Area 2050:

- Initiative EN8a: Regional Electric Vehicle Chargers
- Initiative EN8b: Vehicle Buyback and Electric Vehicle Incentives
- Initiative EN9a: Bike Share
- Initiative EN9b: Car Share
- Initiative EN9c: Targeted Transportation Alternatives
- Initiative EN9d: Vanpools

58 The Plan Bay Area 2050 Growth Geographies are locations prioritized for future jobs and housing growth. For more information, refer to the Draft Plan Bay Area 2050 Plan Document.

All of these initiatives were included in the previous regional plan, Plan Bay Area 2040, and the primary GHG emission calculation approaches remain unchanged. However, the calculation inputs and assumptions have been updated to reflect new data and research, where available, and travel model outputs reflecting the Plan Bay Area 2050 Plan scenario. The initiative descriptions, GHG emission quantification approaches, and results are summarized in the following section by initiative.[59]

Strategy EN8 | Initiative EN8a - Regional Electric Vehicle Chargers

Electric vehicles (EVs) have the potential to significantly reduce GHG emissions from motor vehicles. Today, the Bay Area is the leading U.S. market for EV sales, including both plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs). PHEVs have a hybridized powertrain that is fueled by chemical energy from a battery or by gasoline/diesel. BEVs are powered exclusively by the chemical energy from a battery. The focus of this initiative is on expanding the charging opportunities for the population of PHEVs in the Bay Area by establishing a regional public network of electric vehicle charging stations.

The costs of installing charging stations can be high, and there are other barriers (e.g., on-site electrical capacity) that may also limit the potential for deploying charging at workplaces. This program will be designed to help overcome some of those barriers by providing financial assistance to interested employers, retailers, parking management companies, and others that qualify. A regional network of charging infrastructure will provide drivers an opportunity to plug in while at work, which is where most vehicles spend most of their time parked when not at home. This will mean that PHEVs are able to travel more miles using electricity and fewer miles using gasoline, reducing GHG emissions.

This initiative was included in Plan Bay Area 2040 and continues in Plan Bay Area 2050. In 2017, MTC transferred a total of $10 million to the Bay Area Air Quality Management District (BAAQMD) to advance EV activities. BAAQMD currently administers the Charge! Program, providing grant funding for the purchase and installation of publicly accessible chargers for light-duty EVs. MTC continues to work with BAAQMD to monitor investments and to develop a coordinated approach to implementing charging infrastructure throughout the region.

GHG Reduction Quantification Approach

This initiative invests in charging infrastructure to expand the network of chargers available to Bay Area drivers. As a result, PHEV drivers will be able to drive a larger share of miles in electric mode, as opposed to gasoline-powered mode, reducing GHG emissions. The impacts of this initiative are not otherwise captured in MTC's emissions calculations, which rely on default EMFAC assumptions for the fraction of PHEV miles in electric vs. gasoline mode.

Inputs and Assumptions

The prior Plan Bay Area analysis was updated to account for improved fuel economy estimates, updated vehicle populations, and new vehicle sales in the Bay Area based on data included in the EMFAC2014 (v1.0.7) Emissions Inventory and the ZEV Compliance Mid-Range Scenario of the Advanced Clean Cars Mid-term Review. The analysis also updated the number of chargers to be funded by MTC and deployed to support the region's PHEV population.

In the baseline, it was assumed that 46% to 60% of miles traveled by PHEVs would be in charge-depleting mode (i.e., electric miles instead of gasoline-powered miles). This assumption comes from EMFAC2017 Technical Documentation, which indicates that:

> (CARB) staff modeled PHEVs as having a 25-mile all-electric range, which equates to a utility factor of 0.40. For the average commute, this would mean that 40 percent of the VMT could be from all-electric, and 60% would be from gasoline operations.[60]

59 Note that the off-model analysis results for the No Project alternative are not shown. Off-model strategies are excluded in the No Project alternative and thus result in zero GHG emission reductions.

60 California Air Resources Board, EMFAC2014 Volume III – Technical Documentation v1.0.7, May 2015. Available online at: http://www.arb.ca.gov/msei/downloads/emfac2014/emfac2014-vol3-technical-documentation- 052015.pdf.

To estimate the fraction of PHEVs that operates like pure ZEVs, EMFAC uses utility factors, which are defined as the fraction of VMT the PHEV obtains from the electrical grid. EMFAC2014 was assuming a constant utility factor of 0.4 for all model years of PHEVs, while in EMFAC2017 this fraction is more dynamic and varies by model years from 0.46 for Model Year (MY) 2018 to 0.6 for MY2025+.[61]

The electric VMT (eVMT) percentage is assumed to increase to 80% due to the Regional Charger Program. Based on a review of EV user surveys and analytics included in the Advanced Clean Cars Mid-Term Report[62], data suggest that PHEV owners can reach 80% eVMT with access to adequate supportive charging infrastructure. This analysis assumes that if the entire region has sufficient workplace and opportunity (public) charging infrastructure, then all PHEVs in the region could operate at this assumed maximum eVMT percentage.

The analysis methodology assumes:

- Each charger deployed through the Regional Charger Network serves multiple vehicles each day
- The chargers deployed are Level 2 chargers
- Each charger consists of two plugs

The National Renewable Energy Laboratory's EVI Pro Lite tool was used to determine the number of chargers required to support the forecasted PHEV population. While the ratios vary by PHEV penetration, it is approximately one charger plug for every four vehicles over the program period. For the financial analysis, the initiative assumes a $3,000 subsidy per charger is provided.[63] The table below summarizes the number of expected PHEVs, plugs, and chargers by analysis year.

Table 42. Expected PHEVs, plugs and chargers by analysis year

PARAMETER	2035	2050	SOURCE
PHEV population	363,012	458,818	EMFAC2014
Plug/PHEV ratio	0.2352	0.2352	EVI-Pro
Charging plugs needed	85,384	107,918	Calculation
Chargers needed	42,692	53,959	Calculation
Incentive amount ($/charger)	$3,000	$3,000	Investment assumption

In addition to increasing the percentage of electric miles driven in PHEVs, the increased availability of chargers could mitigate consumers' "range anxiety" concerns and increase the adoption and use of EVs and further reduce GHG emissions, but this potential effect is not included in this approach, as a conservative assumption. Further, this approach does not include any additional PHEVs incentivized through the Vehicle Buyback and EV Incentive initiative and any increased eVMT share for those PHEVs; the baseline eVMT share is applied to PHEVs realized through that initiative rather than the higher eVMT share assumed in the regional charger network scenario, also as a conservative assumption.

61 California Air Resources Board, EMFAC2017 Volume III – Technical Documentation V1.0.2, July 20, 2018. Available online at https://ww3.arb.ca.gov/msei/downloads/emfac2017-volume-iii-technical-documentation.pdf.

62 California Air Resources Board, Advanced Clean Cars Mid-Term Report, Appendix G: Plug-in Electric Vehicle In-Use and Charging Data Analysis, January 18, 2017. Available online at https://ww2.arb.ca.gov/resources/documents/2017-midterm-review-report.

63 Note that the methodology uses the projected PHEV population from EMFAC and EVI-Pro to estimate the total number of chargers required across the region to meet that forecasted PHEV population; the incentive amount is used to calculate the total investment required to meet this demand.

Calculation of emissions impacts relies on the parameters shown in the table below.

Table 43. Regional electric vehicle initiative calculation inputs and assumptions

PARAMETER	VALUE	SOURCE
Fuel efficiency of PHEV gasoline engine	40 mpg	24.9 mpg for gasoline LDV, based on EPA Automotive Trends Report, 2020; 62% improvement for PHEV engine based on comparison of similar gasoline and hybrid models
Baseline eVMT share for PHEVs – pre MY2025	46%	EMFAC2017 Volume III Technical Documentation
Baseline eVMT share for PHEVs – MY2025+	60%	EMFAC2017 Volume III Technical Documentation
Initiative eVMT share for PHEVs	80%	CARB, Advanced Clean Cars Mid-Term Report, 2017
Energy density of gasoline	115.83 MJ/gallon	CA GREET 3.0
Carbon intensity of gasoline (tailpipe)	72.89 gCO_2/MJ	CA GREET 3.0

Calculation Methodology

To determine the GHG emission reductions from the Regional Charger Program, the analysis method employs the following steps:

1. Use EMFAC to obtain the forecast population of EVs in the Bay Area through 2050, by calendar year and model year.
2. Process EV population data to estimate the population of PHEVs by calendar year and model year.
3. Calculate baseline PHEV eVMT by calendar year, using assumptions in EMFAC2017 that eVMT percentage is 46% for MY2018-2024 and 60% for MY2025+.
4. Calculate baseline PHEV emissions, multiplying baseline PHEV VMT for each calendar year by average fuel efficiency, energy density, and carbon intensity.
5. Apply initiative eVMT percentage to calculate difference in eVMT between baseline and initiative scenario.
6. Calculate PHEV emissions in initiative scenario.
7. Calculate GHG emissions reduction as the difference between the baseline and initiative scenario PHEV emissions.

Results

The table below summarizes the CO_2 reductions due to the Regional Electric Vehicle Charger initiative.

Table 44. CO_2 emissions reductions due to Electric Vehicle Charger initiative

ALTERNATIVE	DAILY REDUCTION (SHORT TONS)		PER CAPITA REDUCTION FROM YEAR 2005 EMISSIONS (PERCENT)	
	Year 2035	Year 2050	Year 2035	Year 2050
Plan	-741	-792	-0.93%	-0.88%
EIR Alternative 1	-741	-792	-0.93%	-0.88%
EIR Alternative 2	-741	-792	-0.93%	-0.88%

Emission reductions are consistent across all EIR Alternatives since the analysis does not rely on inputs from the travel model.

Strategy EN8 | Initiative EN8b - Vehicle Buyback and Electric Vehicle Incentive

Despite a rapid increase in commercially available electric vehicle (EV) models, EV sales are still relatively small, representing about 8 percent of total new light-duty vehicle sales in California. While falling battery prices are expected to make EVs more attractive to consumers, there are also barriers related to EV costs and benefits. The price of new EVs is still beyond the reach of many potential new vehicle buyers, particularly lower-income consumers. To begin addressing this challenge, California's Clean Vehicle Rebate Program (CVRP) was changed in 2016 to adjust incentive amounts based on household income. HOV lane access for some EVs has been eliminated, reducing the non-financial incentives to own an EV. And without additional Congressional action, federal EV tax credits will phase out in their current format because the full tax credit applies only to the first 200,000 EVs sold per automaker; once the 200,000-unit limit is reached, the tax credit value decreases on a quarterly basis until it is phased out completely approximately one year after the automaker surpasses the threshold. Tesla was the first automaker to surpass the sales threshold in July 2018 and General Motors followed suit in December 2018. The early phase out and elimination of these tax credits could potentially have negative sales implications for the Tesla Model 3 and Chevy Bolt – two of the most popular EVs sold in California. Other EV manufacturers are expected to surpass the threshold in the coming years.

This program will provide an incentive to purchase an EV when trading in older, higher-emission vehicles. This is intended to extend the market for EVs into a broader range of income classes. Research indicates that the early adopters of EVs have been higher income individuals who own their homes, and in many cases, own or have owned a hybrid vehicle (e.g., a Toyota Prius). The higher purchase price of EVs makes it difficult for middle- and low-income consumers to purchase them. Older and wealthier individuals tend to buy more new vehicles than other cross-sections of the population. This demographic also tends to buy newer cars more frequently. Furthermore, research from IHS Markit has shown that owners of both new and used vehicles are holding on to their vehicles longer, the scrappage rate has flattened, and the average age of vehicles has increased; the researchers forecast that the population of oldest vehicles (16 or more years) will grow the fastest, increasing by 30% by 2021.[64] This will impact the turnover of the fleet significantly and may slow the purchase of new vehicles, including electric vehicles.

64 Vehicles Getting Older: Average Age of Light Cars and Trucks in U.S. Rises Again in 2016 to 11.6 Year, IHS Markit Says." Press release from IHS Markit, November 2016.

In this program, qualifying consumers can receive a subsidy to purchase a plug-in hybrid electric vehicle (PHEV) or battery electric vehicle (BEV) for scrapping a vehicle that is 15 or more years old. The incentive amount will vary with the vehicle type being purchased (e.g., PHEV or BEV). Additionally, to provide more equitable access to clean transportation options, incentive amounts will vary by household income level, with incentives phased out entirely for higher income buyers.

This initiative was included in Plan Bay Area 2040. In 2017, MTC transferred a total of $10 million to the Bay Area Air Quality Management District (BAAQMD) to advance the EV activities. MTC continues to coordinate with BAAQMD, the lead agency for electric vehicle programs in the region, to advance this initiative and track progress. In Plan Bay Area 2050, a significantly larger investment is envisioned with incentive amounts adjusted based on buyer income.

GHG Reduction Quantification Approach

The vehicle buyback program seeks to accelerate fleet turnover while also incentivizing the purchase of EVs. The combination vehicle buyback and incentive program is intended to induce demand in middle- and lower-income brackets that might otherwise delay car purchasing or purchase a new or used conventional vehicle (i.e., non-EV). The program will result in a higher fraction of EVs owned and operated in the Bay Area than assumed in default EMFAC assumptions.

Inputs and Assumptions

Plan Bay Area 2040 analysis was revised to account for improved fuel economy estimates, increased incentive amounts and program participation, and the mix of PHEVs vs. BEVs incentivized. The program is assumed to be implemented through 2035's incentive program, is assumed to be equal across the program years. The age of the vehicles being replaced is assumed to be 15 years or older.

The program incentives are assumed to range from $1,800 to $13,600, with average incentive levels of $3,600 per PHEV and $8,160 per BEV; the program incentive will vary based on income and EV type.[65] The State's primary EV incentive program, the Clean Vehicle Rebate Project (CVRP), is assumed to provide additional purchase incentive amounts on top of the plan initiative in the amount of $3,500 per PHEV and $4,500 per BEV for households with incomes below $50,000, $1,000 per PHEV and $2,000 per BEV for households earning up to $170,000, and no rebates for the highest income households.[66] The region's GHG benefits for this initiative are calculated as a proportion of the region's incentive amount relative to the total combined regional and state incentive amount. The program assumes a $5.1 billion investment through 2035, incentivizing buyback and purchase of 630,000 EVs. It is assumed that 30 percent of incentives are used for PHEVs and 70 percent for BEVs, based on the share of EV types receiving California Vehicle Rebate Project incentives over the period 2017-2019.

65 A consultant review of EV models and equivalent non-EV models (e.g., Volkswagen Golf vs eGolf) found the average difference in cost to be $13,600 The program is assumed to cover the full difference in cost for households in the lowest income quartile. Purchase subsidies for the second and third quartile households are scaled relative to income quartile thresholds; no subsidies are assumed for the highest quartile earners. It is assumed that the participation level across the three qualifying income groups will be equal.

66 California Clean Vehicle Rebate Project incentive amounts based on current (2021) program structure offering $1,000 per PHEV and $2,000 per BEV for consumers earning up to $150,000 (single filers) and an additional $2,500 for consumers earning less than $51,520 (household size 1). Rebate amounts and income eligibility information collected from CVRP website (accessed August 11, 2021): https://cleanvehiclerebate.org/eng.

Calculation of emissions impacts relies on the parameters shown in the table below.

Table 45. Vehicle Buyback and EV incentive calculation inputs and assumptions

PARAMETER	VALUE	SOURCE
Fuel efficiency of PHEV gasoline engine	40 mpg	24.9 mpg for gasoline LDV, based on EPA Automotive Trends Report, 2020; 62% improvement for PHEV engine based on comparison of similar gasoline and hybrid models
Share of incentivized EV types	70% BEV, 30% PHEV	CVRP rebate data, average 2017-19
eVMT share for PHEVs – pre MY2025	46%	EMFAC2017
eVMT share for PHEVs – MY2025+	60%	EMFAC2017
Energy density of gasoline	115.83 MJ/gallon	CA GREET 3.0
Carbon intensity of gasoline (tailpipe)	72.89 gCO_2/MJ	CA GREET 3.0

Calculation Methodology

To determine the GHG emission reductions from the Vehicle Buyback and EV Incentive initiative, the analysis method employs the following steps:

1. Calculate the number of new PHEVs and BEVs incentivized through initiative for each program year.
2. Calculate the cumulative number of incentivized PHEVs and BEVs operating in each calendar year, accounting for average vehicle turnover by vehicle age.[67]
3. Use EMFAC forecasts of vehicle populations, fuel consumption, and VMT for gasoline light-duty automobiles (LDA – Gas) in the Bay Area to calculate the average gasoline consumption per replaced vehicle (for vehicles 15 years old), by calendar year.
4. Calculate the GHG emissions impact of the program, by calendar year, as the difference between emissions from the replaced vehicles and the emissions from the incentivized EVs, using average carbon intensity values for electricity and gasoline, average energy density for electricity and gasoline, and average energy efficiency for gasoline and electric motors.
5. Calculate MPO regional incentive share of combined MPO and State incentive amount for PHEVs and BEVs.
6. Apply MPO incentive share to GHG emissions impact for each program calendar year to calculate MPO share of GHG emission reductions.

67 A share of these new EVs are assumed to be removed from operation (e.g., as a result of collisions) each year, with higher turnover rates for older model years.

Results

The table below summarizes the CO_2 reductions due to the Vehicle Buyback and EV Incentive initiative.

Table 46. CO_2 emissions reductions due to Vehicle Buyback and EV Incentive initiative

ALTERNATIVE	DAILY REDUCTION (SHORT TONS)		PER CAPITA REDUCTION FROM YEAR 2005 EMISSIONS (PERCENT)	
	Year 2035	Year 2050	Year 2035	Year 2050s
Plan	-3,271	-503	-4.12%	-0.56%
EIR Alternative 1	-3,271	-503	-4.12%	-0.56%
EIR Alternative 2	-3,271	-503	-4.12%	-0.56%

Emission reductions are consistent across all EIR Alternatives since the analysis does not rely on inputs from the travel model.

Strategy EN9 | Initiative EN9a - Bike Share

Bike share systems provide bicycles that members of the public can borrow and use for limited durations in exchange for a fee. In traditional systems, bike share bicycles must be borrowed from and returned to designated docking stations. More recently, dockless bike share systems have emerged, allowing users to leave the bicycles anywhere in the service area. Additionally, bike share providers offer electric bikes, or e-bikes, that can be both parked at a station or elsewhere. Dockless e-bikes may attract more users and replace more motorized vehicle trips by making bike trips more convenient and by expanding the trip distances that can be made by bike share. In an analysis of docked, dockless, and e-bike bike share services in San Francisco, researchers found that a dockless e-bike service was used for more bike trips per bike and for longer trips.[68]

In August 2013, in collaboration with MTC, the Bay Area Air Quality Management District implemented a bike share system in the Bay Area on a limited pilot basis called Bay Area Bike Share (BABS). BABS consisted of approximately 700 bikes deployed across 70 stations; approximately half in San Francisco and the other half in South Bay cities. This pilot program provided valuable information regarding the potential for bike share systems to reduce VMT and emissions.

Since the initial pilot program, bike share has expanded widely across the Bay Area both in the number of bikes and in the number of service areas. The system, now called Bay Wheels, is growing to 7,000 bikes and operates across San Francisco, Berkeley, Emeryville, Oakland, and San Jose. Lyft owns and operates the system with MTC serving as contract administrator. MTC has also provided grants to initiate other bike share services that will expand access in the East Bay and bring bike share to the counties of Marin and Sonoma along the SMART train corridor. MTC also manages the Clipper Card, which can also be used to access and unlock bike share bikes.

68 Lazarus, Jessica, Jean Carpentier Pourquier, Frank Feng, Henry Hammel, and Susan Shaheen. Bikesharing Evolution and Expansion: Understanding How Docked and Dockless Models Complement and Compete--A Case Study of San Francisco. No. 19-02761. 2019.

GHG Reduction Quantification Approach

Bike share reduces GHG emissions by enabling users to take short-distance trips by bicycle instead of by car, and in some cases bike share can eliminate longer trips by enabling users to connect to transit. Bike share program expansion is not captured in MTC's travel model. The mode choice models in Travel Model 1.5 were calibrated using the California Household Travel Survey from 2012-2013, before bikeshare deployment. Although MTC's travel model includes bicycling as a travel mode, it is not structured to capture the travel effects of expansion of a bike share system.

In Plan Bay Area 2040, bike share ridership was estimated based on studies of other systems. For Plan Bay Area 2050, the approach has been updated to incorporate recent ridership data collected from the regional bike share operator. Additionally, the approach now includes modeling the impacts of the rapid introduction of e-bikes into the regional bike share system.

Inputs and Assumptions

Travel and emissions impacts are calculated based on the number of Bay Wheels bike share trips and the relationship between bike share trips and VMT reduction.

Lyft reported the number of trips using the Bay Wheels system for the period May to October 2019, shown in the table below. The daily average during this period is 7,089 trips per day.

Table 47. Bike share trips using Bay Wheels system, 2019

CITY	MAY	JUNE	JULY	AUG	SEPT	OCT
Berkeley	15,854	14,173	12,738	17,985	20,324	20,307
Emeryville	1,795	1,989	1,916	2,159	2,071	1,987
Oakland	21,310	22,286	38,145	24,395	24,003	23,723
San Francisco	132,452	142,594	189,313	156,762	160,512	182,369
San Jose	10,945	12,355	17,142	9,416	11,444	11,847
Monthly Total	182,356	193,397	259,254	210,717	218,354	240,233

During this same period, there were 3,203 Bay Wheels bicycles available per day. Full deployment of the bike share system will consist of 7,000 bicycles, including 4,500 in San Francisco, 1,500 in the East Bay, and 1,000 in San Jose. Usage of the system is expected to grow in proportion of the number of bicycles available. Once the system is fully deployed, use of the bike share system is expected to grow in proportion to population; this is a conservative assumption that does not account for expansion of bike share service beyond the planned Bay Wheels program, including service provided by other private providers and service funded through more recent MTC bike share grants.

The bike share trips were then converted to VMT reductions based on results from MTC's evaluation of the Bay Area Bike Share program, which found that each bike share trip, using conventional bicycles, reduced an average of 1.3 VMT.[69] Many bike share trips do not reduce any VMT because they do not displace vehicle trips, while others only reduce short trips, but the evaluation found that a significant share of bike share trips enables users to connect to transit, eliminating longer personal vehicle trips.

69 MTC Climate Initiatives Program Evaluation: Pilot Bike-sharing Program, Prepared for MTC by Eisen-Letunic, 2015.

Over the last several years, bike share systems have begun transitioning to electric bicycles, which are popular with users and enable longer trips. In early 2020, only about 5% of Bay Wheels bicycles were electric, but the system is expected to continue the transition to electric over the next several years. By 2035, it is assumed that all bike share bicycles will electric.

Based on bike share system research conducted in the Bay Area, trips using dockless electric bicycles were 36% longer than trips using conventional bike share bicycles.[70] Using e-bikes, it is assumed that the VMT reduced per bike share trip will be 36% higher than the 1.3 VMT observed during the BABS pilot.

Table 48. Inputs and assumptions for bike share calculations

PARAMETER	VALUE	SOURCE
Planned bike share bike availability (Bay Wheels)	7,000	MTC
Daily bike share trips	15,492	May-October 2019 bike availability and trips, Lyft Bay Wheels System Data
Average VMT displaced per conventional bike share trip	1.30	MTC Climate Initiatives Program Evaluation: Pilot Bike-sharing Program, 2015.
Average VMT displaced per e-bike share trip	1.77	Calculated based on Lazarus, J. et al. Bikesharing Evolution and Expansion: Understanding How Docked and Dockless Models Complement and Compete – A Case Study of San Francisco, Paper No. 19-02761. 2019.
Assumed share of e-bikes in bike share fleet, 2035 and 2050	100%	Assumption based on market trends

Calculation Methodology

The methodology for calculating the GHG reductions from the bike share initiative is as follows:

1. Calculate or obtain average bike share trips per day for base year.
2. Calculate percentage growth of Bay Area total population relative to base year.
3. Multiply the percentage population growth by the baseline average daily bike share trips to calculate the average daily bike share trips for modeled years.
4. Multiply the percentage share of e-bikes by the average bike share trips per day to calculate the number of conventional versus e-bike share trips per day for each modeled year.
5. Multiply the average VMT displaced per conventional bike share trip by the number of conventional bike share trips per day for each modeled year.
6. Multiply the average VMT displaced per e-bike share trip by the number of e-bike share trips per day for each modeled year.
7. Sum the VMT displaced by conventional bike share and e-bike share trips per day.
8. Multiply daily VMT displaced by exhaust emission rates to calculate GHG emission reductions.

70 Lazarus, Jessica, Jean Carpentier Pourquier, Frank Feng, Henry Hammel, and Susan Shaheen. Bikesharing Evolution and Expansion: Understanding How Docked and Dockless Models Complement and Compete--A Case Study of San Francisco. No. 19-02761. 2019.

Results

The table below summarizes the CO_2 reductions due to bike share.

Table 49. CO_2 emissions reductions due to bike share

ALTERNATIVE	DAILY REDUCTION (SHORT TONS)		PER CAPITA REDUCTION FROM YEAR 2005 EMISSIONS (PERCENT)	
	Year 2035	Year 2050	Year 2035	Year 2050
Plan	-15	-17	-0.02%	-0.02%
EIR Alternative 1	-15	-17	-0.02%	-0.02%
EIR Alternative 2	-15	-17	-0.02%	-0.02%

Strategy EN9 | Initiative EN9b - Car Share

Car sharing offers individuals the opportunity to conveniently rent vehicles by the hour or less, thus giving them access to an automobile without the costs (vehicle purchase, operations and maintenance, insurance) and responsibilities of personal vehicle ownership. Car sharing offers the opportunity for users to replace making trips in their own vehicles, particularly short trips such as for errands, shopping, or airport pick-ups. Car sharing can be particularly effective in neighborhoods with bus, rail, bike share, or other alternatives to driving where cars are infrequently needed and households in these neighborhoods can shed one or more vehicles. Even in less dense neighborhoods without high-quality alternatives to driving, car sharing can allow a two- or three-car household to shed one car by making a vehicle accessible for the infrequent instances that multiple vehicles are needed at the same time. Car sharing may also help extend the trend of younger generations putting off or never owning a vehicle. Businesses can also sign up for business memberships (known as corporate car sharing) to avoid maintaining or reduce the size of a company fleet of vehicles.[71]

Car sharing has been growing in the Bay Area since 2001, with multiple car share operators offering different service models, including traditional car share requiring pick-up and return of a company-owned vehicle at a specific location (e.g., Zipcar) and one-way or free-floating car share (e.g., Gig). Traditional car sharing businesses typically operate on a membership basis, where users pay an annual fee in addition to hourly and sometimes per-mile rates. Users benefit by not having to worry about fueling, maintenance, parking, and insurance, which are included in the membership and usage rates.

One-way car sharing allows a driver to pick up a vehicle in one location and drop it off at another, either at a specific location or anywhere within a service zone. This model provides an opportunity to incorporate driving as part of a longer multimodal trip chain. For example, Gig Car Share partnered with Bay Area Rapid Transit (BART) to provide designated Gig parking spaces at six BART stations, allowing users to drive a Gig car to transit, or alternatively, drive home after arriving at the station. This model also allows for more frequent vehicle turnover and higher utilization of vehicles, as the cars are rented just to get to destinations rather than rented and parked while the user completes their activities at the destination before returning the vehicle.

71 Reed, John. 2017. Corporate Car Sharing: an innovative solution to save the cost for company employee' car and taxi work travel. https://www.sharedmobility.news/corporate-car-sharing/.

The expansion of car sharing helps reduce GHG emissions by both reducing the amount participants drive and by shifting their driving to more fuel-efficient vehicles. The cumulative effect of car sharing, from a study conducted by UC Berkeley's Transportation Sustainability Research Center, found that for each car share vehicle, nine to 13 privately owned vehicles are shed from the region's vehicle fleet.[72] Vehicle owners drive more than those who do not own their own vehicle. Additionally, car share vehicles are newer and more fuel efficient than the average vehicle and thus contribute fewer emissions.

Car sharing was included in the previous regional plans and MTC will continue implementing relevant programs. Six grants were awarded to the following agencies to implement car sharing services:

- Contra Costa Transportation Authority
- Sonoma County Transportation Authority
- City of San Mateo
- City of Oakland
- City of Hayward
- Transportation Authority of Marin

Additionally, MTC is implementing a program for mobility hubs which will include car sharing as well as other shared transportation modes. Work has started on pilot projects with full implementation to follow.

GHG Reduction Quantification Approach

Car sharing is not explicitly captured in MTC's travel model, and a car share expansion initiative accordingly is accounted for off-model. Car sharing reduces emissions in two primary ways — by lowering the average VMT of members and by allowing trips to be taken with more fuel-efficient vehicles than would have been used without car sharing.

The primary calculation approach remains unchanged from Plan Bay Area 2040, estimating GHG reductions based on the reduced VMT and use of more fuel-efficient vehicles among car share program participants. However, the approach has been updated to reflect the increasing deployment of electric vehicles in car sharing fleets.

Inputs and Assumptions

Participation in the car share initiative is based on the number of Bay Area residents who are in the age groups likely to adopt car sharing and who live in communities that are compact enough to promote shared use. Research shows that adults between the ages of 20 and 64 are most likely to adopt car sharing, with estimates that between 10% and 13% of the eligible population in more compact areas adopt the practice when car sharing is available.[73, 74] With the implementation of regional initiatives to support car sharing and the introduction of one-way car sharing, adoption rates are assumed to reach 14% of the eligible population in dense urban areas (i.e., areas with at least 10 people per residential acre) by 2035, while 3% of the eligible population could adopt car sharing by 2035 in suburban areas (i.e., areas with fewer than 10 people per residential acre). The table below summarizes the assumptions with respect to car sharing participation rates.

As one-way car sharing programs expand in the Bay Area, it is expected that participation in car sharing programs will increase. Recent research suggests that while one-way car sharing still reduces emissions, the reductions are not as large as with traditional car sharing, as discussed below. In this analysis, it is assumed that one-way car sharing comprises 20% of carshare members in 2020 and remains at this level for 2035 and 2050. The table below summarizes the participation assumptions.

72 Martin, Shaheen, and Lidicker, 2010, "Impact of Carsharing on Household Vehicle Holdings: Results from a North American Shared-Use Vehicle Survey." Transportation Research Record Volume 2143, Issue 1, Pages 150-158. URL: https://escholarship.org/uc/item/3bn9n6pq.

73 Zipcar. http://www.zipcar.com/is-it#greenbenefits. Accessed March 20, 2017.

74 Zhou, B., Kockelman, K, and Gao, R. "Opportunities for and Impacts of Carsharing: A Survey of the Austin, Texas Market." International Journal of Sustainable Transportation 5 (3): 135-152, 2011.

Table 50. Car share participation assumptions

CATEGORY	SCENARIO YEAR		
	2020	2035	2050
Participation rates in urban areas	12%	14%	14%
Participation rates in suburban areas	0%	3%	3%
Percent of car share members who participate in one-way car sharing programs	19%	20%	25%

Research by Robert Cervero indicates that on average traditional car share members drive seven fewer miles per day than non-members.[75] This is mostly due to the members who shed a vehicle after joining carsharing. Daily VMT of these car share members drops substantially and outweighs the increase in VMT from car share members that previously did not have access to a vehicle.

In addition to the reduction in VMT, when members drive in car share vehicles, their per-mile emissions are generally lower because car share vehicles are more fuel efficient than the average vehicle. Research by Martin and Shaheen found that the car share vehicles in their study used 29% less fuel per mile than the passenger vehicle fleet in general.[76] This reduction is used for year 2020 in this analysis and increases to 36% and 43% for 2035 and 2050, respectively, based on a conservative assumption of 10% to 20% of the car share fleet becoming fully electric. The same study also shows that on average, members of traditional car sharing programs drive an average of 1,200 miles in car sharing vehicles per year. MTC assumes this individual annual car share mileage will remain constant over time.

Martin and Shaheen conducted an analysis of one-way car share services in five cities across North America and estimated VMT reduction of participants.[77] Based on the study's findings, this approach assumes that one-way car share members drive an average of 104 miles in car sharing vehicles per year but overall drive 1.07 fewer miles per day than non-members. Also based on the study's findings, it is assumed that one-way car sharing fleets use 45% less fuel per mile. Furthermore, based on observed offerings from recent one-way car share providers, it is assumed that one-way car sharing service fleets will include a share of battery electric vehicles in future years. For this analysis, it is assumed that this mileage will remain constant over time.

75 Cervero, Golub, and Nee, "City CarShare: Longer-Term Travel-Demand and Car Ownership Impacts", July 2006, TRB 2007 Annual Meeting paper.

76 Martin, Elliot, and Susan Shaheen, "Greenhouse Gas Emission Impacts of Carshaing in North America," 2010, Mineta Transportation Institute. MTI Report 09-11.

77 Martin, Elliot, and Susan Shaheen, "Impacts of Car2Go on Vehicle Ownership, Modal Shift, Vehicle Miles Traveled, and Greenhouse Gas Emissions", July 2016, Working Paper.

Table 51. Car share calculation inputs and assumptions

PARAMETER	VALUE	SOURCE
VMT per member per year, traditional carshare	1,200	Estimate based on Martin and Shaheen, MTI report, 2010 (figure 7); assume constant over time
VMT per member per year, one-way carshare	104	Martin and Shaheen, July 2016
VMT reduction per member per day, traditional car share	7	Cervero, Golub, and Nee, July 2006
VMT reduction per member per day, one-way car share	1.07	Martin and Shaheen, July 2016
Average mpg, traditional car share vehicles	32.8	Average US/Canada mpg from Martin and Shaheen, MTI report, page 65; assumed constant from 2010
Average mpg, one-way car share vehicles	24.4	Martin and Shaheen, July 2016
Average mpg, cars avoided by traditional car share service members	23.3	Average US/Canada mpg from Martin and Shaheen, MTI report, page 65; assumed constant from 2010
Average mpg, cars avoided by one-way car share service members	44.0	Martin and Shaheen, July 2016
Battery electric vehicle share of fleet, traditional car share	10% (2035); 20% (2050)	Assumption based on conservative electric vehicle adoption rate
Battery electric vehicle share of fleet, one-way car share	50%	Assumption based on current 100% electric one-way Gig car share fleet in Sacramento area
Travel days per year	347	Standard State Assumption

Calculation Methodology

To calculate the GHG emission reductions due to car sharing, the individual steps were as follows:

1. Calculate the residential density of each transportation analysis zone (TAZ) during the scenario year by dividing the total population by the residential acres (from travel demand model).
2. Sum total car sharing eligible population (between the ages of 20 and 64) for urban areas (TAZs with a population density greater than 10 residents per residential acre) and for suburban areas (TAZs with a population density less than 10 residents per residential acre).
3. Multiply participation rates, urban and suburban, by the car sharing eligible population in urban and suburban areas, respectively, and sum to calculate car share program members.
4. Multiply the one-way car share participation rate to calculate the number of members in traditional and one-way car sharing services.

Number of traditional (station-based) car share members	$= [P_{>10} \times QP_{urban} + P_{<10} \times QP_{suburban}] \times (1 - QP_{1-way})$
Number of one-way car share members	$= [P_{>10} \times QP_{urban} + P_{<10} \times QP_{suburban}] \times QP_{1-way}$
Number of one-way car share members	$= [P_{>10} \times QP_{urban} + P_{<10} \times QP_{suburban}] \times QP_{1-way}$

Where:

$P_{>10}$ = the total population in TAZs with density greater than 10 persons/residential acre

QP_{urban} = the percent of qualifying urban population expected to become members

$P_{>10}$ = the total population in TAZs with density less than 10 persons/residential acre

$QP_{suburban}$ = the percent of qualifying suburban population expected to become members

$QP_{1\text{-}way}$ = the percent of car share members participating in one-way car share

5. Multiply the VMT reduced per day per member by the number of members of each service type and sum the result across both service types to calculate VMT reduction per day from car share users.

Total daily VMT reductions from car sharing members driving less	$= M_{trad} \times V_{trad} + M_{1-way} \times V_{1-way}$

Where:

M_{trad} = the number of traditional car share members

V_{trad} = the VMT reduction per traditional car share member per day

$M_{1\text{-}way}$ = the number of one-way car share members

$V_{1\text{-}way}$ = the VMT reduction per one-way car share member per day

6. Multiply daily VMT reductions by average vehicle emission rates from EMFAC2014 to calculate GHG emission reductions due to car share members driving less.
7. Multiply the number of car share members for traditional and one-way car sharing by the respective average VMT per day per member to calculate VMT per day by service type.
8. Multiply daily VMT in each car share service type by the percent vehicle efficiency improvements (based on average car share vs non-car share vehicle fuel consumption rate) for each service type and by average vehicle emission rates to calculate GHG reductions due to car share members driving more fuel-efficient vehicles.
9. Sum GHG emission reductions due to car share members driving less (Step 6) and GHG reductions due to car share members driving more fuel-efficient vehicles (Step 8) to calculate total GHG reductions due to car sharing.

Results

The table below summarizes the CO_2 reductions due to car share.

Table 52. CO_2 emissions reductions due to car share

ALTERNATIVE	DAILY REDUCTION (SHORT TONS)		PER CAPITA REDUCTION FROM YEAR 2005 EMISSIONS (PERCENT)	
	Year 2035	Year 2050	Year 2035	Year 2050
Plan	-1,928	-2,173	-2.43%	-2.42%
EIR Alternative 1	-1,928	-2,171	-2.43%	-2.42%
EIR Alternative 2	-1,926	-2,171	-2.43%	-2.42%

Strategy EN9 | Initiative EN9c - Targeted Transportation Alternatives

The Targeted Transportation Alternatives initiative employs a variety of approaches, including individual travel consultation, organized events, and distribution of outreach and informational materials to encourage people to shift from driving alone to carpooling, transit, biking, or walking for any of their trips. These programs are "targeted" because they tailor activities and materials to focus on the travel needs and transportation options that are available in specific job centers or residential neighborhoods. Several MPOs and large cities in the U.S. administer these programs, partnering with local governments, transit agencies, employers, and transportation management associations to customize projects to different communities. In several cities, these types of programs have been operating for more than 10 years with documented positive results, including Portland (Ore.) Metro's Regional Travel Options program, City of Portland's SmartTrips program, and King County (Wash.)'s InMotion program.

Several public agencies in the Bay Area have successfully implemented similar programs. Two of the Climate Initiative Innovative Grant pilot projects funded by MTC from 2011-14, GoBerkeley and Connect, Redwood City!, included targeted transportation alternatives components. The former involved working with property managers to market travel options and provide free bus passes to residents of multifamily transit-oriented developments, while the latter included focused outreach to employers with billboard and print advertising to promote alternatives to driving alone.

MTC's Targeted Transportation Alternatives Program includes both residential and employer activities. The employer portion of the program will have a particular focus on supporting smaller employers to complement a separate strategy, EN7: Expand Commute Trip Reduction Programs at Major Employers (reflected in the travel model). The program is expected to reduce drive alone trips and associated VMT by encouraging travelers to shift to using active and shared modes for their commute and non-commute trips. By reducing single occupancy vehicle trips, the program will reduce GHG emissions.

The Targeted Transportation Alternatives initiative was included in Plan Bay Area 2040. MTC is currently developing a pilot project of this approach, which will inform implementation of a broader program.

GHG Reduction Quantification Approach

Off-model analysis is necessary to capture GHG reductions from targeted transportation alternatives programs. The mode choice models in Travel Model 1.5 were calibrated using the 2012-2013 California Household Travel Survey, so they do not capture the impacts of new strategies that change travel behavior such as this one. It is possible that these strategies will be captured by a future model once they have been implemented to the extent that they influence people's behavior and can be captured by the travel surveys, and once the model framework has been altered to include inputs that represent the presence of behavior change strategies.

Since Plan Bay Area 2040, the approach has been updated with a new cost per participant assumption based on a review of more recent evaluations from a broader set of similar programs across the country; the cost per household was increased significantly from $3.11 to $18.81 per household. This results in a more conservative estimate of program benefits per dollar of investment than identified in the last plan.

Inputs and Assumptions

To estimate the impacts of this program on traveler behavior, the analysis relies on evaluation data collected for similar programs implemented in other regions. For residential-focused programs, program evaluation information was obtained for the City of Portland's SmartTrips program, King County's InMotion Program, SANDAG's Travel Encinitas pilot program, and the Community Transit (Snohomish County, Wash.) Curb the Congestion program. For employer-focused programs, evaluation information was obtained for Portland Metro's Regional Travel Options program. Some of these programs have conducted multiple rounds of evaluation, with each round covering multiple projects. Information was collected on the cost per year of marketing to an individual household/employee, the percentage of residents/employees receiving program information who change behavior (penetration rate), and the reduction in SOV mode share for those residents/employees from evaluations of these programs. These were then applied to the daily number and distance of trips for all trips (for households) and for commute trips (for employees) to estimate VMT impacts.

Evaluations of targeted transportation alternatives programs typically focus on impacts during the year after programs are implemented; however, long-term evaluations that provide information on how long behavior change persists due to marketing and outreach programs are not currently available. To account for this uncertainty, the methodology uses a conservative assumption that behavior change lasts for five years before participants revert to their previous travel patterns.

Table 53. Targeted Transportation Alternatives calculation assumptions

PARAMETER	HOUSEHOLDS	EMPLOYEES	SOURCE
Average cost per year of marketing to a household/ employee	$18.81	$4.34	Portland, OR and King and Snohomish Counties, WA program evaluations
Average penetration rate	19%	33%	Portland, OR and King and Snohomish Counties, WA program evaluations; Assumption based on discussion with Portland Metro Regional Travel Options program staff
Average reduction in SOV mode share among participants	12%	9%	Portland, OR and King and Snohomish Counties, WA program evaluations; Portland Metro, Regional Travel Options 2012 Program Evaluation
Average daily one-way driving trips affected	5.47	2	MTC, Characteristics of Rail and Ferry Station Area Residents in the SF Bay Area
Average one-way trip length (miles)	6.2 (2035); 5.8 (2050)	10.0 (2035); 9.8 (2050)	Travel Model, Plan scenario
Number of years for which behavior change persists	5	5	Assumption based on discussion with SANDAG Community Based Travel Planning program consultant

MTC's investment in this initiative is the primary input in the GHG reduction estimates. MTC anticipates investing $5 million in this initiative per year, with $3 million going to residential programs and $2 million going to employee programs. MTC is working with consultants to develop an approach to implementation beginning in 2021. Implementation of the program is expected to continue through the lifetime of the plan years due to the assumption that behavior change from program interventions is temporary. The program is applied to all households and jobs in the region for each modeled year. Based on the annual investment assumption and cost per household or employee, the program is expected to reach approximately 160,000 households and 460,000 employees.[78]

78 2018 National Establishment Time Series (NETS) data indicates that there are approximately 2.5 million people in the Bay Area who work for establishments with less than 50 employees.

Calculation Methodology

The methodology for calculating the GHG reductions from the Targeted Transportation Alternatives initiative is as follows:

1. Allocate the investment between household and employee programs.
2. Divide the respective household/employee investments by the average cost per year of marketing to a household/employee and multiply by the penetration rate to calculate the total number of participants.
3. Multiply the total number of participants by the average reduction in SOV mode share among participants and the average daily one-way driving trips affected and the average number of years that behavior change will persist to calculate the total daily number of vehicle trips reduced due to total program funding.
4. Sum the total daily vehicle trip reductions for employees and households to calculate the total daily vehicle reductions.
5. Multiply daily vehicle trips reduced by the average one-way trip length to calculate the total daily VMT reductions.
6. Sum the product of trip-end emission rates and daily vehicle trip reductions and the product of exhaust emission rates and daily VMT reductions to calculate total GHG emission reductions.

Results

The table below summarizes the CO_2 reductions due to Targeted Transportation Alternatives.

Table 54. CO_2 emissions reductions due to Targeted Transportation Alternatives

ALTERNATIVE	DAILY REDUCTION (SHORT TONS)		PER CAPITA REDUCTION FROM YEAR 2005 EMISSIONS (PERCENT)	
	Year 2035	Year 2050	Year 2035	Year 2050
Plan	-883	-861	-1.11%	-0.96%
EIR Alternative 1	-877	-847	-1.11%	-0.94%
EIR Alternative 2	-872	-862	-1.10%	-0.96%

Strategy EN9 | Initiative EN9d - Vanpools Vanpool Incentives

MTC has coordinated a vanpool program since 1981 to encourage alternative commutes and reduce congestion and emissions. To date, MTC's 511 vanpool program recruitment has consisted of online passenger and driver matching, employer outreach, up to $500 for startup fees, empty seat subsidies to encourage continued participation when a passenger is lost, free bridge tolls, discounted parking permits, and various other incentives. With this program there is an operational vanpool fleet in the Bay Area of more than 500 vans.

As defined by the 511 program, a vanpool is a group of seven to 15 people commuting together and being driven by an unpaid driver. There are a handful of options for drivers to procure a vehicle: the first is simply a vehicle that is owned by the driver, the second is a vehicle provided by an employer, and the third option is renting a vehicle from a third-party provider. MTC modified its vanpool program to be similar to programs in San Diego, Los Angeles, Denver, Arizona and elsewhere. San Diego's program began in 2001 and saw 5% to 10% growth in the vanpool fleet every year through FY 2013. Los Angeles Metro began its program in 2007 and the vanpool fleet has grown about 14% per year.

The vanpool program was included in previous regional plans and MTC will continue supporting vanpooling across the region in Plan Bay Area 2050. Through a partnership with Enterprise Rent-A-Car, groups may be eligible for a $350 monthly subsidy for vanpool vehicles rented through the Commute with Enterprise program.[79] Currently vanpool rentals cost approximately $1,300 to rent and operate per month.[80] The $350 per month subsidy would reduce these costs by 27%. MTC assumes this incentive will significantly increase the vanpool fleet. Combined with growth in Bay Area population, employment, and highway congestion, the size of the Bay Area vanpool fleet is expected to reach 1,030 vans by 2035, after which the number of vanpools is assumed to stabilize. A sustained fleet of 1,030 vans is slightly more than the 1996 peak of 900 vans. Moreover, there is significant potential to expand vanpool operations in the Bay Area. For comparison, the Puget Sound region operates more than 1,700 vanpool vans compared to the Bay Area's 515 vans, with a population that is 54% of the Bay Area's.[81] In addition to financial subsidies, MTC works with vanpool groups, both in Commute with Enterprise and other vanpools, to provide technical assistance such as ride matching tools, identification of incentives (e.g., parking and bridge toll discounts), form completion guidance, and social media promotion resources to help form and fill vanpools.

GHG Reduction Quantification Approach

Travel and emissions impacts are calculated based on the number of vanpool program vans, average vanpool occupancy, and the relationship between vehicle trip reductions and VMT reductions. The vanpool program reduces GHG emissions by encouraging groups of people to share a ride for their commute, which reduces travel by single occupancy vehicles and associated VMT. The vanpool program is not captured by MTC's travel model and thus, the emission reductions resulting from this initiative are not otherwise captured. Travel Model 1.5's mode choice models are calibrated using the 2012-2013 California Household Travel Survey (CHTS).

The overall quantification approach remains unchanged from Plan Bay Area 2040 but uses updated driving mode shares from Plan Bay Area 2050. The impacts of the vanpool program are calculated based on the difference between the number of vanpools in existence since 2005 (515 vans) and the number expected in the future with an expanded program.

Inputs and Assumptions

In this analysis, the base year vanpool fleet of 515 vans is assumed to double by 2035 and remain at this level through 2050. Average vanpool occupancy, which is used to calculate the total daily vehicle trip reductions, is determined with data gathered from MTC's 511 program and is assumed to stay consistent over time.

The emission reduction analysis assumes that vanpools have an average of 10.8 passengers and roundtrip distance of 110 miles[82], both of which are expected to remain constant over time. To account for the emissions from the vanpool van itself, the calculations account for only 9.8 passengers in the van. Reducing the vanpool size is a simplified approach to account for the emissions from the shared van.

The population that shifts to vanpools is expected to be consistent with the commute mode share of the general population. Emissions reduced from a commuter switching from a single occupancy vehicle (SOV) are assumed to be 100%. Emissions reduced from a commuter switching from a two-person carpool are assumed to be 50%. Emissions reduced from a commuter switching from a 3+ person carpool are assumed to be 33%. Shifts from other modes (walking, biking, or transit modes) are not assumed to reduce emissions.

79 MTC Bay Area Vanpool Program, Commute with Enterprise, https://511.org/vanpool/enterprise.

80 Based on MTC staff conversations with vanpool users.

81 Ennis, Michael (2010). Vanpools in the Puget Sound Region: The case for expanding vanpool programs to move the most people for the least cost. Washington Policy Center for Transportation.

82 MTC Transit Finance Working Group memo, February 2015.

Since the baseline year for the SB 375 emissions reduction target is 2005, the current vanpool fleet of 515 vans is not included in the analysis; only growth above and beyond 515 vans is included in the calculations.

Table 55. Vanpool calculation inputs and assumptions

PARAMETER	VALUE	SOURCE
Baseline number of vans, 2005	515	MTC data, 2005-2011
Average vanpool occupancy	10.8	MTC data, 2005-2011
Vanpool program vans, 2035-2050	1,030	Assume doubling of the baseline fleet by 2035 and sustained stabilized fleet after 2035

The vanpool program is expected to be self-funding. Reporting ridership mileage to the National Transit Database (NTD) returns Federal Transit Administration (FTA) funding to the region for transit. Several other cities and regional agencies, including San Diego, Los Angeles, Denver, and Arizona, have found that NTD reporting of vanpool data returns more money to a jurisdiction than the amount spent to offset vanpool costs. For example, the Northern Virginia Transportation Commission found that failure to report vanpool data in the Washington, D.C. metropolitan area resulted in a $6 million to $8 million loss per year, and that each $1 invested would have returned more than $2 in transit funds.[83] Los Angeles spends $7 million annually to offset vanpool costs and brings back $20 million in additional transit funding.[84] While the amount returned varies depending on the number of passenger miles traveled, vanpools that log more miles and carry more passengers have higher returns. MTC estimates that for every $1 spent on vanpools, it could expect a return of about $1.40 in transit funds.

Calculation Methodology

To calculate the GHG emission reductions resulting from the vanpool program, the analysis steps were as follows:

1. Multiply the projected increase in vanpools by the number of passengers (minus the driver) to obtain increased number of vanpool participants.

Number of vanpool participants	$= (V_{2035} - V_{2005}) * (Pass_{avg} - 1)$

Where:

V = number of vanpools

$Pass_{avg}$ = average number of passengers per van (10.8)

2. Estimate the number of vehicle round trips reduced by vanpools, accounting for the previous mode selection of the vanpool participants, by multiplying the number of vanpool participants by each of the vehicle mode shares and an adjustment factor that accounts for the number of passengers and summed the results.

83 Northern Virginia Transportation Commission; FTA Section 5307 Earnings Potential from Vanpools in DC Metropolitan Region; Revised: August 7, 2009.

84 MTC October 2014 interview with LA Metro program manager, Jamie Carrington.

Number of vehicle round trips reduced by vanpools	$= (P * MS_{SOV}) + (P * MS_{HOV2} * 0.5) + (P * MS_{HOV3} * 0.33)$

Where:

P = vanpool participants

MS_{SOV} = drive alone mode share

MS_{HOV2} = 2-person carpool mode share

MS_{HOV3} = 3+ person carpool mode share

3. Multiply number of vehicle round trips reduced by the round trip vanpool mileage to obtain daily VMT reduced.
4. Sum the product of trip-end emission rates and daily vehicle trip reductions and the product of exhaust emission rates and daily VMT reductions to calculate total GHG emission reductions.

Results

The table below summarizes the CO_2 reductions due to vanpool programs.

Table 56. CO_2 emissions reductions due to vanpool initiative

ALTERNATIVE	DAILY REDUCTION (SHORT TONS)		PER CAPITA REDUCTION FROM YEAR 2005 EMISSIONS (PERCENT)	
	Year 2035	Year 2050	Year 2035	Year 2050
Plan	-131	-122	-0.17%	-0.14%
EIR Alternative 1	-131	-121	-0.16%	-0.13%
EIR Alternative 2	-129	-113	-0.16%	-0.13%

Performance and Equity Analysis

The purpose of this document is to describe the response of travelers to the strategies implemented in the Plan as compared to the No Project and EIR Alternatives. Information from the travel model was also used to help assess the performance of each alternative using the adopted Plan Bay Area 2050 Guiding Principles as a framework.

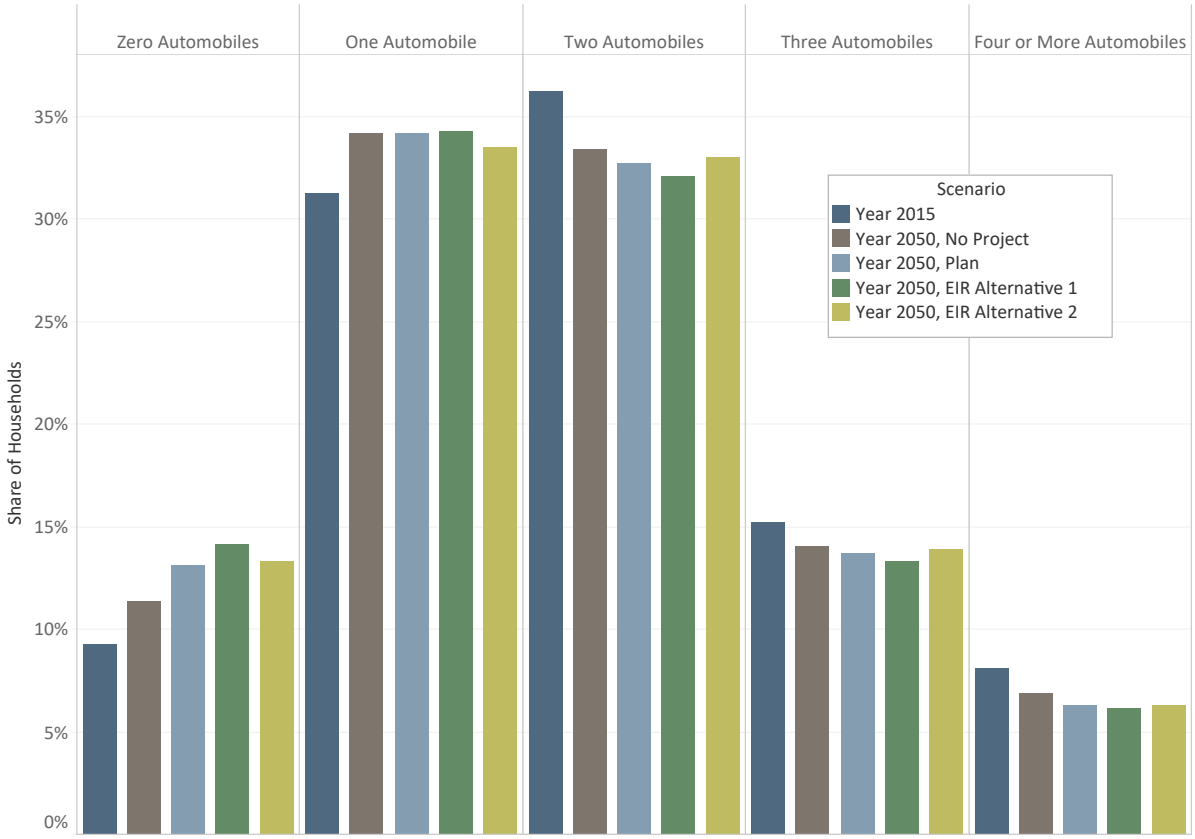
Greenhouse Gas Emissions

The above section on Off-Model Calculations describes how the Plan strategies which couldn't be represented in the travel model were estimated to contribute to the reduction of greenhouse gas emissions from transportation. More information about how the Plan achieves the Sustainable Communities and Climate Protection Act of 2008 (SB 375) 2035 targets for per-capita greenhouse gas emission reductions compared to 2005 levels can be found in the Environmental Impact Report for Plan Bay Area 2050, in Chapter 3.6: Climate Change, Greenhouse Gases, and Energy. Information about how the Bay Area achieved the 2020 greenhouse gas emissions targets can be found in MTC's Technical Methodology for the Sustainable Communities Strategy.

Automobile Ownership

Figure 31 presents the automobile ownership rates across the four alternatives in the year 2050 simulations as well as year 2015. Recall that one of the key factors affecting auto ownership between 2015 and 2050 is the assumption of some autonomous vehicle fleet penetration, which reduces the need for higher auto ownership levels per household because households with autonomous vehicles can share more easily. Beyond that, the Plan strategies enable slightly higher rates of zero automobile households, as do the land use patterns and strategies retained in the EIR Alternatives.

Figure 31. Auto ownership results in 2050 across alternatives



Activity Location Decisions

Figure 32 and Figure 33 present the average trip distance by travel mode for all travel and for trips on work tours, respectively. The key finding here is that the EIR Alternative 1 brings activities slightly closer together, when compared to 2050 Alternatives.

Figure 32. Average trip distance in 2050 across alternatives

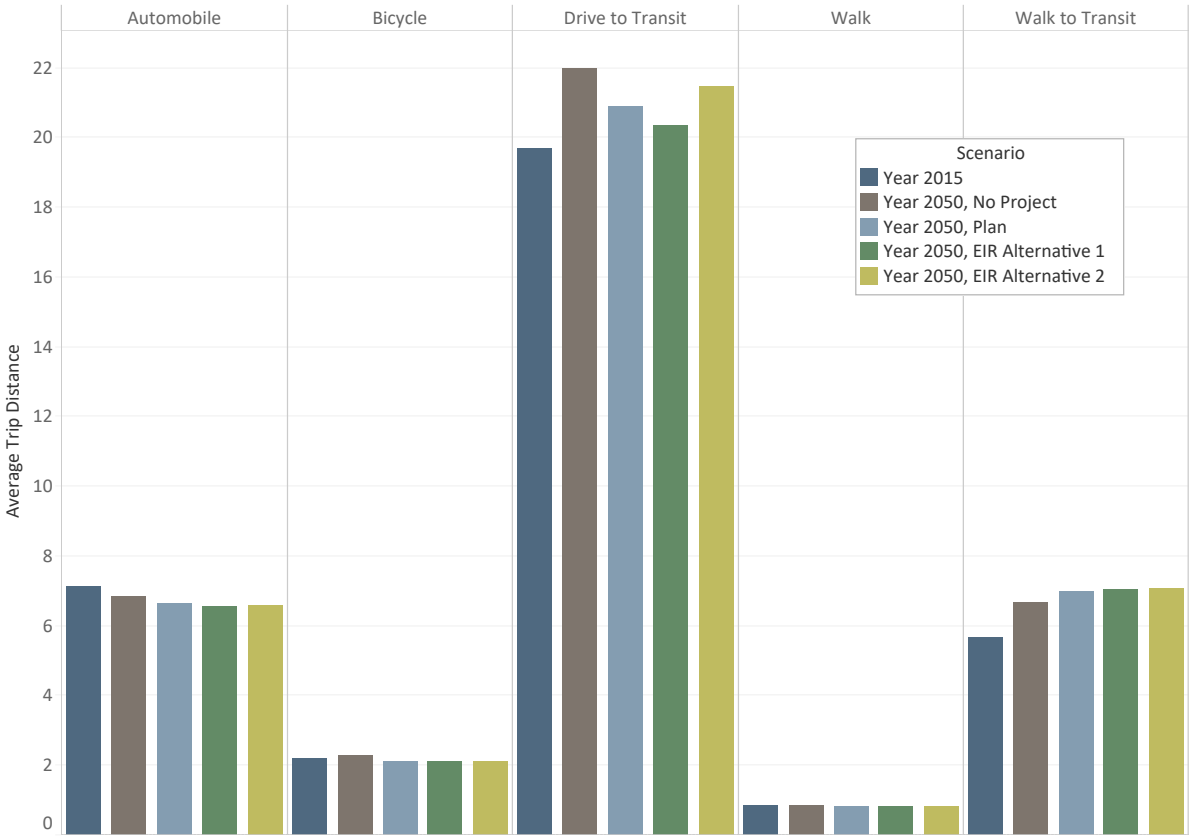
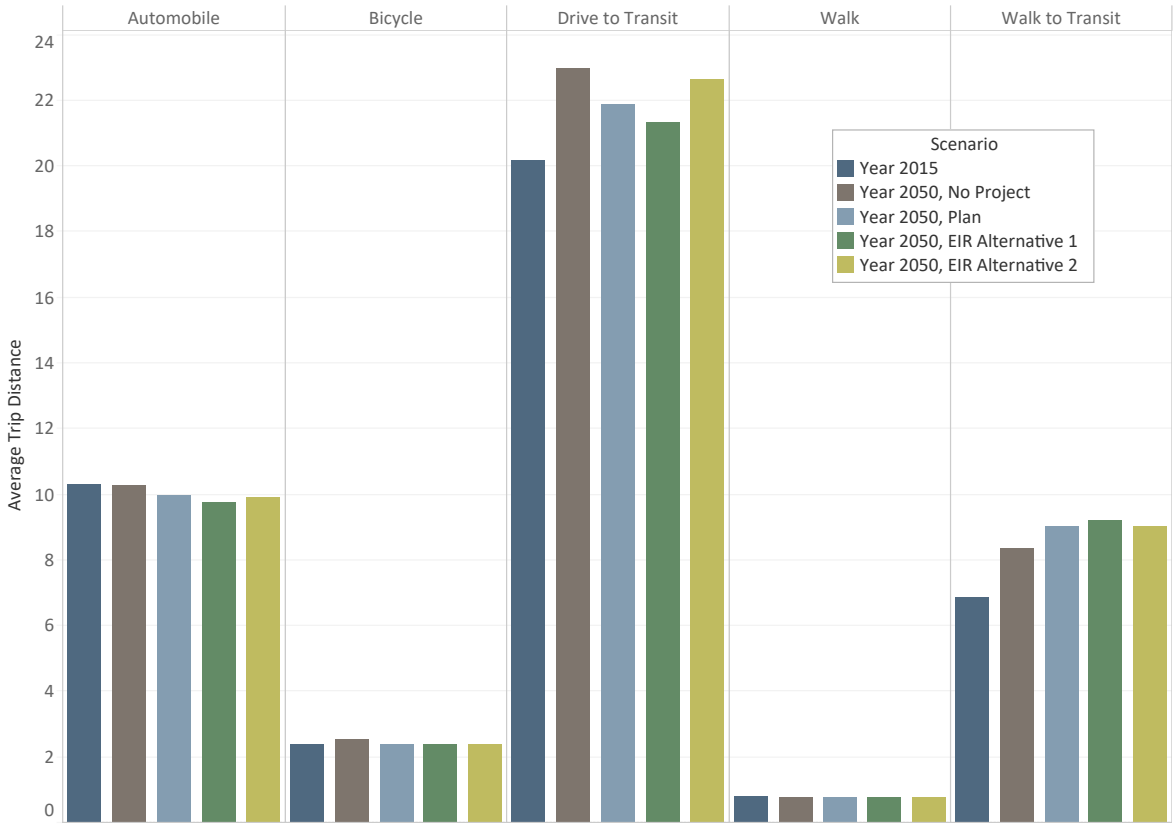


Figure 33. Average trip distance for travel on work tours in 2050 across alternatives



Travel Mode Choice Decisions

The means by which a traveler gets from point A to point B is referred to as the travel mode. Within MTC's representation of travel behavior, seven automobile-based modal options are considered, specifically:

1. traveling alone in a private automobile and opting not to pay to use a tolled lane ("Single Occupant, No Toll"), an option only available to those in households who own at least one automobile;
2. traveling alone in a private automobile and opting to pay to use a tolled lane ("Single Occupant, Paying Toll"), an option only available to those who both own a car and whose journey would benefit from using the tolled facility (e.g., this option is not available to those driving through a residential neighborhood to drop a child at school);
3. traveling with one passenger in a private automobile and opting not to pay to use a tolled lane ("Two Occupants, No Toll) (these travelers can use carpool lanes for which they are eligible), an option available to all households;
4. traveling with one passenger in a private automobile and opting to pay to use a tolled lane ("Two Occupants, Paying Toll"), an option available to all households provided they would benefit from using a tolled lane (if the tolled lane facility which benefits travelers allows two-occupant vehicles to travel for free, then these travelers are categorized as "Two Occupants, No Toll");
5. traveling with two or more passengers in a private automobile and opting not to pay to use a tolled lane ("Three or More Occupants, No Toll")
6. travelling with two or more passengers in a private automobile and opting to pay to use a tolld lane ("Three or More Occupants, Paying Toll"), an option available to all households provided they would benefit from using a tolled lane (if the tolled lane facility which benefits travelers allows three-occupant vehicles to travel for free, then these travelers are categorized as "Three Occupants, No Toll"); and
7. traveling using a taxi, transportation network company (TNC) vehicle -- either pooled with another party or as a single party; this option is available to all households.

The travel model explicitly considers numerous non-automobile options which are collapsed in these summaries into the following four options: transit, getting to and from by foot ("walk to transit"); transit, getting to or from in an automobile ("drive to transit"); walk; and bicycle.

Figure 34 and Figure 35 present the share of trips made by various travel modes. Figure 34 shows shares of travel in automobiles by occupancy category as well as by willingness to pay to use a tolled lane. The effect of Strategy T5 to Implement Means-Based Per-Mile Tolling on Congested Freeways with Transit Alternatives is clearly visible here as a large proportion of automobile trips become toll-paying trips. Overall, the shift towards the bike mode driven by Strategy T8: Build a Complete Streets Network is clearly visible in the three EIR Alternatives, as well as a slight shift towards transit.

Figure 34. Year 2050 automobile mode shares for all travel in 2050 across alternatives

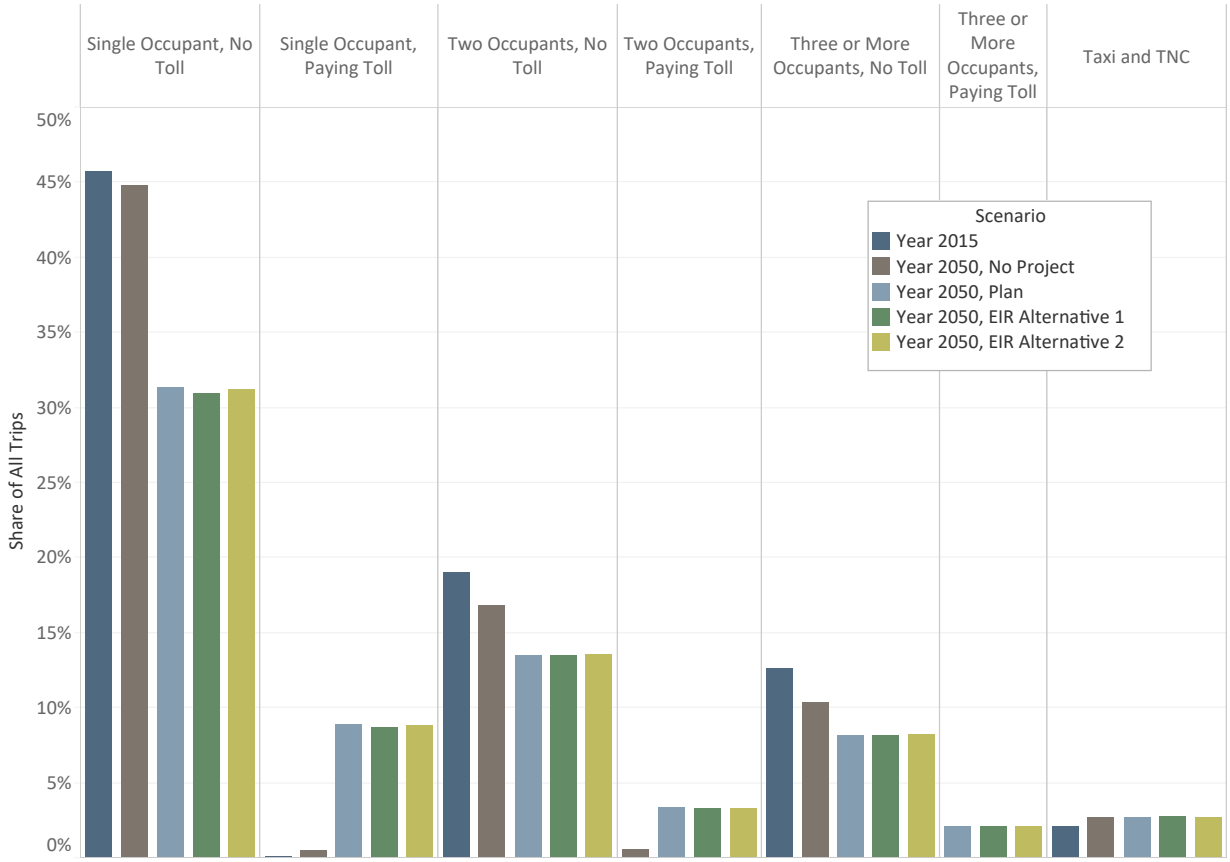
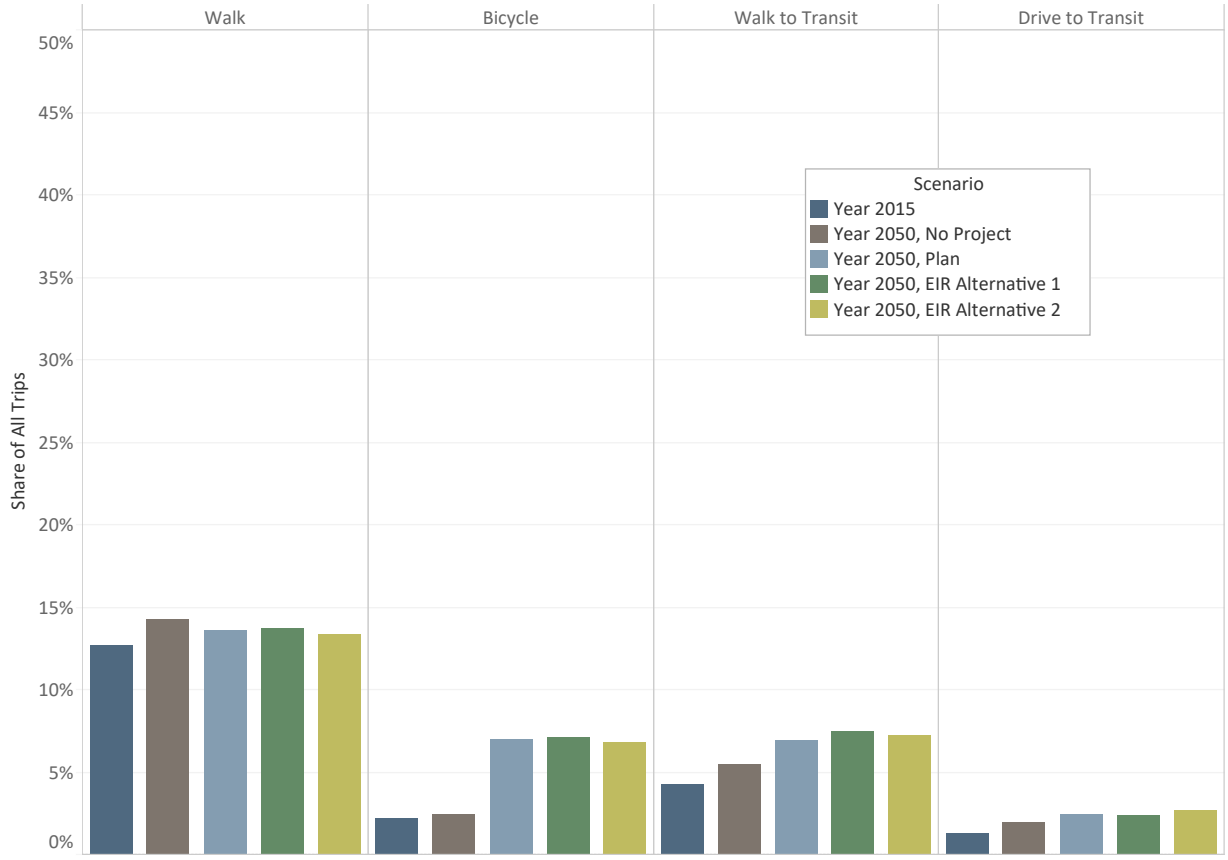


Figure 35. Non-automobile mode shares for all travel in 2050 across alternatives



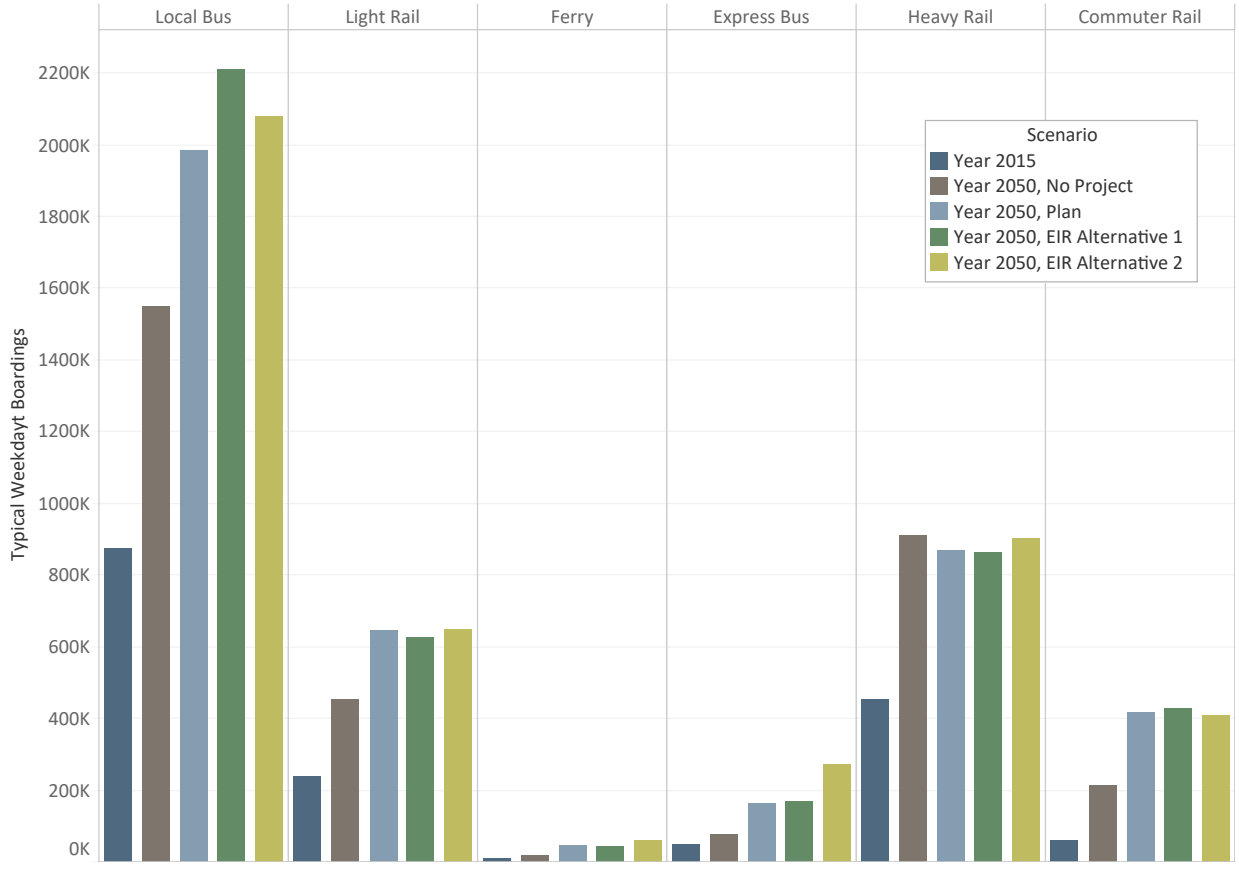
Aggregate Transit Demand Estimates

Bay Area residents choosing to travel by transit are explicitly assigned to a specific transit route. As a means of organizing the modeling results, MTC groups transit lines into the following technology- specific categories:

1. **Local bus:** standard, fixed-route bus service, of the kind a traveler may take to and from a neighborhood grocery store or to work, as well as "bus rapid transit" service. Cable cars are included in this category.
2. **Express bus:** longer distance service typically provided in over-the-road coaches. Golden Gate Transit, for example, provides express bus service between Marin County and Downtown San Francisco.
3. **Light rail:** represented in the Bay Area by San Francisco's Muni Metro and streetcar services (F- Market and E-Caltrain), as well as Santa Clara Valley Transportation Authority's light rail service.
4. **Heavy rail:** another name for the Bay Area Rapid Transit (BART) service.
5. **Commuter rail:** longer distance rail service typically operating in dedicated right-of-way, including Caltrain, Sonoma-Marin Area Rail Transit (SMART), Amtrak's Capitol Corridor, and Altamont Commuter Express.

Figure 36 presents the estimates of transit boardings by these categories on the typical weekday simulated by the travel model. Ridership increases from about 1.7 million daily boardings in 2015 to 3.1 million daily boardings in 2050 No Project, and 4 million daily boardings in all project scenarios in 2050.

Figure 36. Typical weekday transit boardings by technology in 2050 across alternatives



Roadway Utilization and Congestion Estimates

Trips made by automobile are first aggregated into matrices identifying each trip's origin and destination, and then "assigned" to a representation of the Bay Area's roadway network. The assignment process iteratively determines the shortest path between each origin-destination pair, shifting some number of trips to each iteration's shortest path, until the network reaches a certain level of equilibrium – defined as a state in which travelers cannot change to a lower "cost" route (where cost includes monetary and non-monetary (time) expenditures). Several measures of interest are generated by the assignment process, including vehicle miles traveled, delay, and average travel speed.

Please note that MTC maintains two separate estimates of the quantity of vehicle miles traveled (VMT), as follows:

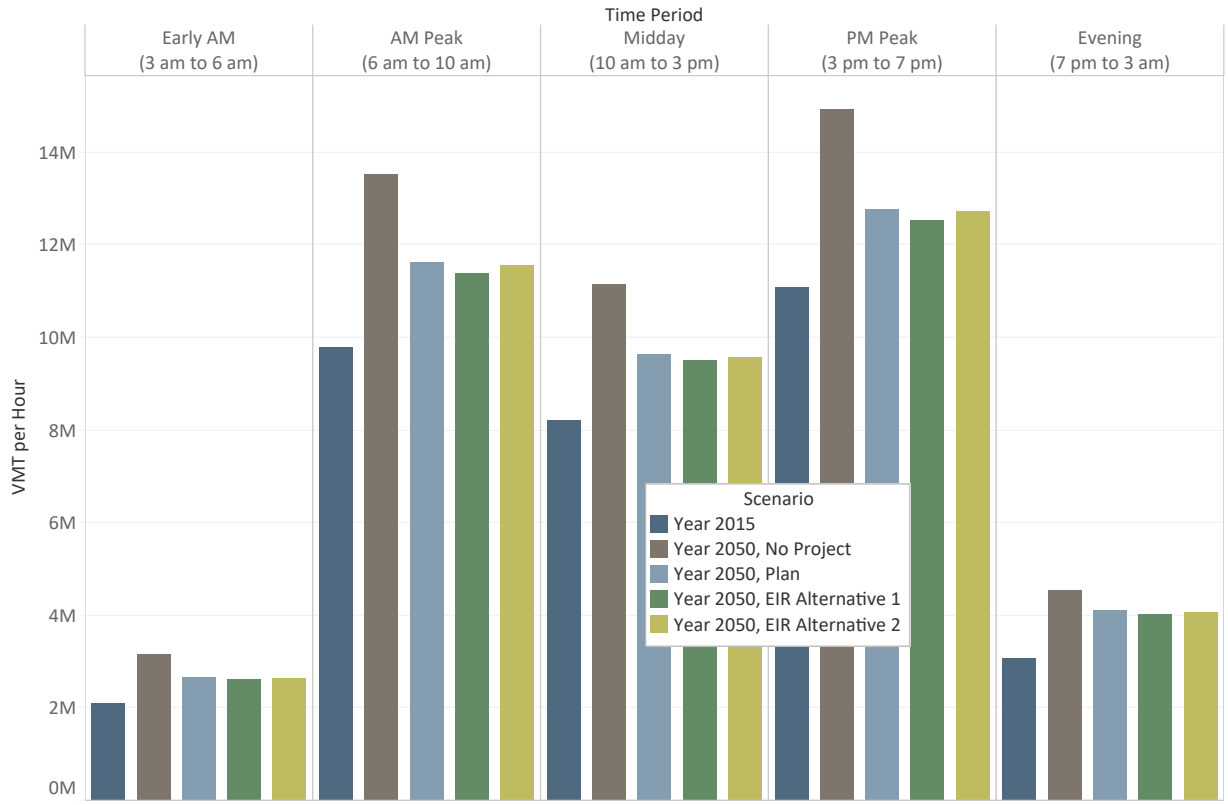
(1) the quantity assigned directly to the highway network; and

(2) the quantity (1) plus so-called "intra-zonal" VMT (i.e., travel that occurs at a geographic scale finer than the travel model's network representation), which is computed off-model

In this document, the VMT identified as (1) in the above list is presented.

Figure 37 first segments VMT into five time periods and then scales the VMT by the number of hours in each time period. The result is the intensity of VMT by time of day as well as the increase in VMT from 2015 to 2050. VMT drops significantly in the 2050 Plan and EIR Alternatives compared to 2050 No Project due to the strategies included in the Plan and EIR Alternatives, including road pricing and the commute trip reduction strategies, strategies to improve jobs/housing balance, and the other strategies included in the plan.

Figure 37. Vehicle miles traveled per hour by time period in 2050 across alternatives



Changes from Draft Forecasting and Modeling Report

Following the release of the Draft Environmental Impact Report and Draft Forecasting and Modeling Report for Plan Bay Area 2050, several assumptions underlying the Travel Modeling process were updated, and the scenarios were re-run. These fixes fell into two categories:

1) updates to modeling assumptions, and

2) network coding refinements for assorted projects to incorporate updated assumptions or correct errors

Additional detail on some of the more major updates is included below.

Refine "workers not working" assumptions

As discussed in the Draft Plan Bay Area 2050 Forecasting and Modeling Report, when staff incorporated updates to the estimate of telecommuters in the No Project scenario, staff applied data from the 2018-2019 Bay Area Transportation Study to estimate what proportion of workers who were not making a work tour (on the model simulation day) were telecommuting versus not going to work (due to alternative work schedules, or taking a vacation, sick or personal day). In reviewing this assumption, staff still considers it an appropriate assumption to apply to the 2015 model base year, but not to carry forward into future years. This is because the telecommute share is expected to rise, but the proportion of workers not going to work is not necessarily expected to change.

Therefore, staff updated the model assumption for future years to assume a fixed share of workers not working on the simulation day based upon the 2015 share: 10.8% of full-time workers and 20.6% of part-time workers. Assumptions about baseline telecommute rate (e.g., the share of workers telecommuting before the EN7 strategy was applied, described in Table 37 in the report) was not changed.

The impact on full-time workers for the No Project model runs is shown below. For the Draft EIR runs, the share of workers not working (in orange) increases slightly over time. With the implementation refinement, this share stays fixed for future years. This refinement affects all future year run, across all alternatives (No Project, Plan, EIR Alternative 1 and EIR Alternative 2).

Figure 38. Workers telecommuting, commuting, and not going to work in the Draft Plan (May 2021)

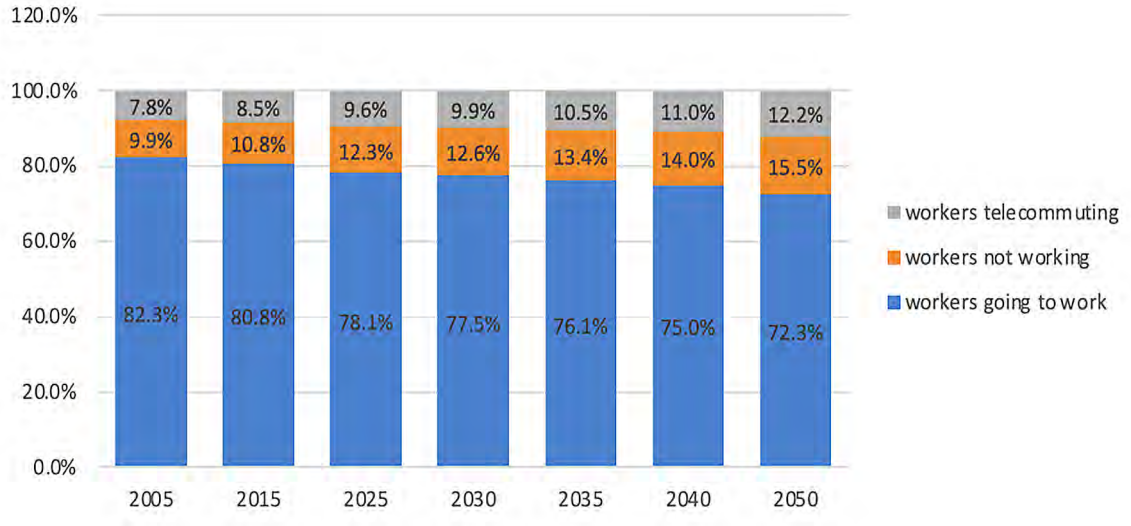
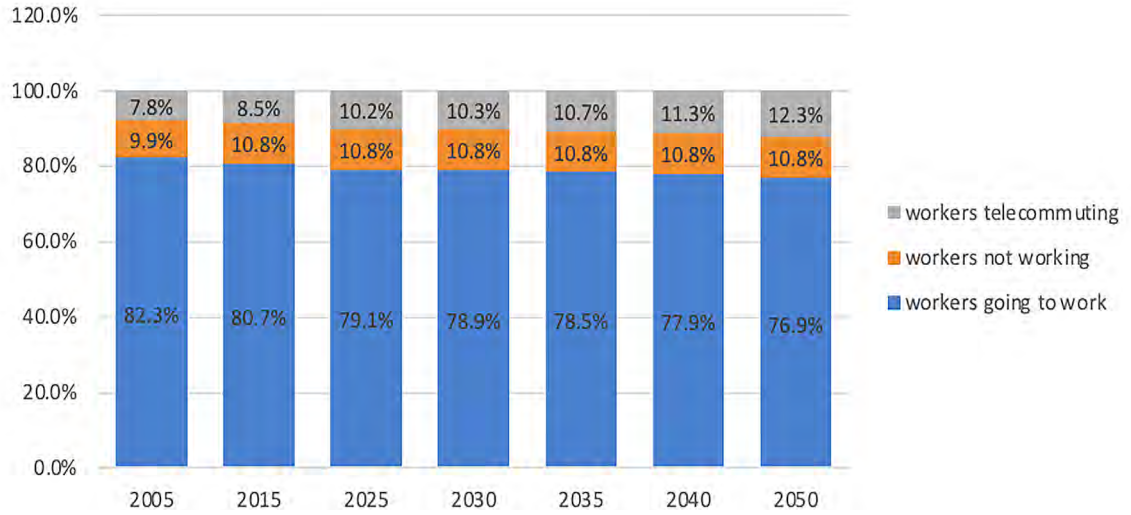


Figure 39. Workers telecommuting, commuting, and not going to work in the Plan (October 2021)



Update Transportation Network Company (TNC) wait time distribution configuration

The TNC wait time mean and standard deviation was reduced slightly in the highest density category. The wait time distribution was updated in the 2035 configuration, but not in the configuration for years after 2035; this omission has been corrected. This change has minor affects in model results because TNC trips represent a small share of trips.

Update Cube software to include fix for link-based fares which are used to represent zone-based express bus fares

For the Draft EIR travel model runs, 64-bit Cube 6.4.4 was used for transit assignment and skimming. This version does not assess link-based fares, which are used to add additional fares to the initial boarding fare when a certain link is traversed in a transit path. Link-based fares are a proxy for zone-based fares for express buses with a zone-based structure. Cube was updated to version 6.4.5, which fixed the bug in which link-based fares were not assessed. This fix had the effect of slightly decreasing express bus ridership for all model runs, but the effects were not significant. Staff verified the 2015 model run's transit ridership output was still valid with this fix.

Fix minor issues in base (2015) network

All the links in the 2015 network were scanned and the following fixes applied: a) reverse links that had different attribute values (distance, facility type, area type, city ID) b) a ramp that should be one-way instead of two-way on SR-4 in Antioch was fixed. Because the future year networks are built on top of the 2015 base network, these fixes affect the 2015 runs as well as all future year runs. However, the errors were all minor and so the effects on model results are likely insignificant.

Update internal/external travel assumptions

Travel Model 1.5 includes a representation of trips representing travel by non-residents who live outside the Bay Area and who drive into or out of the region on the typical simulated model day. For future forecast years, the traffic volumes at these gateway are assumed to be split into commute versus non-commute traffic; the assumed split is based on a comparison of Census Transportation Planning Product 2006-2010 and associated traffic volumes by subregion. For Plan Bay Area 2050, the commute share is not assumed to grow into the future, while the non-commute share of traffic is assumed to grow linearly based on past traffic volumes at the gateway. In 2019, these assumptions were updated slightly to move some forecasted growth between two gateways based on discussion with the neighboring Metropolitan Planning Organization, the Sacramento Area Council of Governments. Some model runs were found to be using the old configuration, and these were fixed. The effect of this fix is a minor change to traffic volumes at these gateways in future years.

Update Vehicle Buyback and Electric Vehicle Incentive initiative assumptions

Discussed in the Off-Model Calculations section, several updates were made to this program, which is part of Strategy, EN8: Expand Clean Vehicle Initiatives. First, the program's funding was increased, from $3.7 billion to $5.1 billion through 2035, incentivizing buyback and purchase of 630,000 electric vehicles (from 462,000 electric vehicles assumed with the lower funding amount). Second, the analysis was updated to assume electric vehicle adoptions are a result of both the regional program and the state's program, the California Clean Vehicle Rebate Project, and greenhouse gas emissions reductions are shared between the programs.

PLAN BAY AREA 2050

APPENDIX 1

PLAN BAY AREA 2050 GROWTH PATTERN

PLAN BAY AREA 2050

PLAN BAY AREA 2050 GROWTH PATTERN

Data tables below summarize the regional, county, and sub-county growth pattern for households and jobs in the Plan Bay Area 2050 Final Blueprint. Jurisdiction-level growth projections are developed solely for the 2023-2031 Regional Housing Needs Allocation (RHNA) process – for more information on RHNA, go to abag.ca.gov.

PROJECTED HOUSEHOLD AND JOB GROWTH, BY COUNTY

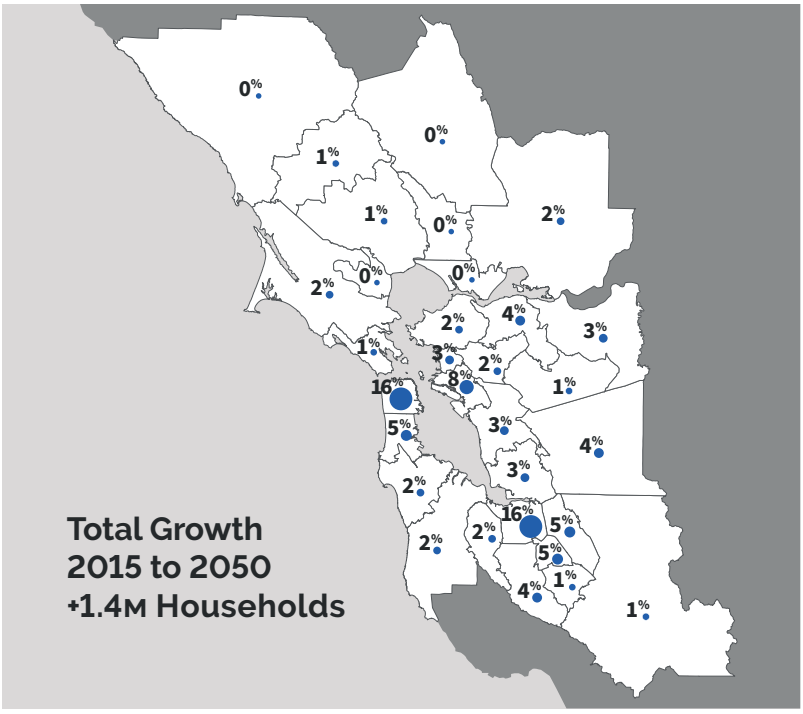
	HOUSEHOLDS					JOBS				
COUNTY	2015	2050	GROWTH	PERCENT GROWTH	SHARE OF REGIONAL GROWTH	2015	2050	GROWTH	PERCENT GROWTH	SHARE OF REGIONAL GROWTH
San Francisco	366,000	578,000	213,000	+58%	16%	682,000	918,000	236,000	+35%	17%
San Mateo	265,000	394,000	129,000	+48%	9%	393,000	507,000	114,000	+29%	8%
Santa Clara	623,000	1,075,000	453,000	+73%	33%	1,099,000	1,610,000	511,000	+46%	36%
Alameda	552,000	847,000	295,000	+54%	22%	867,000	1,182,000	315,000	+36%	22%
Contra Costa	383,000	551,000	169,000	+44%	12%	404,000	534,000	130,000	+32%	9%
Solano	142,000	177,000	35,000	+24%	3%	132,000	201,000	69,000	+53%	5%
Napa	50,000	56,000	5,000	+10%	0%	72,000	87,000	15,000	+21%	1%
Sonoma	188,000	220,000	32,000	+17%	2%	221,000	251,000	30,000	+14%	2%
Marin	109,000	146,000	37,000	+34%	3%	135,000	116,000	–19,000	–14%	–1%
REGION	2,677,000	4,043,000	1,367,000	+51%	100%	4,005,000	5,408,000	1,403,000	+35%	100%

Numbers may not always sum to 100% due to rounding.

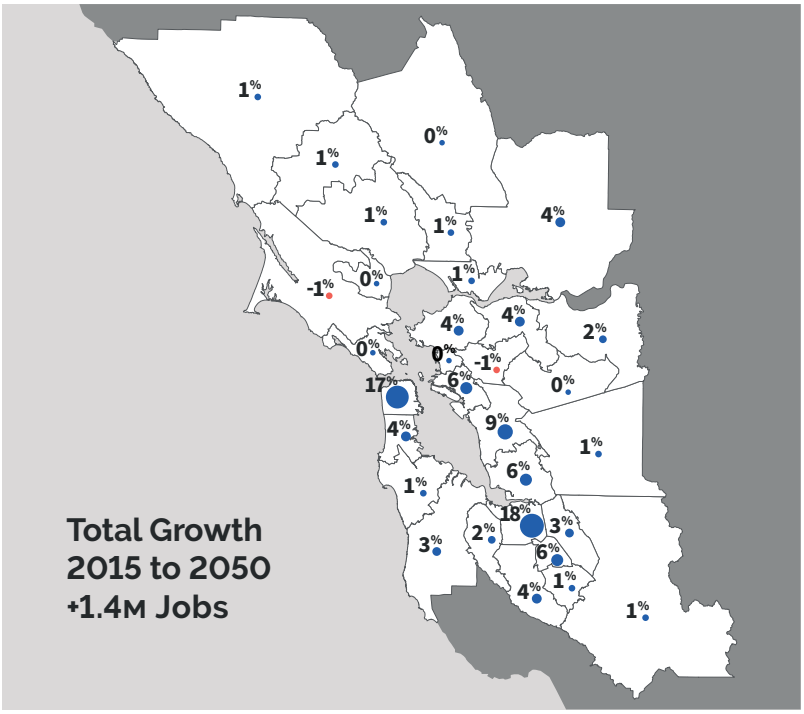
PLAN BAY AREA 2050

PLAN BAY AREA 2050 GROWTH PATTERN

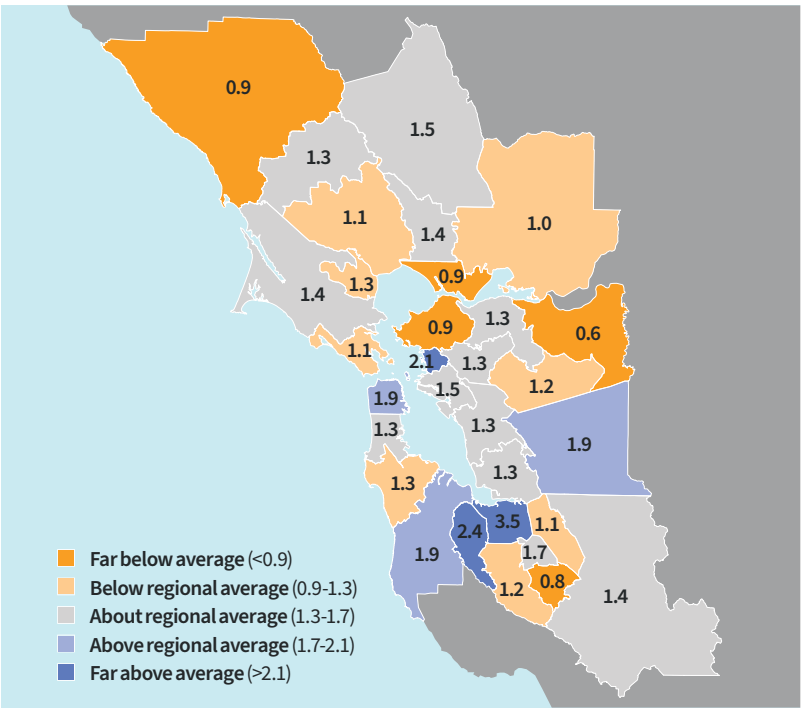
Housing Growth between 2015-2050
(as a Share of Region's Growth)



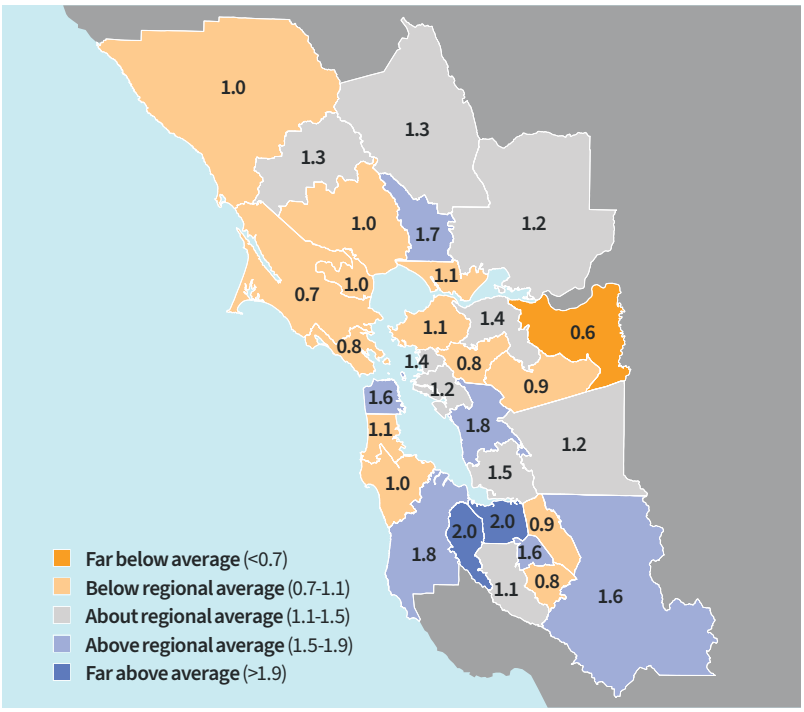
Job Growth between 2015-2050
(as a Share of Region's Growth)



Jobs/Housing Ratio 2015
(Region-Wide Average: 1.5)



Jobs/Housing Ratio 2050
(Region-Wide Average: 1.3)



The nine-county Bay Area is divided into 34 subcounty areas, called "superdistricts." Superdistricts are combinations of cities, towns and unincorporated areas that allow the public to see the more localized growth pattern in Plan Bay Area 2050. More information on the superdistricts can be found in the layer documentation.

PLAN BAY AREA 2050 GROWTH PATTERN

PROJECTED HOUSEHOLD AND JOB GROWTH, BY SUPERDISTRICT

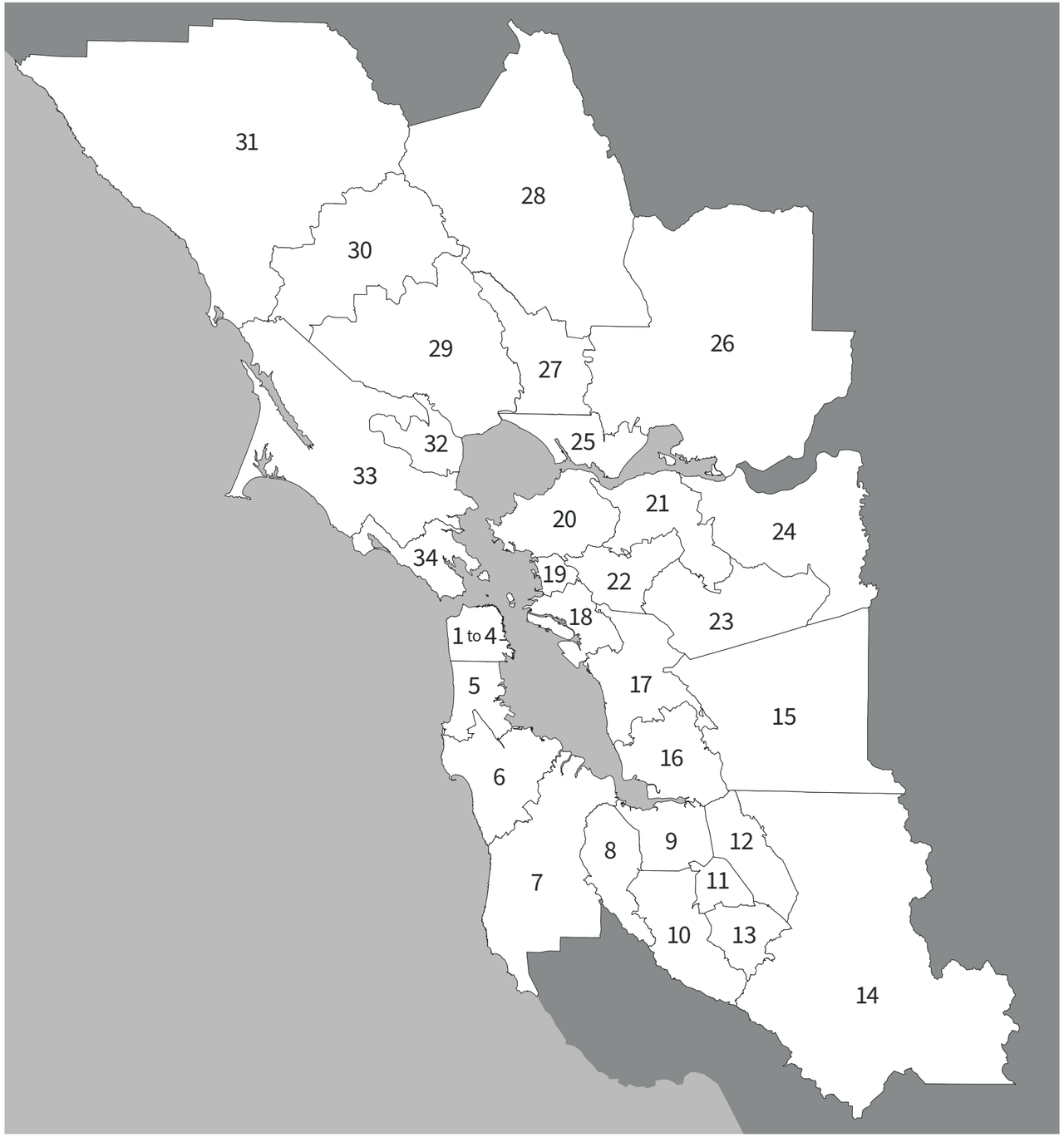
			HOUSEHOLDS					JOBS				
COUNTY	SUPER-DISTRICT	SUPERDISTRICT NAME	2015	2050	GROWTH	PERCENT GROWTH	SHARE OF REGIONAL GROWTH	2015	2050	GROWTH	PERCENT GROWTH	SHARE OF REGIONAL GROWTH
San Francisco	1 to 4	San Francisco County (Combined)	366,000	578,000	213,000	+58%	16%	682,000	918,000	236,000	+35%	17%
San Mateo	5	North San Mateo County	98,000	166,000	69,000	+70%	5%	130,000	188,000	58,000	+44%	4%
	6	Central San Mateo County	87,000	121,000	34,000	+39%	2%	110,000	123,000	13,000	+12%	1%
	7	South San Mateo County	80,000	106,000	26,000	+32%	2%	152,000	196,000	44,000	+29%	3%
Santa Clara	8	Northwest Santa Clara County	74,000	102,000	28,000	+38%	2%	180,000	207,000	27,000	+15%	2%
	9	North Santa Clara County	107,000	320,000	212,000	+199%	16%	370,000	629,000	259,000	+70%	18%
	10	West Santa Clara County	121,000	172,000	51,000	+42%	4%	145,000	197,000	52,000	+36%	4%
	11	Central Santa Clara County	105,000	168,000	63,000	+60%	5%	178,000	263,000	86,000	+48%	6%
	12	East Santa Clara County	108,000	180,000	72,000	+67%	5%	121,000	170,000	49,000	+40%	3%
	13	Central South Santa Clara County	73,000	91,000	18,000	+25%	1%	57,000	77,000	21,000	+36%	1%
	14	South Santa Clara County	35,000	43,000	8,000	+24%	1%	49,000	68,000	18,000	+37%	1%
Alameda	15	East Alameda County	72,000	132,000	60,000	+82%	4%	138,000	156,000	18,000	+13%	1%
	16	South Alameda County	105,000	152,000	47,000	+45%	3%	142,000	221,000	79,000	+56%	6%
	17	Central Alameda County	120,000	160,000	40,000	+33%	3%	157,000	285,000	128,000	+82%	9%
	18	North Alameda County	181,000	287,000	107,000	+59%	8%	275,000	358,000	83,000	+30%	6%
	19	Northwest Alameda County	73,000	115,000	42,000	+57%	3%	155,000	162,000	7,000	+5%	0%
Contra Costa	20	West Contra Costa County	89,000	123,000	34,000	+38%	2%	79,000	132,000	52,000	+66%	4%
	21	North Contra Costa County	85,000	134,000	49,000	+58%	4%	121,000	184,000	63,000	+52%	4%
	22	Central Contra Costa County	60,000	89,000	28,000	+47%	2%	81,000	74,000	-7,000	–9%	-1%
	23	South Contra Costa County	55,000	70,000	15,000	+28%	1%	66,000	60,000	-6,000	–9%	0%
	24	East Contra Costa County	94,000	136,000	42,000	+45%	3%	56,000	84,000	28,000	+51%	2%
Solano	25	South Solano County	53,000	57,000	5,000	+9%	0%	45,000	62,000	17,000	+37%	1%
	26	North Solano County	89,000	119,000	30,000	+34%	2%	87,000	139,000	53,000	+61%	4%
Napa	27	South Napa County	34,000	40,000	5,000	+15%	0%	48,000	66,000	19,000	+39%	1%
	28	North Napa County	16,000	16,000	0	+1%	0%	24,000	20,000	-3,000	–14%	0%
Sonoma	29	South Sonoma County	64,000	83,000	19,000	+30%	1%	72,000	80,000	8,000	+11%	1%
	30	Central Sonoma County	88,000	98,000	10,000	+11%	1%	118,000	131,000	14,000	+12%	1%
	31	North Sonoma County	36,000	39,000	3,000	+9%	0%	31,000	40,000	9,000	+28%	1%
Marin	32	North Marin County	23,000	30,000	7,000	+28%	0%	29,000	29,000	0	+0%	0%
	33	Central Marin County	44,000	66,000	22,000	+50%	2%	63,000	49,000	–14,000	–23%	–1%
	34	South Marin County	41,000	50,000	9,000	+21%	1%	44,000	40,000	–4,000	–10%	0%
REGION			2,677,000	4,043,000	1,367,000	+51%	100%	4,005,000	5,408,000	1,403,000	+35%	100%

Numbers may not always sum to 100% due to rounding.

PLAN BAY AREA 2050

PLAN BAY AREA 2050 GROWTH PATTERN

REGIONAL MAP – SUPERDISTRICTS



SUPER-DISTRICT	COUNTY	SUPERDISTRICT NAME	PRIMARY JURISDICTIONS INCLUDED IN SUPERDISTRICT
1 to 4	San Francisco	San Francisco County (Combined)	San Francisco
5	San Mateo	North San Mateo County	Brisbane, Colma, Daly City, Pacifica, South San Francisco, Millbrae, San Bruno, Burlingame (partial)
6	San Mateo	Central San Mateo County	Half Moon Bay, Hillsborough, San Mateo, Foster City, Belmont, Burlingame (partial)
7	San Mateo	South San Mateo County	Atherton, Menlo Park, Redwood City, Woodside, East Palo Alto, Portola Valley, San Carlos
8	Santa Clara	Northwest Santa Clara County	Los Altos Hills, Los Altos, Palo Alto (partial), Mountain View (partial)
9	Santa Clara	North Santa Clara County	Sunnyvale, Santa Clara (partial), Mountain View (partial), Milpitas (partial), San Jose (partial), Palo Alto (partial)
10	Santa Clara	West Santa Clara County	Los Gatos, Monte Sereno, Saratoga, Cupertino, Campbell (partial), Santa Clara (partial)
11	Santa Clara	Central Santa Clara County	Campbell (partial), San Jose (partial)
12	Santa Clara	East Santa Clara County	Milpitas (partial), San Jose (partial)
13	Santa Clara	Central South Santa Clara County	San Jose (partial)
14	Santa Clara	South Santa Clara County	Gilroy, Morgan Hill, San Jose (partial)
15	Alameda	East Alameda County	Dublin, Livermore, Pleasanton
16	Alameda	South Alameda County	Newark, Fremont, Union City
17	Alameda	Central Alameda County	San Leandro, Hayward
18	Alameda	North Alameda County	Alameda, Piedmont, Oakland
19	Alameda	Northwest Alameda County	Albany, Berkeley, Emeryville
20	Contra Costa	West Contra Costa County	El Cerrito, Hercules, Pinole, Richmond, San Pablo
21	Contra Costa	North Contra Costa County	Clayton, Pleasant Hill, Concord, Martinez, Lafayette (partial), Pittsburg (partial)
22	Contra Costa	Central Contra Costa County	Moraga, Orinda, Walnut Creek (partial), Lafayette (partial)
23	Contra Costa	South Contra Costa County	Danville, San Ramon, Walnut Creek (partial)
24	Contra Costa	East Contra Costa County	Antioch, Brentwood, Oakley, Pittsburg (partial)
25	Solano	South Solano County	Benicia, Vallejo
26	Solano	North Solano County	Dixon, Fairfield, Rio Vista, Suisun City, Vacaville
27	Napa	South Napa County	American Canyon, Napa
28	Napa	North Napa County	Calistoga, St. Helena, Yountville
29	Sonoma	South Sonoma County	Cotati, Petaluma, Sonoma, Rohnert Park
30	Sonoma	Central Sonoma County	Santa Rosa, Sebastopol
31	Sonoma	North Sonoma County	Cloverdale, Healdsburg, Windsor
32	Marin	North Marin County	Novato
33	Marin	Central Marin County	Fairfax, San Anselmo, San Rafael, Ross
34	Marin	South Marin County	Belvedere, Corte Madera, Mill Valley, Sausalito, Tiburon, Larkspur

Unincorporated areas included in most superdistricts outside San Francisco. Small overlap zones, representing less than 10% of any city's size, are not shown for clarity.

Metropolitan Transportation Commission and Association of Bay Area Governments

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Appendix E

TCM A: Regional Express Bus

Regional Express Bus Program

Vehicle Deployment Throughout the Bay Area[1]

February 18, 2009

Transit Operator	Vehicle Type	Serial Registration[2]	Funds Obligated	Operating Agency	Route	Weekday Service Hours	Weekend Service Hours
AC Transit[3]	Over-The-Road	1M8PDMPA43P055640	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPA63P055641	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPA83P055642	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPAX3P055643	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	IM8PDMPA33P055645	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPA53P055646	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPA73P055647	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPA93P055648	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPA73P055650	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPA93P055621	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPA03P055652	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPA23P055653	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPA43P055654	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPA63P055655	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPAX3P055657	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPA13P055658	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPA33P055659	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPAX3P055660	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPA13P055661	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	IM8PDMPA73P055664	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	IM8PDMPA83P055656	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	IM8PDMPA03P055666	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	IM8PDMPA93P055665	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	IM8PDMPA53P055663	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	IM8PDMPA33P055662	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	IM8PDMPA23P055667	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	IM8PDMPA03P055649	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPAX3P055674	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPA43P055668	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	IM8PDMPA63P055669	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPA23P055670	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPA43P055671	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPA63P055672	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	IM8PDMPA83P055673	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPA33P055676	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPA53P055677	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	IM8PDMPA73P055678	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPA93P055679	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Over-The-Road	1M8PDMPA13P055675	3/25/2001	AC Transit	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Suburban	15GCD201531111916	1/27/2003	AC Transit - Transferred from SamTrans[4]	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Suburban	15GCD201731111917	1/27/2003	AC Transit - Transferred from SamTrans[4]	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Suburban	15GCD201931111918	1/27/2003	AC Transit - Transferred from SamTrans[4]	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
	Suburban	15GCD201031111919	1/27/2003	AC Transit - Transferred from SamTrans[4]	Transbay - Bay, San Mateo, and Dumbarton Bridges	5:00 AM - 12:45 AM	5:30 AM - 12:50 AM
CCCTA	Suburban	15GDD271X21111662	3/25/2002	CCCTA	960B & 960C Mitchell Drive Park & Ride/Bishop Ranch	**960B** 5:15 AM - 7:51 PM **960C** 6:15 AM - 7:50 PM	
	Suburban	15GDD271X21111663	3/25/2002	CCCTA	960B & 960C Mitchell Drive Park & Ride/Bishop Ranch	**960B** 5:15 AM - 7:51 PM **960C** 6:15 AM - 7:50 PM	
	Suburban	15GDD271X21111664	3/25/2002	CCCTA	960B & 960C Mitchell Drive Park & Ride/Bishop Ranch	**960B** 5:15 AM - 7:51 PM **960C** 6:15 AM - 7:50 PM	
	Suburban	15GDD271X21111665	3/25/2002	CCCTA	960B & 960C Mitchell Drive Park & Ride/Bishop Ranch	**960B** 5:15 AM - 7:51 PM **960C** 6:15 AM - 7:50 PM	
	Suburban	15GDD271X21111666	3/25/2002	CCCTA	960B & 960C Mitchell Drive Park & Ride/Bishop Ranch	**960B** 5:15 AM - 7:51 PM **960C** 6:15 AM - 7:50 PM	
	Suburban	15GDD271X21111667	3/25/2002	CCCTA	960B & 960C Mitchell Drive Park & Ride/Bishop Ranch	**960B** 5:15 AM - 7:51 PM **960C** 6:15 AM - 7:50 PM	
	Suburban	15GDD271X21111668	3/25/2002	CCCTA	960B & 960C Mitchell Drive Park & Ride/Bishop Ranch	**960B** 5:15 AM - 7:51 PM **960C** 6:15 AM - 7:50 PM	
	Suburban	15GDD271X21111669	3/25/2002	CCCTA	960B & 960C Mitchell Drive Park & Ride/Bishop Ranch	**960B** 5:15 AM - 7:51 PM **960C** 6:15 AM - 7:50 PM	
	Suburban	15GDD271X21111670	3/25/2002	CCCTA	960B & 960C Mitchell Drive Park & Ride/Bishop Ranch	**960B** 5:15 AM - 7:51 PM **960C** 6:15 AM - 7:50 PM	
	Suburban	15GDD271X21111671	3/25/2002	CCCTA	960B & 960C Mitchell Drive Park & Ride/Bishop Ranch	**960B** 5:15 AM - 7:51 PM **960C** 6:15 AM - 7:50 PM	
	Suburban	15GDD271X21111672	3/25/2002	CCCTA	960B & 960C Mitchell Drive Park & Ride/Bishop Ranch	**960B** 5:15 AM - 7:51 PM **960C** 6:15 AM - 7:50 PM	
	Suburban	15GDD271X21111673	3/25/2002	CCCTA	960B & 960C Mitchell Drive Park & Ride/Bishop Ranch	**960B** 5:15 AM - 7:51 PM **960C** 6:15 AM - 7:50 PM	
	Suburban	15GDD271X21111674	3/25/2002	CCCTA	960B & 960C Mitchell Drive Park & Ride/Bishop Ranch	**960B** 5:15 AM - 7:51 PM **960C** 6:15 AM - 7:50 PM	

TCM A: Regional Express Bus

Regional Express Bus Program

Vehicle Deployment Throughout the Bay Area[1]

February 18, 2009

Transit Operator	Vehicle Type	Serial Registration[2]	Funds Obligated	Operating Agency	Route	Weekday Service Hours	Weekend Service Hours
Fairfield-Suisun	Over-The-Road	1M8PDMPA13P055949	11/14/2002	Fairfield-Suisun	40 Vacaville/Fairfield to Pleasant Hill/Walnut Creek BART	5:00 AM - 9:57 AM & 3:01 PM - 8:31 PM	
	Over-The-Road	1M8PDMPA83P055950	11/14/2002	Fairfield-Suisun	40 Vacaville/Fairfield to Pleasant Hill/Walnut Creek BART	5:00 AM - 9:57 AM & 3:01 PM - 8:31 PM	
	Suburban	15GCD201731111920	1/27/2003	Fairfield-Suisun - Transferred from SamTrans[4]	30 Fairfield to Davis/Sacramento	6:08 AM - 7:05 PM	Sat Only 8:03 AM - 4:43 PM
	Suburban	15CGD201931111921	1/27/2003	Fairfield-Suisun - Transferred from SamTrans[4]	30 Fairfield to Davis/Sacramento	6:08 AM - 7:05 PM	Sat Only 8:03 AM - 4:43 PM
Golden Gate	Over-The-Road	1M8PDMPA53PO55680	11/8/2002	Golden Gate	71 Novato/San Rafael/Marin City/San Francisco	6:35 AM - 8:27 PM	Sat Only 6:59 AM - 7:28 PM
	Over-The-Road	1M8PDMPA73PO55681	11/8/2002	Golden Gate	71 Novato/San Rafael/Marin City/San Francisco	6:35 AM - 8:27 PM	Sat Only 6:59 AM - 7:28 PM
	Over-The-Road	1M8PDMPA93PO55682	11/8/2002	Golden Gate	72 Santa Rosa/Rohnert Park/Cotati/San Francisco	3:54 AM - 8:59 AM & 2:12 PM - 8:05 PM	
	Over-The-Road	1M8PDMPAO3PO55683	11/8/2002	Golden Gate	72 Santa Rosa/Rohnert Park/Cotati/San Francisco	3:54 AM - 8:59 AM & 2:12 PM - 8:05 PM	
	Over-The-Road	1M8PDMPA23PO55684	11/8/2002	Golden Gate	75 Santa Rosa/Rohnert Park/Cotati · Petaluma /Marin Civic Center/San Rafael	5:02 AM - 8:35 AM & 2:59 PM - 7:18 PM	
	Over-The-Road	1M8PDMPA43PO55685	11/8/2002	Golden Gate	75 Santa Rosa/Rohnert Park/Cotati · Petaluma /Marin Civic Center/San Rafael	5:02 AM - 8:35 AM & 2:59 PM - 7:18 PM	
LAVTA	Suburban	15GDD271521110872	3/25/2002	LAVTA	70X Pleasanton - Walnut Creek Express	5:09 AM - 9:16 AM & 3:19 PM - 7:42 PM	
	Suburban	15GDD271721110873	3/25/2002	LAVTA	70X Pleasanton - Walnut Creek Express	5:09 AM - 9:16 AM & 3:19 PM - 7:42 PM	
	Suburban	15GDD271921110874	3/25/2002	LAVTA	70X Pleasanton - Walnut Creek Express	5:09 AM - 9:16 AM & 3:19 PM - 7:42 PM	
	Suburban	15GDD271021110875	3/25/2002	LAVTA	70X Pleasanton - Walnut Creek Express	5:09 AM - 9:16 AM & 3:19 PM - 7:42 PM	
NCTPA	Suburban	15GCD201631111911	1/27/2003	SamTrans Transfering to NCPTA on 2/28/09	June 2009 - Calistoga/Yountville/Napa/American Canyon/Baylink Ferry Terminal	5:00 AM-6:30 PM; Peak Only	
	Suburban	15GCD201831111912	1/27/2003	SamTrans Transfering to NCPTA on 2/28/09	June 2009 - Calistoga/Yountville/Napa/American Canyon/Baylink Ferry Terminal	5:00 AM-6:30 PM; Peak Only	
Tri-Delta	Over-The-Road	1M8PDMPA63P055686	11/8/2002	Tri-Delta	300 Express Commuter Service Brentwood/Pittsburg BART	4:15 AM - 9:07 PM	
	Over-The-Road	1M8PDMPA63P055687	11/8/2002	Tri-Delta	300 Express Commuter Service Brentwood/Pittsburg BART	4:15 AM - 9:07 PM	
	Over-The-Road	1M8PDMPA63P055688	11/8/2002	Tri-Delta	300 Express Commuter Service Brentwood/Pittsburg BART	4:15 AM - 9:07 PM	
	Over-The-Road	1M8PDMPA63P055689	11/8/2002	Tri-Delta	300 Express Commuter Service Brentwood/Pittsburg BART	4:15 AM - 9:07 PM	
Vallejo	Over-The-Road	1M8PDMPA13P055627	11/14/2002	Leased to Fairfield-Suisun[5]	90 Fairfield/El Cerrito Del Norte BART	4:55 AM - 10:35 PM	
	Over-The-Road	1M8PDMPA33P055628	11/14/2002	Leased to Fairfield-Suisun[5]	90 Fairfield/El Cerrito Del Norte BART	4:55 AM - 10:35 PM	
	Over-The-Road	1M8PDMPA53P055629	11/14/2002	Vallejo	78 Vallejo/Benicia/Pleasant Hill BART/Walnut Creek BART	5:00 AM - 8:38 PM	
	Over-The-Road	1M8PDMPA13P055630	11/14/2002	Leased to Fairfield-Suisun[5]	90 Fairfield/El Cerrito Del Norte BART	4:55 AM - 10:35 PM	
	Over-The-Road	1M8PDMPA33P055631	11/14/2002	Leased to Fairfield-Suisun[5]	90 Fairfield/El Cerrito Del Norte BART	4:55 AM - 10:35 PM	
	Over-The-Road	1M8PDMPA53P055632	11/14/2002	Vallejo	78 Vallejo/Benicia/Pleasant Hill BART/Walnut Creek BART	5:00 AM - 8:38 PM	
	Over-The-Road	1M8PDMPA73P055633	11/14/2002	Vallejo	78 Vallejo/Benicia/Pleasant Hill BART/Walnut Creek BART	5:00 AM - 8:38 PM	
	Over-The-Road	1M8PDMPA93P055634	11/14/2002	Vallejo	78 Vallejo/Benicia/Pleasant Hill BART/Walnut Creek BART	5:00 AM - 8:38 PM	
	Over-The-Road	1M8PDMPA03P055635	11/14/2002	Vallejo	78 Vallejo/Benicia/Pleasant Hill BART/Walnut Creek BART	5:00 AM - 8:38 PM	
	Over-The-Road	1M8PDMPA23P055636	11/14/2002	Leased to Fairfield-Suisun[5]	90 Fairfield/El Cerrito Del Norte BART	4:55 AM - 10:35 PM	
	Over-The-Road	1M8PDMPA43P055637	11/14/2002	Leased to Fairfield-Suisun[5]	90 Fairfield/El Cerrito Del Norte BART	4:55 AM - 10:35 PM	
	Over-The-Road	1M8PDMPA83P055639	11/14/2002	Leased to Fairfield-Suisun[5]	90 Fairfield/El Cerrito Del Norte BART	4:55 AM - 10:35 PM	
WestCat	Suburban	15GCD211121111974	3/7/2002	WestCat	30Z Hercules Transit Center/Martinez/BART	5:59 AM - 8:03 PM	
	Suburban	15GCD211521111975	3/7/2002	WestCat	30Z Hercules Transit Center/Martinez/BART	5:59 AM - 8:03 PM	
	Suburban	15GCD211121111976	3/7/2002	WestCat	30Z Hercules Transit Center/Martinez/BART	5:59 AM - 8:03 PM	
	Suburban	15GCD201X31111913	1/27/2003	WestCat - Transferred from SamTrans[4]	LYNX Rodeo/Hercules/San Francisco Transbay Terminal	5:00 AM - 9:45 AM & 3:30 PM - 8:33 PM	
	Suburban	15GCD201131111914	1/27/2003	WestCat - Transferred from SamTrans[4]	LYNX Rodeo/Hercules/San Francisco Transbay Terminal	5:00 AM - 9:45 AM & 3:30 PM - 8:33 PM	
	Suburban	15GCD201331111915	1/27/2003	SamTrans[4]	LYNX Rodeo/Hercules/San Francisco Transbay Terminal	5:00 AM - 9:45 AM & 3:30 PM - 8:33 PM	

1. Please note: MTC does not currently have information compiled on cumulative operating hours for all of the TCRP buses. For projects where the buses have been assigned to routes receiving operating funds that are tied to required performance measures, MTC has data compiled on the annual performance of those routes.
2. Each vehicle may be deployed on any of the approved routes listed for each operator.
3. Vehicles are deployed as needed for various routes on weekdays and weekends. All transbay service does not operate on weekends, but all vehicles may be deployed on weekend transbay service.
4. SamTrans REX service was discontinued in 2007 due to low ridership; all 11 TCRP vehicles purchased for the REX service were reallocated to AC Transit, Fairfield-Suisun Transit, WestCat, and NCTPA.
5. Route 90 service was transferred from Vallejo to Fairfield-Suisun Transit in 2006.

TCM B: Bicycle/Pedestrian Program
TDA ARTICLE 3 [Transportation Development Act Funds for Bicycle and Pedestrian Projects]

	SPONSOR	PROJECT NAME	AMOUNT
FY 2003-04	Alameda County	ADA Compliant Accessible Ramps	$ 105,767
FY 2003-04	Alameda County	Tesla Road Bicycle Lanes	$ 51,000
FY 2003-04	City of Albany	Manor Way Pedestrian Improvements	$ 22,706
FY 2003-04	City of Berkeley	Bicycle Safety Education	$ 30,000
FY 2003-04	City of Berkeley	Prepare plan for implementing future	$ 31,033
FY 2003-04	City of Fremont	Bike Detectors, Bike Logo on Pavement,	$ 128,989
FY 2003-04	City of Hayward	Installation of Wheelchair Ramps	$ 84,198
FY 2003-04	City of Livermore	Complete Portion of S. Livermore Valley	$ 97,301
FY 2003-04	City of Newark	Silliman Activity Center Pedestrian/	$ 59,158
FY 2003-04	City of Oakland	Bancroft Ave. Bike Lanes (96th - Durant)	$ 96,000
FY 2003-04	City of Oakland	Citywide Ped. Curb Ramp Program -	$ 295,266
FY 2003-04	City of Oakland	Lake Merritt 12th St. Dam Ped/Bike	$ 116,000
FY 2003-04	City of Oakland	Pedestrian Bulb Outs-Highland &	$ 100,000
FY 2003-04	City of Oakland	Walk/Bike Calif. Conf. - Alameda Co.	$ 30,000
FY 2003-04	City of Oakland	West City of Oakland Bay Trail	$ 289,000
FY 2003-04	City of Piedmont	Sidewalk Extension and Curb Cuts	$ 6,506
FY 2003-04	City of Pleasanton	ADA Compliant Wheelchair Accessible	$ 38,627
FY 2003-04	City of San Leandro	Install New Curb Cuts & Upgrade	$ 40,000
FY 2003-04	City of Brentwood	Installation of Wheelchair Ramps	$ 30,000
FY 2003-04	City of Concord	Iron Horse Trail Rte 242 Undercrossing	$ 36,000
FY 2003-04	City of Concord	Wren Avenue Ped. Improvements	$ 45,000
FY 2003-04	Contra Costa County	Bicycle/Pedestrian Safety Education	$ 21,500
FY 2003-04	Contra Costa County	Olympic Blvd. Ped. Path Phase II	$ 115,000
FY 2003-04	City of Lafayette	Hough Avenue Sidewalk	$ 37,000
FY 2003-04	City of Moraga	Rheem Blvd./Moraga Rd. Intersection	$ 66,100
FY 2003-04	City of Pittsburg	Polaris Drive Bike Facility	$ 77,500
FY 2003-04	City of San Ramon	Dougherty Road Sidewalk	$ 25,000
FY 2003-04	Marin County	Bicycle/Pedestrian Bridge	$ 140,000
FY 2003-04	Mill Valley	Signage Project	$ 7,200
FY 2003-04	City of Novato	Commuter Bikeway Connection	$ 402,286
FY 2003-04	City of Novato	Hill Road Path Connection	$ 60,000
FY 2003-04	City of San Anselmo	Purchase & Install Bicycle Racks	$ 15,000
FY 2003-04	Napa County	Yountville Cross Rd. Bike Lane	$ 150,000
FY 2003-04	Yountville	Yountville Cross Rd. Bike Lane	$ 47,000
FY 2003-04	City of Campbell	Westmont Ave. Improvement Project	$ 43,192
FY 2003-04	City of Los Altos	Fremont Ave. Sidewalk Phase III	$ 15,781
FY 2003-04	Los Altos Hills	Paseo Del Roble Pedestrian Bridge	$ 9,554
FY 2003-04	City of Milpitas	Calaveras Blvd. Sidewalk & Bike Path	$ 36,895
FY 2003-04	Mountain View	Access Ramp Installation	$ 24,905
FY 2003-04	Mountain View	Audible Ped. Signal Installations	$ 16,500
FY 2003-04	Mountain View	Bicycle Path Construction	$ 13,113
FY 2003-04	Palo Alto	Baffle Replacements: Calif. Ave.	$ 15,993
FY 2003-04	Palo Alto	Homer Ave. Ped. Bicycle Undercrossing	$ 293,000
FY 2003-04	Palo Alto	Ped. Walkway Lighted Warning System	$ 20,000
FY 2003-04	City of San Jose	ADA Wheel Chair Curb & Ramp Install.	$ 100,000
FY 2003-04	City of San Jose	Certified TDA Fiscal Audit	$ 9,000
FY 2003-04	City of San Jose	Murdock Park Bridge over San Tomas	$ 100,000
FY 2003-04	City of San Jose	Ped & Bike Facility Signing & Striping	$ 100,000
FY 2003-04	City of San Jose	Ped & Bike Safety Education	$ 50,000
FY 2003-04	City of San Jose	Pedro Street Sidewalk Improvement	$ 124,434
FY 2003-04	City of San Jose	Street Sidewalk Improvement	$ 147,435
FY 2003-04	City of Santa Clara	Certified TDA Fiscal Audit	$ 5,000
FY 2003-04	City of Santa Clara	Install Bike & Ped. Improvements	$ 61,815
FY 2003-04	City of Santa Clara	Update City's Existing Bike Plan &	$ 3,900
FY 2003-04	Santa Clara County	Bike Detector @ various Intersections	$ 58,118

TCM B: Bicycle/Pedestrian Program
TDA ARTICLE 3 [Transportation Development Act Funds for Bicycle and Pedestrian Projects]

	SPONSOR	PROJECT NAME	AMOUNT
FY 2003-04	Santa Clara County	Path along McKee Rd. bet Staples Ave.	$ 50,000
FY 2003-04	City of Saratoga	Saratoga Avenue Walkway Project	$ 17,254
FY 2003-04	City of Sunnyvale	Calabazas Creek Trail	$ 50,152
FY 2003-04	San Francisco City and County	Bicycle Projects	$ 404,000
FY 2003-04	San Francisco City and County	Pedestrian Projects	$ 300,000
FY 2003-04	City of Half Moon Bay	Construct Rt. 92 Bicycle Lanes and	$ 485,146
FY 2003-04	City of Pacifica	Milagra Drive Overcrossing at State	$ 240,000
FY 2003-04	City of San Bruno	Crystal Springs Rd. Traffic Signal	$ 20,000
FY 2003-04	City of San Mateo	Bikeway Detection Units	$ 30,000
FY 2003-04	City of San Mateo	Regional Bayfront Trail Upgrade	$ 150,000
FY 2003-04	South San Francisco	Construct San Francisco Bay Trail	$ 100,000
FY 2003-04	South San Francisco	Orange Avenue Intersection Improve.	$ 100,000
FY 2003-04	City of Benicia	Park Road Bike/Ped Improvements	$ 160,000
FY 2003-04	Solano County	Dixon to Davis Bike Route	$ 125,000
FY 2003-04	City of Suisun City	Central County Bikeway	$ 25,000
FY 2003-04	City of Healdsburg	Foss Creek Northwestern Pacific Multi-	$ 99,695
FY 2003-04	City of Petaluma	Washington Creek Multi-Use Path	$ 175,000
FY 2003-04	City of Santa Rosa	Sonoma Ave. Bike Lanes Phase II	$ 50,000
FY 2003-04	Sonoma County	Old Redwood Highway Class II Bike Lanes	$ 350,000
FY 2004-05	Alameda County	Conduct a planning study & develop	$ 38,000
FY 2004-05	Alameda County	Conduct bicycle plan study	$ 59,650
FY 2004-05	Alameda County	Sign & stripe 0.6 miles of 6-foot wide	$ 100,000
FY 2004-05	City of Berkeley	Contract with a qualified consultant	$ 34,281
FY 2004-05	City of Berkeley	Educate children about bicycle safety	$ 30,000
FY 2004-05	City of Fremont	Stripe bike lanes, modify bike lane	$ 121,168
FY 2004-05	City of Hayward	Design & construct ADA wheel chair	$ 88,925
FY 2004-05	City of Newark	Design & construct ADA wheel chair	$ 27,009
FY 2004-05	City of Piedmont	Design & construct ADA wheel chair	$ 6,852
FY 2004-05	City of Pleasanton	Preserve Golf Course	$ 75,000
FY 2004-05	City of San Leandro	Install curb ramps, accessible ped.	$ 41,438
FY 2004-05	City of San Leandro	Install curb ramps, accessible ped.	$ 50,024
FY 2004-05	City of San Leandro	Install curb ramps, accessible ped.	$ 8,000
FY 2004-05	City of Antioch	Improve curbs, ramps, crosswalk, signs	$ 80,000
FY 2004-05	City of Brentwood	Install lighted crosswalk and flashing lights	$ 31,500
FY 2004-05	City of Concord	Construct 500 ft of 4-to 6-foot wide bike/ped path	$ 45,000
FY 2004-05	City of El Cerrito	Conduct a planning study for bicycle/ped needs	$ 26,500
FY 2004-05	City of Lafayette	Construct 125 feet of 5-foot wide	$ 10,000
FY 2004-05	City of Martinez	Replace the two existing unsafe bridges	$ 90,000
FY 2004-05	City of Orinda	Develop a Lamorinda Trail Map & install	$ 28,500
FY 2004-05	City of Pittsburg	Construct Class II and Class III	$ 51,000
FY 2004-05	City of Pittsburg	Sign & stripe 3600 feet of 13-foot wide	$ 52,000
FY 2004-05	City of San Pablo	Install bike/ped friendly lighting	$ 45,100
FY 2004-05	City of Walnut Creek	Construct 2040 feet of asphalt walkway	$ 95,000
FY 2004-05	Contra Costa County	Construct 344 feet of 4.5-foot wide bike/ped path	$ 201,000
FY 2004-05	Contra Costa County	Construct 402 feet of 5-foot wide bike/ped path	$ 158,928
FY 2004-05	Contra Costa County	Provide bicycle & pedestrian safety	$ 20,000
FY 2004-05	City of San Rafael	Construct 6' wide sidewalk & stripe	$ 207,710
FY 2004-05	City of Sausalito	Construct 6' wide sidewalk & stripe	$ 186,290
FY 2004-05	City of Calistoga	Construct 1.0 miles of Class I bike-ped path	$ 270,881
FY 2004-05	City of Napa	Construct 2.0 miles of Class I bikeway	$ 149,727
FY 2004-05	City of Campbell	Construct Class II bike lockers at J.D.	$ 24,308
FY 2004-05	City of Campbell	Widen & regrade bicycle/Pedestrian	$ 515,600
FY 2004-05	City of Cupertino	Construct 1030' bike path	$ 107,622
FY 2004-05	City of Gilroy	Complete 881' of Uvas Creek Class I	$ 50,000
FY 2004-05	City of Gilroy	Refurbish & replace bikeway signs, etc	$ 10,611

TCM B: Bicycle/Pedestrian Program
TDA ARTICLE 3 [Transportation Development Act Funds for Bicycle and Pedestrian Projects]

	SPONSOR	PROJECT NAME	AMOUNT
FY 2004-05	City of Gilroy	Rehabilitate, resurface & stripe 2.5 mile path	$ 60,666
FY 2004-05	City of Los Altos	Construct approx. 300' of concrete bike path	$ 27,354
FY 2004-05	City of Los Altos	Replace approx. 2,800 lineal feet of bike path	$ 17,580
FY 2004-05	City of Los Gatos	Design & construct solution to restore path	$ 35,000
FY 2004-05	City of Morgan Hill	Install bicycle sensitive detector	$ 36,000
FY 2004-05	City of Mountain View	Install countdown pedestrian signals	$ 30,000
FY 2004-05	City of Mountain View	Install curb access ramps at Showers	$ 2,381
FY 2004-05	City of Mountain View	Install curb access ramps at various	$ 15,696
FY 2004-05	City of Mountain View	Purchase & install 14 bicycle lockers	$ 14,506
FY 2004-05	City of Palo Alto	Construct raised pavement pedestrian path	$ 50,000
FY 2004-05	City of San Jose	Construct 0.66 miles of Class I paved path	$ 712,131
FY 2004-05	City of San Jose	Design & construct ADA wheel chair improvement	$ 176,068
FY 2004-05	City of San Jose	Design & construct sidewalk for school	$ 36,000
FY 2004-05	City of San Jose	Design & install 12' wide asphalt path	$ 136,821
FY 2004-05	City of San Jose	Install median island ped. Refuge	$ 185,000
FY 2004-05	City of San Jose	Install sidewalk, ADA curb ramps	$ 90,000
FY 2004-05	City of San Jose	Provide bicycle & pedestrian safety	$ 50,000
FY 2004-05	City of San Jose	Stripe crosswalks, paint pavements	$ 100,000
FY 2004-05	City of Santa Clara	Perform an annual transportation	$ 5,000
FY 2004-05	City of Santa Clara	Stripe crosswalks & paint pavements	$ 62,148
FY 2004-05	City of Saratoga	Install continuous curb & gutter	$ 19,357
FY 2004-05	City of Sunnyvale	Provide gates, signs, fencing and ramps	$ 27,550
FY 2004-05	Santa Clara County	Construct a 3,300' by 5' walkway	$ 63,403
FY 2004-05	Santa Clara County	Sign & restripe 8" stripe on shoulders	$ 121,105
FY 2004-05	SF City/County	Bicycle safety brochures, maps, public education	$ 31,500
FY 2004-05	SF City/County	Prelim. engineering (plan & design) of bike path	$ 200,000
FY 2004-05	SF City/County	Purchase & install bicycle racks	$ 95,000
FY 2004-05	SF City/County	Repair public sidewalks at various locations	$ 115,000
FY 2004-05	SF City/County	Stripe & sign Class II bike lanes	$ 188,500
FY 2004-05	City of Benicia	Final design plans, specs & estimate	$ 124,573
FY 2004-05	City of Suisun City	Constr. 10' wide concrete bike path	$ 86,000
FY 2004-05	City of Vacaville, Transit	Construct 3400 feet of Class I bike/Ped path	$ 148,738
FY 2004-05	Solano Transportation Authority (STA)	Build bridge adjacent to existing path	$ 76,000
FY 2004-05	City of Petaluma	Construction of pedestrian & bicycle path	$ 54,876
FY 2004-05	City of Rohnert Park	Install 80' long bicycle & pedestrian path	$ 160,000
FY 2004-05	City of Santa Rosa	Install directional signage & ADA signs	$ 18,900
FY 2004-05	County of Sonoma	Construct 1.5 miles of Class I Bikeway	$ 160,000
FY 2004-05	County of Sonoma	Conduct bicycle safety education workshop	$ 10,000
FY 2004-05	County of Sonoma	Install 27 "Share Road" bicycle sign	$ 15,000
FY 2004-05	County of Sonoma	Purchase 37 front loading bicycle	$ 5,000
FY 2005-06	San Carlos	Class II bike lanes on Alameda de Las Pulgas and on Brittan Avenue; Class III bike lanes on Old County Road	$ 20,000
FY 2005-06	San Mateo	Design of a pedestrian and bicycle bridge in the vicinity of the Hillsdale interchange of highway U.S. 101	$ 100,000
FY 2005-06	South San Francisco	Bicycle and pedestrian crosswalk and signals at intersection of Spruce Ave. and South San Francisco Linear Park	$ 150,000
FY 2005-06	Half Moon Bay	Construct 6600 foot Class I trail in the right of way of Highway 1 between Highway 92 and Higgins Purisima Rd.	$ 220,000
FY 2005-06	Brisbane	Install 45 feet by 8 feet asphalt cement path adjacent to Shoreline Court; sign and restripe existing Class II bikeway	$ 25,739

TCM B: Bicycle/Pedestrian Program
TDA ARTICLE 3 [Transportation Development Act Funds for Bicycle and Pedestrian Projects]

	SPONSOR	PROJECT NAME	AMOUNT
FY 2005-06	South San Francisco	Construct 363 feet by 12 feet asphalt bicycle and pedestrian trail near the Oyster Point Marina	$ 36,000
FY 2005-06	San Bruno	Construct a Class II bike lane in both directions of Sneath Lane from El Camino Real to Skyline Boulevard	$ 60,000
FY 2005-06	Daly City	Install bike lanes on Callan Blvd from King Dr to Serramonte Blvd and along Serramonte Boulevard	$ 82,000
FY 2005-06	Burlingame	Install bike lane directional signs at 52 locations along north-south bicycle routes throughout the city	$ 17,400
FY 2005-06	Burlingame	Install an in-pavement lighted crosswalk system across Carolan Avenue at Morrell Avenue, including new push buttons	$ 30,000
FY 2005-06	Menlo Park	Install video detection for bikes at 3 intersections: Willow at Middlefield, Marsh at Bohannon, Marsh at Bay	$ 44,000
FY 2005-06	San Mateo	Install bridge railing fencing on the north side of the Nineteenth Avenue Bridge over highway U.S. 101	$ 50,000
FY 2005-06	Menlo Park	Create bicycle lanes on Bay Road between Berkeley Avenue and Willow Road, plus signage	$ 13,600
FY 2005-06	San Mateo	Install bike detection loops at: 3rd + Claremont, 3rd + Delaware, 4th + Claremont, 4th + Delaware	$ 40,000
FY 2005-06	Daly City	Install in-pavement lights and warning signs: Park Plaza Dr. north of Belmar, and Mission St. at Evergreen Ave.	$ 120,000
FY 2005-06	San Mateo	Install pedestrian countdown signal heads at 27 existing signalized intersections throughout the city	$ 50,000
FY 2005-06	Daly City	Install pedestrian countdown signal heads at 15 signalized intersections; and audible warnings at 11 of them	$ 20,000
FY 2005-06	Burlingame	Install pedestrian countdown signal heads with audible pedestrian warnings at 8 signalized intersections	$ 30,900
FY 2005-06	Menlo Park	Create bicycle lanes on Middlefield Road between Willow Road and San Francisquito Creek	$ 2,400
FY 2005-06	San Mateo	Install in-pavement lighted crosswalks: 5th Ave. at Central Park; Bovet Rd. betw. Borel Ave. and El Camino Real	$ 110,000
FY 2005-06	South San Francisco	Install pedestrian countdown signal heads at 12 existing signalized intersections throughout the city	$ 22,000
FY 2005-06	County of San Mateo	Bike detection loops, countdown signal heads with audible warnings, upgrade pedestrian signal actuators	$ 80,509
FY 2005-06	Sebastopol	Construct .5 mile Class I trail between Joe Rodota trail and Sebastopol Avenue and Morris Street intersection	$ 51,356
FY 2005-06	Santa Rosa	Construct connector ramp between Joe Rodota trail and Pierson Reach of Prince Memorial Greenway trail	$ 350,000
FY 2005-06	Windsor	Construct a 950 foot Class I trail within Keiser Park, including brdige crossing a tributary of Starr Creek	$ 112,000

TCM B: Bicycle/Pedestrian Program
TDA ARTICLE 3 [Transportation Development Act Funds for Bicycle and Pedestrian Projects]

	SPONSOR	PROJECT NAME	AMOUNT
FY 2005-06	Contra Costa County, Health Services	Provide bicycle and pedestrian safety education to low-income county residents, particularly children	$ 20,000
FY 2005-06	Concord	Constr't 500 foot Class I trail adjacent to Galindo Crk. + Ygnacio Valley Rd betw. Alberta Way + Pebble Glen Dr	$ 60,000
FY 2005-06	Lafayette	1030 feet x 5 feet sidewalk Sweet Dr. betw Walnut + Woodview; Woodview Dr. betw. St Mary's + Sweet Drive	$ 110,000
FY 2005-06	Antioch	Construct curb ramps and sidewalks at Hillcrest Avenue, Somersville Road, "G" Street, and Dallas Ranch Road	$ 110,000
FY 2005-06	Brentwood	Install pedestrian countdown signal heads + large diameter pedestrian push buttons at 12 signalized intersections	$ 66,000
FY 2005-06	Contra Costa County, Public Works	Construct 240 feet x 5 feet sidewalk and curb ramps on Camino Tassajara and on Hansen Lane	$ 20,000
FY 2005-06	Orinda	Replace 12 existing non-compliant curb ramps in downtown Orinda with ADA compliant ramps	$ 45,000
FY 2005-06	San Pablo	Install in-pavement lighted crosswalks: Market Avenue at 21st St.; 23rd St. at Wilcox Ave.; 23rd St. at Stanford Ave.	$ 180,000
FY 2005-06	Brentwood	Restripe Minnesota Ave. bike lane; install lighted crosswalk; construct 1300 feet of sidewalk, curb and gutter	$ 31,000
FY 2005-06	San Francisco	Public sidewalk repair and reconstruction	$ 180,000
FY 2005-06	San Francisco	Preliminary engineering of curb ramps	$ 270,000
FY 2005-06	San Francisco	Safety brochures, maps, public outreach concerning bicycle pavement arrows, hotline, and bicycle safety advertising	$ 45,000
FY 2005-06	San Francisco	Purchase and install bicycle racks at various locations in San Francisco as requested by the public	$ 100,000
FY 2005-06	San Francisco	Stripe and sign bike lanes: Conservatory Drive East, San Jose Avenue ramps, Townsend Street, and elsewhere	$ 305,000
FY 2005-06	Berkeley	Bicycle & Pedestrian Injury Prevention Program	$ 30,000
FY 2005-06	Berkeley	Ninth Street Bicycle Boulevard extension (Project from FY01/02)	$ 135,000
FY 2005-06	Oakland	ADA Compliant Wheelchair Accessible Ramps (Project Completed FY01/02)	$ 294,548
FY 2005-06	Oakland	Laurel Pedestrian Project, Phase I (Project Completed FY01/02)	$ 200,000
FY 2005-06	Oakland	MacArthur Blvd. Bicycle Lane Design (Project Completed FY01/02)	$ 55,000
FY 2005-06	Oakland	Grand Avenue Transit and Pedestrian Improvements (Project from FY 04/05)	$ 245,847
FY 2005-06	Oakland	ADA Compliant Wheelchair Accessible Ramps Program	$ 121,144
FY 2005-06	Oakland	Market Street Bikeway	$ 165,000
FY 2005-06	Oakland	Bancroft Bikeway Gap Closures	$ 25,000
FY 2005-06	Piedmont	ADA Wheelchair Accessible Ramps and Pedestrian enhancements at Rose/Arroyo & Grand Ave	$ 8,353
FY 2005-06	Hayward	ADA Wheelchair Accessible Ramps	$ 109,309

TCM B: Bicycle/Pedestrian Program
TDA ARTICLE 3 [Transportation Development Act Funds for Bicycle and Pedestrian Projects]

	SPONSOR	PROJECT NAME	AMOUNT
FY 2005-06	San Leandro	Pedestrian Accessibility Improvements & Sidewalk Gap Closures	$ 74,177
FY 2005-06	Fremont	Citywide ADA Compliant Wheelchair Accessible Ramps	$ 158,067
FY 2005-06	Newark	History Center Complex Sidewalks and ADA Wheelchair Accessible Ramps	$ 33,072
FY 2005-06	Union City	San Francisco Bay Trail Specific Plan (Project Completed FY01/02)	$ 63,585
FY 2005-06	Dublin	Bicycle Master Plan	$ 45,144
FY 2005-06	Livermore	Chestnut and N. P Street Bicycle Lanes	$ 113,044
FY 2005-06	Alameda Co. Congestion Management Agency	Alameda Countywide Bicycle Master Plan	$ 20,000
FY 2005-06	County of Alameda	Pedestrian Safety Improvements in the vicinity of Schools	$ 75,775
FY 2005-06	County of Alameda	Pedestrian Safety Improvement Projects - Sidewalk Improvements	$ 75,600
FY 2005-06	County of Alameda	Restriping Bicycle Lanes Along Various Roadways	$ 30,000
FY 2005-06	Benicia	Stripe and sign bike lanes: Military East between East 5th Street and Park Road	$ 25,000
FY 2005-06	Fairfield	Design McGary Road segment of Solano Bikeway Extension and complete extension feasibility study	$ 100,000
FY 2005-06	Suisun City	Construct curb ramps and sidewalks at Whispering Bay Lane and Francisco Dr.	$ 5,400
FY 2005-06	Suisun City	Replace existing non-compliant curb ramps in downtown Suisun City with ADA compliant ramps	$ 11,856
FY 2005-06	Solano County	Reconstruct deck and railings, seismic retrofit, lighting and pathways to railroad trestle bridge over Putah Creek	$ 180,000
FY 2005-06	Campbell	Implement bike lanes on Harriet Ave and Union Ave, Replace Los Gatos creek bridge, and widen Campbell Ave bridge	$ 27,859
FY 2005-06	Campbell	Design and construct sidewalk and bike lanes and edge striping, curb and gutter along Westmont Avenue	$ 39,992
FY 2005-06	Campbell	Widen Campbell Ave. bridge over Los Gatos Creek for bike lane and sidewalk; and reconstruct sidewalk under SR 17	$ 240,000
FY 2005-06	Cupertino	Construct pedestrian and bicycle bridge across Interstate 280 along Mary Avenue between Homestead Rd and Meteor Dr	$ 38,361
FY 2005-06	Los Altos Hills	Replace pedestrian bridge adjacent to the Foothill College entrance road connecting to El Monte Road	$ 11,310
FY 2005-06	Los Gatos	Replace existing College Avenue sidewalk and fencing; and repair Los Gatos Creek Trail footbridge decking	$ 20,000
FY 2005-06	Milpitas	Install ADA pedestrian ramps with truncated dome landings along suggested routes to schools	$ 47,112
FY 2005-06	Morgan Hill	Identify where additional bicycle and pedestrian trails can be established adjacent to creeks and streams	$ 32,000
FY 2005-06	Mountain View	Bicycle boulevard from Mayfield Mall area to Stevens Creek Trail, including signs, markings and signal modifications	$ 25,000

TCM B: Bicycle/Pedestrian Program
TDA ARTICLE 3 [Transportation Development Act Funds for Bicycle and Pedestrian Projects]

	SPONSOR	PROJECT NAME	AMOUNT
FY 2005-06	Mountain View	ADA Compliant Wheelchair Accessible Ramps Program	$ 17,000
FY 2005-06	Mountain View	Produce bicycle and pedestrian education and awareness materials, and a new bike map and multilingual flyers	$ 5,000
FY 2005-06	Mountain View	Install "bikes wrong way" signs on existing poles along California Street and adjacent streets	$ 5,217
FY 2005-06	Palo Alto	Bicycle boulevard along Maybell Ave and Donald Dr.: signs, markings, speed tables, & median refuge islands	$ 75,000
FY 2005-06	San Jose	Install sidewalk, curb and gutter to improve access to Lynhaven Elementary School	$ 90,000
FY 2005-06	San Jose	Install sidewalk, curb and gutter to fill gap on Borina Ave. at Saratoga Ave.	$ 70,000
FY 2005-06	San Jose	Install sidewalk, curb and gutter to improve access on both sides of Yerba Buena Road at Thompson Creek	$ 47,000
FY 2005-06	San Jose	Install sidewalk, curb, gutter and ADA ramps on Carola Avenue at Clarita Avenue	$ 110,000
FY 2005-06	San Jose	Install sidewalk, curb, gutter, pedestrian crossing and median island to provide access to Penitencia Creek County Park	$ 62,000
FY 2005-06	San Jose	Install sidewalk, curb and gutter on Senter Road at Burke Street	$ 58,000
FY 2005-06	San Jose	Install sidewalk, curb and gutter to improve access to Toyon Elementary School	$ 45,000
FY 2005-06	San Jose	Citywide ADA Compliant Wheelchair Accessible Ramps	$ 100,000
FY 2005-06	San Jose	Sign and stripe bicycle and pedestrian facilities, including bike lanes, bike routes, crosswalks, and bike paths	$ 58,397
FY 2005-06	San Jose	Provide bicycle and pedestrian safety education to elementary school children and adults, purchase educational material	$ 35,000
FY 2005-06	Santa Clara	Install and maintain bicycle and pedestrian facilities, including bike lanes, bike routes, crosswalks, and bike paths	$ 78,180
FY 2005-06	Saratoga	Acquire right-of-way to upgrade UPRR railroad crossing in a bulb configuration to allow bicycles to cross at 90 degrees	$ 95,000
FY 2005-06	Sunnyvale	Improve Calabazas Creek Trail with additional gates, signs, fences, ramp modifications, and a bridge across creek	$ 182,048
FY 2005-06	County of Santa Clara	Restripe four co. expressways' shoulders with 8 inch stripes and sign to allow functioning as bicycle shoulder	$ 50,000
FY 2005-06	Brentwood	Crosswalk and sidewalk improvements on Minnesota Avenue between Deer Creek and Sand Creek	$ 31,000
FY 2005-06	Union City	Construct 1750 feet by 15 feet textured decorative concrete sidewalks plus 5 foot bike lanes on both sides of 11th Street	$ 53,142
FY 2005-06	TAM	Update and complete bicycle and pedestrian master plans countywide and for cities and towns in Marin County	$ 160,000

TCM B: Bicycle/Pedestrian Program
TDA ARTICLE 3 [Transportation Development Act Funds for Bicycle and Pedestrian Projects]

	SPONSOR	PROJECT NAME	AMOUNT
FY 2005-06	Campbell	Construct bike lanes on Harriet Avenue north of Westmont Avenue and on Union Avenue south of Campbell Avenue	$ 24,308
FY 2005-06	Larkspur	Design + construct 13 ft wide Class I bike/pedestrian path and modify signals on Magnolia Ave. + Doherty Dr	$ 136,668
FY 2005-06	County of San Mateo	Develop bike route data for GIS, integrate into countywide GIS files, and maintain bike route GIS data	$ 40,000
FY 2005-06	City of Napa	Class I path along Napa Valley Wine Train right of way between Redwood Rd/SR 29 and Vallejo St/Soscol Av	$ 85,271
FY 2005-06	American Canyon	Construct bike lanes and Class I trail adjacent to Commerce Boulevard	$ 34,729
		Total	**$ 21,785,915**

TCM C: Transportation for Livable Communities

FY 2004-05 MTC TLC Planning Program

Project Sponsor	Project Title	TLC Grant
Alameda County		
City of Oakland	Revitalizing Foothill / Seminary: A Model for Oakland's Regional Transit Streets	$ 75,000
City of Berkeley	Downtown Berkeley BART Plaza and Transit Area	$ 75,000
Contra Costa County		
City of Lafayette	BART-Downtown Lafayette Pedestrian Linkages Project	$ 20,000
San Francisco County		
San Jose/Guerrero Coalition to Save Our Streets	The San Jose/Guerrero Neighborhood Plan	$ 75,000
San Mateo County		
Redwood City	Transit Station Sub-area Precise Plan	$ 71,760
SamTrans	Transforming the El Camino Real to Link Caltrain Stations with Vibrant Downtowns in Redwood City, San Carlos and Belmont	$ 63,840
Santa Clara County		
City of Sunnyvale	Murphy Avenue Streetscape Revitalization	$ 75,000
Sonoma County		
City of Santa Rosa	Downtown Pedestrian Linkages Study	$ 44,400
	Total	**$ 500,000**

FY 2004-05 MTC TLC Capital Program

Project Sponsor	Project Title	TLC Grant
City of Oakland, CEDA	Revive Chinatown – Phase 1	$ 2,200,000
City of Union City Public Works Dept.	Union City Intermodal Station –Pedestrian connections and New East Plaza	$ 1,124,000
Richmond Redevelopment Agency	Richmond Transit Village: Intermodal Transit Station	$ 1,581,000
County of Marin	Cal-Park Hill Tunnel Rehab and Class I Bikeway	$ 1,500,000
City of Gilroy	Monterey Streetscape Improvements – Fourth Street to Sixth Street	$ 2,500,000
City of Morgan Hill	Morgan Hill – Depot Street Capital Improvements	$ 2,627,000
Bay Area Rapid Transit District	Daly City BART- St. Charles Pedestrian & Bike Project	$ 501,000
City & Co. of San Francisco Dept. of Public Works	Broadway Streetscape Improvements Project – Phase II	$ 2,000,000
City of South San Francisco	BART Linear Park-Huntington Avenue to Orange Avenue	$ 1,933,000
City of Vallejo	Vallejo Station Pedestrian Links	$ 2,071,000
City of Petaluma/Eden Housing Inc.	Downtown River Apts Riverwalk and Streetscape Improvements	$ 358,000
	Total	***$ 18,394,000***

Contingency Projects

City of Union City Public Works Dept.	Union City Intermodal Station – West Plaza Enhancements	$ 1,713,500
City of Oakland, CEDA	MacArthur Transit Hub Streetscape Improvement Project	$ 1,918,000
Town of Los Gatos Parks & Public Works Dept.	Streetscape & Gateway	$ 2,400,000
City of San Leandro Community Dev. Dept.	East 14th Street South Area Revitalization Project – La Palma District	$ 1,600,000
County of Contra Costa Redevelopment Agency	North Richmond Third Street Upgrades	$ 1,966,000

TCM C: Transportation for Livable Communities

FY 2005-06 Marin County TLC Capital Program

Project Sponsor	Project Title	TLC Grant
Town of Fairfax	Center Boulevard Streetscape Redesign Project	$ 500,000
County of Marin	Fireside Pedestrian and Traffic Safety Project	$ 198,906
Town of Corte Madera	Bayside Trail Improvement Project	$ 371,826
	Total	**$ 1,070,732**

FY 2005-06 Alameda County TLC Capital Program

Project Sponsor	Project Title	TLC Grant
City of Oakland	Coliseum BART Streetscape	$ 500,000
City of Oakland	Oakland Coliseum Pedestrian Walkway	$ 885,000
City of Oakland	W. Oakland Transit Village Streetscape Project	$ 1,300,000
City of Oakland	MacArthur Entry Plaza & 40th Streetscape Project	$ 1,147,000
City of Berkeley	Ashby/Ed Roberts Bicycle/Pedestrian Improvements	$ 1,200,000
City of Union City	Pedestrian/Bicycle Improvements	$ 2,000,000
	Total	**$ 7,032,000**

FY 2005-06 Sonoma County TLC Capital Program

Project Sponsor	Project Title	TLC Grant
City of Petaluma	Petaluma Blvd. Pedestrian Enhancements	$ 485,000
City of Rohnert Park	Rohnert Park City Center Drive Improvements	$ 1,150,000
Town of Windsor	Windsor Pedestrian Enhancements & Traffic Calming	$ 235,000
Sonoma County Reg'l Parks	Sonoma County Santa Rosa Creek Trail	$ 550,000
Town of Windsor	Windsor Old Redwood Hwy Pedestrian Linkages	$ 338,000
Sonoma County Reg'l Parks	Sonoma County Bodega Bay Bicycle & Pedestrian Trail	$ 535,000
City of Santa Rosa	Santa Rosa Courthouse Square Off-Site Improvements & Gateway Street	$ 1,000,000
	Total	**$ 4,293,000**

	Grand Total	**$ 31,289,732**

TCM D: Additional Freeway Service Patrol

The Bay Area FSP is a joint project of the Metropolitan Transportation Commission Service Authority for Freeways and Expressways (MTC SAFE), the California Highway Patrol (CHP) and the California Department of Transportation (Caltrans). The service is provided by private tow truck companies, selected through a competitive bid process, under contract to MTC SAFE. During the hours of operation, the vehicles and drivers are exclusively dedicated to patrolling their freeway beat. The program is intended to augment the MTC SAFE network of motorist-aid call boxes in the nine Bay Area counties.

Current Profile (as of February 2009)
A fleet of 83 trucks patrols some 550 miles of the Bay Area's freeways. Patrol routes are selected based on several factors, including a high rate of traffic and congestion, frequent accidents or stalls, and lack of shoulder space for disabled vehicles.

The FSP tow trucks operate primarily during morning and afternoon commute hours, generally from 6 a.m. to 9 a.m. or 10 a.m. and from 3 p.m. to 6 p.m. or 7 p.m., Monday through Friday. Weekend service is provided in Napa, as well as seasonally along Highway 17, and in some other locations on Sunday.

FSP tow trucks are equipped for nearly any contingency. In addition to the standard auto repair and towing equipment, they carry 5 gallons of diesel fuel, 5 gallons of unleaded gasoline, and 5 gallons of water, as well as an external speaker and public address system.

Funding
The tow trucks are financed with federal, state and local moneys. Local funds come from the MTC SAFE, which is financed by a $1 annual vehicle registration fee in participating counties. The service costs approximately $7 million a year to operate. Another $2 million is invested in sophisticated communications equipment, including an automatic vehicle location system that enables CHP and Caltrans to monitor the location of the trucks and improve dispatching efficiency.

Implementation Plan
See the attached Implementation Plan, which is also available at:
http://www.fsp-bayarea.org/implementation_plan/Iplan.pdf

BAY AREA FREEWAY SERVICE PATROL PROGRAM
IMPLEMENTATION PLAN

Revised 06/01/07

BEAT ID	CONTRACTOR	LOCATION COUNTY	LOCATION ROUTE	BEAT LIMITS	CALTRANS ONE WAY LENGTH (IN MILES)	START DATE	ENDING DATE	WEEKDAYS AM SHIFT	WEEKDAYS MIDDAY SHIFT	WEEKDAYS PM SHIFT	SUNDAY PM SHIFT	# OF TOW TRUCKS	# OF PICKUP TRUCKS	# OF FLATBED TRUCKS	# OF BACKUP TRUCK	NOTES	TOTAL CONTRACT HOURS	BEAT ID
1	Redhill Towing	ALA	980	Interstate 580 to Interstate 880	2.03	07/01/07	07/26/09	6:00-10:00		15:00-18:30	13:00-19:00	2	1			b	12,395	1
		ALA	880	7th Street to Jackson Street	2.04													
		ALA	24	Interstate 580 to Contra Costa County Line	4.39													
		CC	24	Contra Costa County Line to Oak Hill Road	6.25													
		CC/ALA	*13*	*State Route 24 to Redwood Avenue*	(4.23)											e		
2	A-One Towing Service	ALA	80	Powell Street to Contra Costa County Line	4.25	07/01/07	07/26/09	6:00-10:00	10:00-15:00	15:00-19:00	13:00 - 19:00	2	1		1	a, b, c	15,755	2
		CC	80	Alameda County Line to San Pablo Dam Road	4.34													
		ALA/CC	580	Interstate 80 to Western Drive/Pt. Molate	6.01													
3	Palace Garage	ALA	880	Alvarado-Niles Road to State Route 238	7.66	06/25/07	06/26/11	06:00-10:00		15:00-19:00	13:00-19:00	2				b,c	17,132	3
		ALA	92	Interstate 880 to Clawiter Road	1.91													
4	Palace Garage	ALA	880	Broadway to State Route 238	10.55	07/01/07	07/26/09	6:00-10:00		15:00-19:00	13:00-19:00	2	1			b	13,170	4
		ALA	238	Interstate 880 to Interstate 580	2.11													
5	K&S Tow	CC	680	Stone Valley Road to Marina Vista Road	13.89	07/02/07	07/04/11	06:00-09:00		14:00-18:30		2	1		1	b	22,523	5
		CC	24	Oak Hill Road U/C to Interstate 680	2.87													
6	B&A Body Works & Towing	SM	101	State Route 92 to SF City Limit/101 to Foster City Boulevard	14.23	07/01/07	07/05/09	6:00-10:00	10:00-15:00	15:00-19:00		2	2		1	a, b	18,754	6
		SM	92	Interstate 101 to Foster City Boulevard	1.47													
7	Redhill Towing	MRN	101	Alexander to 3rd Street/Irwin Street (Central San Rafael Exit)	10.28	07/03/05	07/06/08	6:00-10:00		15:00-19:00	13:00 - 19:00	2			1	b, c	13,090	7
		MRN	580	Highway 101 to Interstate 580 San Quetin	1.60													
8	Campbell's Towing	SCL	101	Blossom Hill Road to Ellis Street	18.40	07/01/07	07/05/09	6:00-10:00		15:00-19:00	13:00 - 19:00	2	2		1	b, c	16,808	8
		SCL	237	Highway 101 to Lawrence Expressway	2.12													
9	Campbell's Towing	SCL	280	Interstate 680/Highway 101 to Foothill Exp.	11.45	06/11/07	06/10/11	6:00-10:00		15:00-19:00		3	1		1	b	32,032	9
		SCL	85	Junction Route 280 to El Camino Real	3.3													
		SCL	87	State Route 85 to Hwy. 101	9.22													
10	Sunrise Enterprise 87	SCL-SM	101	Ellis Street to State Route 92	17.44	06/11/07	06/10/11	6:00-10:00		15:00-19:00		2	1			a, b	24,024	10
		SCL	92	Junction Route 101 to El Camino Real	0.93													
11	B&A Body Works & Towing	SF	101	Cesar Chavez to San Mateo Co. Line	2.92	06/11/07	06/12/11	6:00-10:00	10:00-15:00	15:00-19:00	10:00-16:00	2				a, b,c	22,473	11
		SF	280	San Mateo Co. Line to Highway 101	4.34													
		SM	101	Harney Way to San Francisco Co. Line	0.41													
		SM	280	Geneva/Ocean Avenue to San Francisco Co. Line	1.77													
	(Bridge Tow Coverage)	*SF*	*280*	*Highway 101/Interstate 280 Interchange to Sixth Street*	(3.2)											e		
	(Bridge Tow Coverage)	*SF*	*80*	*Cesar Chavez to Interstate 80/Fourth Street*	(1.5)											e		
12	Ken Betts Towing	CC	80	San Pablo Dam Road to Cummings Skyway	8.39	07/09/07	07/10/11	6:00-10:00	10:00-15:00	15:00-19:00	13:00-19:00	2				a, b, c	22,473	12
13	Bill's Towing	MRN	101	Interstate 580 to Junction Route 37	9.13	06/25/07	06/26/11	6:00-10:00		14:30-18:30	13:30-18:30	2				b, c	17,282	13
14	All Ways Tow & Transport	ALA	880	Mowry Avenue to Alvarado Niles Road	5.84	07/01/07	07/24/09	6:00-10:00		15:00-19:00		2				b	8,272	14
		ALA	84	Thornton Avenue to Interstate 880	2.26													
15	Yarbrough Bros. Towing	SON	101	Wilfred Avenue to River Road	10.8	07/02/07	07/01/11	6:30-9:30		15:30-18:30		1					6,006	15
16	Lima Tow	SCL	17	Junction Route 9 to Summit Road	7.07	07/09/07	07/10/11	6:30-9:30		15:30-18:30	See separate beat 16/SC schedule	1				b, c, f	7,974	16
17	Sierra Hart	SOL	12	Interstate 80 to Napa Co. Line	2.95	07/23/07	07/24/11	6:00-10:00		15:00 -19:00	8:00-16:30 Sat. & Sun.	1 wkdy, 2 wknd			1 wkdy		15,573	17
		NAP	12	Napa Co. Line to Sonoma Co. Line	11.60													
		NAP	29	State Route 37 to Oakville Cross Road	24.0													
		SON	12	Sonoma Co. Line to Junction 116	4.90													
		NAP	*29*	*Oakville Cross Road to State Route 128*	(1.8)											e		
18	All Ways Tow & Transport	SCL	880	Junction Route 237 to Alameda County Line	2.08	07/01/07	07/10/09	6:00-10:00		15:00-19:00		2				b	8,112	18
		ALA	880	SCL County Line to Mowry Avenue	7.18													
19	Lima Tow	SCL	880	Junction Route 237 to Junction Route 17	8.42	07/01/07	07/10/09	6:00-9:00		15:00-19:00		2	1			b	10,647	19
		SCL	17	Junction Interstate 880 to Junction Route 9	6.88													
		SCL	237	Junction Interstate 880 to Lawrence Expressway	4.70													
20	Nelson's Tow	SM	280	*Geneva/Ocean Avenue* to Interstate 380	8.18	07/01/07	07/10/09	6:30-9:30		15:00-18:00		2				b	6,084	20
		SM	380	Interstate 280 to Highway 101	1.67													
21	Matos Towing & Transport	ALA	680	Scott Creek to Alcosta Boulevard	21.35	07/01/07	07/10/09	5:30-9:30		15:00-19:00		1	1	1	1	b	12,168	21
22	Palace Garage	ALA	580	Vasco Road to Santa Rita	8.25	07/23/07	07/24/11	5:30-9:30		15:30-19:00	13:00-19:00	2	1			b, c, d	25,685	22
		ALA	580	Grant Line Road to Vasco Road	8.23													
23	Campbell's Towing	SCL/ALA	680	Highway 101 to Scott Creek Road	10.17	07/01/07	07/10/09	5:30-9:30		15:00-19:00		2				b	8,112	23
24	Roadrunner Tow	SOL	680	Interstate 80 to Junction 780	14.30	07/23/07	07/22/11	6:00-9:00		15:30-18:30		1				g	6,036	24
		SOL	780	Junction 680 to Junction 80	6.42													
25	B&D Towing	CC	4	Hillcrest Avenue to Pacheco Blvd.	20.39	07/01/07	07/17/09	5:30-9:30		15:30-19:00		2	1			b	11,520	25
		CC	242	State Route 4 to Interstate 680	3.4													
26	A-One Tow Service	ALA	580	Harrison Street/Oakland Avenue to Junction Route 238	13.47	07/01/07	07/17/09	6:30-9:30		15:30-18:30		1		1		b	6,144	26
		ALA	*13*	*Redwood Avenue to Interstate 580*	(0.0)											e		
27	Palace Garage	ALA	580	Santa Rita Road to Junction 238	12.86	06/25/07	06/26/11	6:00-9:30		15:30-18:30	13:00-19:00	2	1			b,c	21,020	27
28	Bill's Towing	MRN/SON	101	State Route 37 to East Washington Boulevard	13.1	07/01/07	07/17/09	5:30-9:30		15:30-18:30		1				b	3,584	28
29	Roadrunner Tow	SOL	80	Magazine Street to Abernathy Road	14.04	07/09/07	07/10/11	6:00-9:00		15:30-18:30	13:00-19:00	2				b, c, h	15,020	29
					0													
30	Nelson's Tow	SM	92	State Route 1 to Highway 280	8.03	07/23/07	07/22/11	6:00-9:30		15:30-18:30		2				b	13,013	30
		SM	280	Interstate 380 to State Route 92	10.20													
		SM	92	Interstate 280 to Highway 101	4.83													
31	Campbell's Towing	SCL	101	Blossom Hill Road to East Dunne Avenue	12.6	07/01/07	07/19/09	6:00-9:00		16:00-19:00	13:00 - 19:00	2				b, c	6,900	31
32	Dick's Automotive Transport	SCL	85	Interstate 280 to Cottle Road	16.48	07/01/07	07/17/09	6:00-9:00		16:00-19:00		2				b	6,144	32
33	Yarbrough Bros. Towing	SON	101	East Washington Boulevard to Wilfred Avenue	10.26	07/24/05	07/20/08	6:00-9:00		15:30-18:30		1				b	4,482	33
34	Vacaville Tow	SOL	80	Abernathy Road to I-505 Vaca Valley Road	12.54	07/09/07	07/10/11	6:00-9:00		15:30-18:30	13:00-19:00	2				b, c, h	15,020	34
35	Palace Garage	CC	680	Alcosta Boulevard to Stone Valley Road	10.36	07/09/07	07/08/11	6:00-9:00		15:00-18:30		1				b	6,507	35
36	Ken Betts Towing	CC	4	Interstate 80 to Pacheco Blvd.	11.8	07/23/07	07/22/11	6:00-9:30		15:30-19:00		1					7,007	36
37	Vacaville Tow	SOL	80	Junction I-505 to Richards Blvd.	16.4	07/23/07	07/24/11	6:00-9:00		15:30-18:30	13:00-19:00	2				b, c, h	15,032	37
					539.67							**65 wkdy, 66 wknd**	**15**	**2**	**8 wkdy, 7 wknd**		**493,973**	

TCM E: Transit Access to Airports

BART to San Francisco International Airport:
S. San Francisco: From Colma BART station to the new SFO station; Extend BART system to the San Francisco International Airport.

BART Fares and Schedules
The latest BART fares and schedules (as of January 2008) can be found at: http://www.bart.gov/guide/brochures.aspx

Service Adjustments
See attached document for service adjustments overtime since June 2003 through December 2006.

SFO Service Changes Over Time

Below is a list and description of service changes that have been implemented since the San Francisco Extension opening on June 22, 2003 through December 31, 2006. Some of these changes are major system changes. Other changes are more minor involving train sizing.

June 22, 2003 - SFO Initial Service

Bay Point trains provide service to Millbrae during all hours of operation, all week. Dublin trains provide service to the San Francisco Airport (SFO) during all hours of operation, all week. These routes operate on 15 minute headways during the weekday, and on 20 minute headways during evenings and on weekends. A shuttle train provides service between Millbrae and SFO on 20 minute headways during all hours of operation, all week. In addition to the base 15 minute service, three AM peak period rush trains provide service from Bay Point to Daly City, then operate express from Daly City to SFO. These three trains return during the evening peak period and operate express from SFO to Daly City, then on to Bay Point.

1. Direct service to/from Millbrae and direct service to/from SFO
2. Peak rush trains provide Bay Point line passengers direct service to/from SFO during the peak periods
3. 20 minute shuttle does not synch with the 15 minute base service during the day

February 9, 2004

Bay Point trains provide direct service to SFO, then continue to Millbrae. On the return trip these trains follow the same route back to Bay Point. This service route has been called the "Reverse L" service because the shape of the service on the SFO extension resembles a backward or reverse "L" shape. During the 3-1/2 hour AM and PM peak period on weekdays, Richmond trains provide direct service to Millbrae, then continue to SFO. On the return trip these trains follow the same route back to Richmond. This service route is referred to as the "L" service. The Richmond trains do not operate on the weekend. When the Richmond trains are operating on the extension during the week the Bay Point trains terminate at SFO and do not continue to Millbrae. At all other times (off-peak, evenings and weekends) the Bay Point trains complete the "Reverse L" service pattern. There are no other direct peak period rush trains. Service during the day (and during the peak rush) is 15 minutes, while evenings and weekends operate at 20 minute headways.

1. Provides for direct service on all extension routes to Millbrae and SFO, no need to transfer
2. 20 minute shuttle (during normal 15 minute service) replaced by 15 minute direct trains
3. During off-peak, evenings and weekends, direct service to Millbrae is through the SFO station

March 8, 2004

Train sizing adjustments: Train 361 increased from 4 to 5-car train off-peak. Train 441 changed to 10-car peak size for all PM trips instead of breaking to 5-car train on last trip. Other minor adjustments were made to the 200s and 500s.

September 13, 2004

Bay Point trains provide direct service to SFO, then continue to Millbrae. This service provides "Reverse L" service and operates during all hours of operation, all week. During the 3 hour AM and PM peak period on weekdays, Richmond trains provide direct service to SFO, then continue to Millbrae in a "Reverse L" service configuration. During the 3 hour AM and PM peak period (weekdays only) the Richmond and Bay Point trains both provide service directly to and from Millbrae/SFO. The Richmond trains do not operate on the weekend. Service during the day on each route (and during the peak rush) is 15 minutes, while evenings and weekends operate at 20-minute headways.

1. Provides for direct service on all extension routes to Millbrae and SFO, no need to transfer

2. During all hours, direct service to Millbrae is through the SFO station (but is effectively every 7.5 minutes during the 3 hour AM and PM peak periods)

December 13, 2004
Train sizing adjustments were made to better match capacity with demand, generally to shorter trains.

April 23, 2005
Train sizing adjustments: The 300 series trains on Saturday were increased from 8 to 9-car trains.

June 13, 2005
Train lengths were generally shortened to an 8-car plan in two phases, in June and August, 2005, with peak size trains running all day on the Bay Point line.

August 15, 2005
Second phase of implementing the "8-car" plan.

September 12, 2005
Dublin trains provide direct service to SFO, then continue to Millbrae in a "Reverse L" service configuration. Only the Dublin trains will provide service to the extension on weekdays and weekends. Richmond and Bay Point trains will truncate at Daly City. Service during the day (and during the peak rush) is 15 minutes, while evenings and weekends operate at 20-minute headways. Although direct service from Bay Point has been replaced with this new service, the transfer time from a Bay Point base train to SFO train (from Dublin) is only 3-4 minutes in each direction.

September 22, 2005
Extend service from Richmond and lengthen trains. Up to six consists will be lengthened from 4 to 8-car trains. Richmond trains to Daly City will be extended to Colma for two hours in the morning and two hours in the evening.

October 10, 2005
The following adjustments were made:

Weekday
100s - three trains lengthened
200s - one train lengthened, Make/Break timing changed
300s - several trains lengthened with a few trains reduced in size
400s - one train lengthened
500s - No change since September 22, 2005 (Make/Break timing)

Saturday
300s - some trains lengthened

Sunday
300s - some trains lengthened

December 5, 2005
The following adjustments were made:

Weekday
100s – 115 becomes the last AM Break train
300s – Train 323 and 363 increased from 8-car to 9-car trains

Saturday
200s – All trains are now 6-car trains during the day

January 30/31, 2006e
The following adjustments were made:

Weekday
100 Series Trains (net +1)
Train 101 +1 (9 to 10 cars) peak increase
Train 115 off peak increase 4 to 5 cars

200 Series Trains (net 0)
No change

300 Series Trains (net –2)
Train 365 off peak decrease only on dispatches of 20:58, 22:19, and 23:38
Train 367 +1 (9 to 10 cars) off peak decrease only on dispatches of 21:18, 22:39, and 24:00
Train 371 –1 (10 to 9 cars)
Train 377 –1 (10 to 9 cars)
Train 381 –1 (10 to 9 cars)
Train 331 -2 (10 to 8 cars)
Train 335 +2 (8 to 10 cars)

400 Series Trains (net +2)
Train 443 –1 (9 to 8 cars) for AM peak period only
Train 445 +1 (8 to 9 cars)
Train 453 –1 (9 to 8 cars) for PM peak period only
Train 455 +2 (8 to 10 cars) and off peak increase 4 to 5 cars

500 Series Trains (net +10)
Train 501 +1 (8 to 9 cars) peak increase and off peak increase 4 to 5 cars
Train 503 +1 (8 to 9 cars) peak increase and off peak increase 4 to 5 cars
Train 505 +1 (8 to 9 cars) peak increase
Train 507 +1 (8 to 9 cars) peak increase
Train 509 +1 (8 to 9 cars) peak increase
Train 511 +1 (8 to 9 cars) peak increase
Train 513 +1 (8 to 9 cars) peak increase and off peak decrease 8 to 5 cars
Train 519 +1 (8 to 9 cars) peak increase
Train 521 +1 (8 to 9 cars) peak increase and off peak increase 4 to 5 cars
Train 523 +1 (8 to 9 cars) peak increase

Saturday
100s – no change
200s – no change
300s – All 8-car trains are now 9-car trains
400s – no change
500s – Four trains increased from 4 to 5-cars (501, 505, 511, and 515)

Sunday
200s – no change
300s – no change
500s – All trains 9-car midday and some offpeak increased from 4 to 5-cars (503, 505, and 515)

Appendix F

Air Resources Board

Alan C. Lloyd, Ph.D.
Chairman
1001 I Street • P.O. Box 2815 • Sacramento, California 95812 • www.arb.ca.gov

Winston H. Hickox
Agency Secretary

Gray Davis
Governor

November 30, 2001

Mr. Wayne Nastri
Regional Administrator
U.S. Environmental Protection Agency
Region IX
75 Hawthorne Street
San Francisco, California 94105

Dear Mr. Nastri:

The Air Resources Board (ARB/Board) hereby transmits the Bay Area emission factor model (SF Bay Area-EMFAC 2000) to the U.S. Environmental Protection Agency (U.S. EPA) for approval and use in the 2001 San Francisco Bay Area State Implementation Plan (Bay Area SIP) and subsequent Bay Area conformity determinations.

SF Bay Area-EMFAC 2000 is tailored specifically to the San Francisco Bay Area. The emission factors contained in SF Bay Area-EMFAC 2000, along with updated activity data from the Metropolitan Transportation Commission (MTC), provide the basis for the mobile source emissions budgets in the 2001 Bay Area SIP. SF Bay Area-EMFAC 2000 will be used for subsequent Bay Area conformity determinations. At a public meeting on November 1, 2001 the ARB Board approved SF Bay Area-EMFAC 2000 for these purposes following a 30-day public notice. At the time the Bay Area SIP was being developed, this model was the most current emission factor model available. SF Bay Area-EMFAC 2000 was based on EMFAC2000. The documentation for EMFAC2000 was publicly available beginning in May 2000 and made available for use by the Bay Area Air Quality Management District when it began developing the 2001 Bay Area SIP in November 2000.

The three Bay Area co-lead agencies responsible for developing the Bay Area SIP have committed to do a mid-course review of the Bay Area SIP by December 31, 2003 and revise the 2001 SIP by March 2004. ARB has committed to submit the revised Bay Area SIP to U.S. EPA by April 15, 2004. The mid-course review will use the most current emission factor model available at that time to develop the mobile source emissions budgets. This model will be EMFAC2001 or its successor.

This transmittal provides documentation of the emission factors and activity data used in SF Bay Area-EMFAC 2000 to develop the 2001 Bay Area SIP. In addition, it includes the methodology ARB will be using to conduct Bay Area conformity determinations.

SF Bay Area-EMFAC 2000 Emission Factor Model Documentation

Comparison between MVEI7F/7G and SF Bay Area-EMFAC 2000

The emission factors used in the SF Bay Area-EMFAC 2000 emission factor model represent a major improvement over emission factors used in older models such as MVEI7F and MVEI7G. SF Bay Area-EMFAC 2000 exhaust hydrocarbon emission rates are significantly higher than the emission rates included in the older models. The increase in exhaust hydrocarbon rates is mainly a result of the following changes:

- More accurately reflecting real-world driving by using the Unified Cycle (UC) driving cycle rather than the Federal Test Procedure (FTP);
- Using new speed adjustment factors to better reflect how emissions change as average driving speeds change;
- Representing 45 model years, rather than only 35; and
- Incorporating new vehicle test data.

Evaporative hydrocarbon emission rates in SF Bay Area-EMFAC 2000 are also significantly higher than the older models' emission rates. The most important changes causing the increase in evaporative hydrocarbon emission rates include:

- Higher hot soak emission rates, especially for older catalyst-equipped vehicles;
- Higher running loss emission rates, based on new data; and
- Including emissions for vehicles with liquid fuel leaks.

Emission rates for oxides of nitrogen (NOx) are also significantly higher in SF Bay Area-EMFAC 2000 than in the older models. The increased estimates of NOx emission rates are primarily due to the following changes:

- Inclusion of "off-cycle NOx" (i.e., NOx emissions that were not represented in the certification driving cycle); and
- Incorporation of new vehicle test data for catalyst equipped passenger cars and light trucks.

Incorporation of Latest Standards

SF Bay Area-EMFAC 2000 also includes the effects of recently adopted standards on the emissions of the on-road fleet. The future year emission rates in SF Bay Area-EMFAC 2000 reflect the adopted standards described below.

<u>Supplemental Federal Test Procedure</u>
Two supplemental test procedures to the FTP were adopted by the Board in July of 1997. These new standards are applicable to passenger cars, light-duty trucks, and medium-duty vehicles weighing 8,500 pounds or less. These standards require the

control of excess emission of hydrocarbon and oxides of nitrogen during “off-cycle” operations (high speed and hard acceleration), and excess emissions associated with the use of air conditioning. The new standards are to be phased-in between 2001 and 2005.

Low Emission Vehicles (LEVII)

The second phase of Low Emission Vehicle Standards (LEVII) was adopted by the Board in November of 1998. This action imposed more stringent hydrocarbon, carbon monoxide, NOx and exhaust particulate matter emissions standards for passenger cars, light-duty trucks and medium-duty vehicles up to 14,000 pounds sold in California beginning in 2003.

Near Zero Evaporative Standards

Also in November 1998, the Board adopted new standards for the emissions of evaporative hydrocarbons (diurnal, hot soak and resting loss). The standards were reduced from 2 grams per test (hot soak plus diurnal) for passenger cars, to 0.5 grams per test.

New On-Road Motorcycle Standards

In December of 1998, the Board adopted lower exhaust emission standards for on-road motorcycles. These standards, which may require future motorcycles to utilize catalytic converters, are applicable to new motorcycles sold in California beginning in 2004.

Off-Cycle NOx Mitigation

In a settlement reached between the federal government, the Air Resources Board and heavy-duty engine manufacturers, several mitigation measures were agreed to regarding off-cycle NOx emissions. In addition to ending the practice of defaulting to an advanced timing condition during extended cruise operation, several manufacturers have agreed to perform “low emission” rebuilds for in-use engines. These rebuilds will lower the emissions of the in-use fleet.

New Exhaust Emissions Standards for Urban Transit Buses

In February of 2000, the Board adopted a regulation that allows transit agencies the choice between either a diesel or alternative fuel “path” to lower emissions. Beginning in 2002, over the course of 10 years, this regulation requires increased introduction of

cleaner engine buses in transit agencies' fleets, use of cleaner diesel fuel, retrofits to reduce exhaust particulate matter (PM) emissions from older diesel buses, and use of zero-emission buses (ZEBs).

Public Review

The emission factors used in SF Bay Area-EMFAC 2000 were developed in a 3-year process and were subject to public review and comment during three workshops held in 1998, 1999, and 2000. Throughout the comment period, ARB received a number of written and verbal comments, which were addressed in the development of the emission factor model.

Further detail regarding the development of the SF Bay Area-EMFAC 2000 emission factor model may be found in the attached Technical Support Documentation. The Technical Support Documentation refers to broader work on the statewide EMFAC2000 emission factor model, but also applies to the region specific SF Bay Area-EMFAC2000.

Activity Data Documentation

The Bay Area vehicle miles traveled (VMT), VMT growth rates, and VMT-speed distributions incorporated into SF Bay Area-EMFAC 2000 represent the best current activity data estimates available. The derivation of these estimates are explained below.

Vehicle Miles of Travel

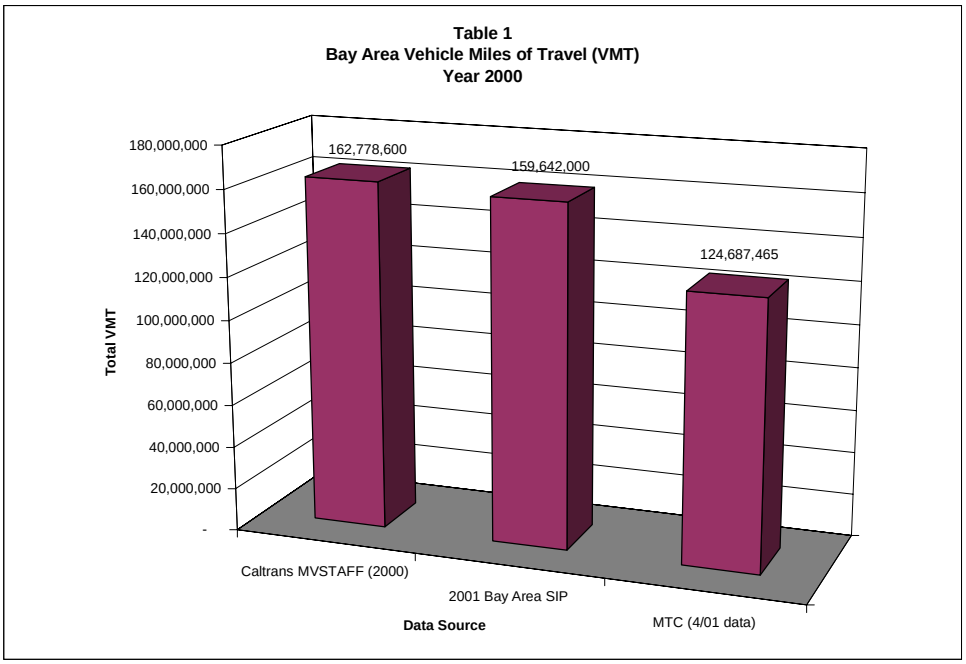
Bay Area VMT estimates for calendar year 2000 are based on the ARB VMT estimation methodology using mileage accrual rates derived from Smog Check odometer data and Department of Motor Vehicle vehicle populations (see Section 7 of the attached Technical Support Documentation for further detail on the ARB VMT estimation methodology).

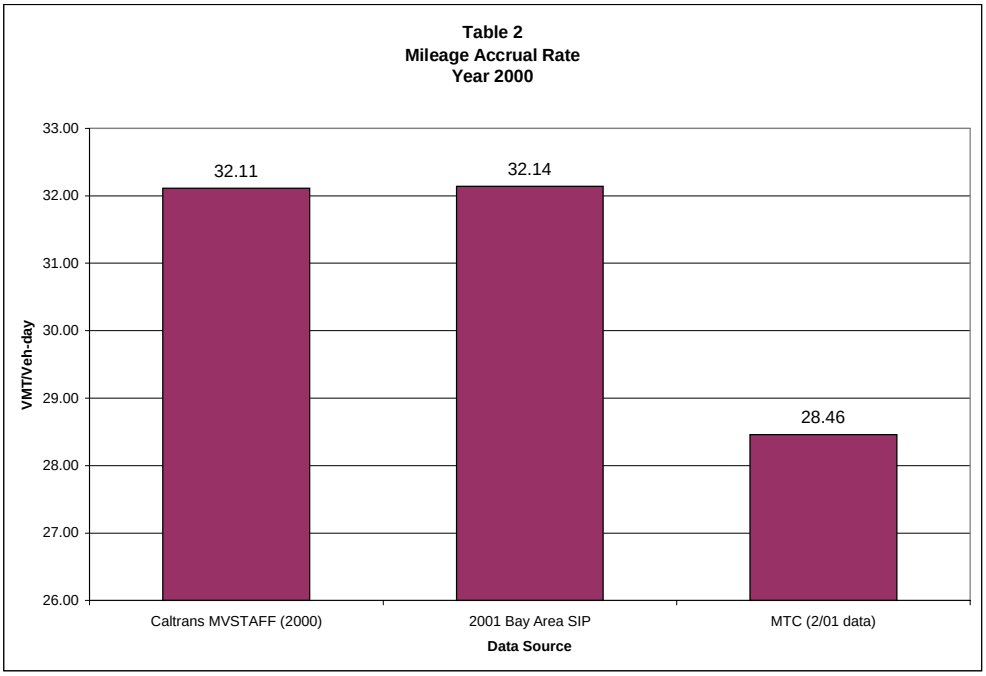
The decision to use ARB's VMT estimate instead of the VMT estimate from MTC's BAYCAST-90 travel demand model for calendar year 2000 was made in an agreement between MTC and ARB. As Table 1 illustrates, MTC's 2000 VMT estimate for the region is about 22 percent lower than both ARB and Caltrans' estimates. The ARB and Caltrans[1] methods for estimating VMT were developed independently of each other, yet fall within 1 percent of each other.
Additional justification for using the ARB VMT estimation methodology is found in the estimate of the number of miles driven by each vehicle per day (i.e., the mileage accrual

[1] Caltrans' VMT estimate was taken from the annual "Motor Vehicle Stock, Travel, and Fuel Forecast" (MVSTAFF) report. The MVSTAFF report forecasts statewide VMT based on statewide vehicle population data from the DMV, fuel consumption estimates from the Board of Equalization, and fuel economy estimates derived from the national fuel economy standards. Statewide VMT estimates are then disaggregated to the county level using county auto registration and road system mileage ratios.

rate). Table 2 compares mileage accrual rates from various data sources. MTC's estimates appear too low to be consistent with odometer readings collected in the Smog Check program. MTC's mileage accrual estimates are 11 percent lower than both Caltrans' ARB's estimates for the Bay Area.

For the purposes of the 2001 Bay Area SIP, MTC agreed to use ARB's 2000 VMT estimate. It was also agreed that the difference in VMT between ARB's and MTC's calendar year 2000 VMT estimates would be used as a "correction" for all future analysis years.





VMT Growth Rates

In the agreement between ARB and MTC, ARB agreed to use MTC's VMT growth rate as implied by the VMT estimates produced by BAYCAST-90. The rationale for this is that while ARB questions the level of travel in calendar year (CY) 2000 as estimated by MTC's travel demand model, ARB is not questioning future year growth projections included in the travel demand model.

VMT-Speed Distributions

The final pieces of activity data provided by MTC and incorporated into SF Bay Area-EMFAC 2000 are the VMT-speed distributions for two calendar years (2000 and 2005). Based on consultation between MTC and ARB staff, ARB incorporated the VMT-speed distributions into SF Bay Area-EMFAC 2000 by applying CY2000 speed distributions to CYs 2000-2003, and CY2005 speed distributions to CYs 2004+.

Methodology for Bay Area Conformity Determinations

For all Bay Area conformity determinations based on the mobile source emissions budgets set in the Bay Area SIP (using SF Bay Area-EMFAC 2000), the following step-wise methodology will be followed:

1. MTC will submit to ARB updated VMT-speed distributions and updated VMT estimates by county for all relevant analysis years. ARB will follow the procedures below for analysis years for which MTC does not submit new activity data (i.e. for which activity data does not change from MTC's original SIP submittal):
    - ARB will use the speed distributions submitted by MTC for the most recent calendar year prior to the analysis year of interest. For example, if MTC submits new VMT-speed distributions for 2005 and 2010, but not for the 2006 analysis year, the 2006 analysis year will use the speed distributions submitted for 2005. VMT-speed distributions will not be interpolated.
    - The VMT estimate for each county will be interpolated using county-specific compounded growth rates.[2] The interpolated VMT will then be used for the following steps.

2. ARB will calculate VMT for the portions of Sonoma and Solano Counties that fall in the San Francisco (S.F.) Air Basin. This is necessary since the SIP budgets are based on the S.F. Air Basin (which covers only the southern portions of Solano and Sonoma Counties), while the MTC VMT estimates include the full nine Bay Area counties. The county portions will be calculated by multiplying the full county VMT submitted by MTC by the VMT ratio (partial county/county) derived from SF Bay Area-EMFAC 2000.[3] In year 2000, about 71 percent of Solano County, and 77 percent of Sonoma County VMT occurred in the S.F. Basin.

3. ARB will calculate the year 2000 difference in VMT between the VMT estimate included in the SF Bay Area-EMFAC 2000 runs[4] and the VMT estimate submitted by MTC for conformity.[5] The resulting differences by county represent the VMT "correction" between ARB and MTC's VMT estimates.

4. The VMT correction will be added by county to the submitted VMT for all analysis years, resulting in the "target" VMT estimate that will be used for the conformity modeling runs.[6]

---

[2] For example, 2006 VMT is interpolated from 2005 and 2010 VMT estimates submitted by MTC by the following equation: $VMT_{2006} = (VMT_{2010} / VMT_{2005})^{0.2} * VMT_{2005}$

[3] For the S.F. Basin portions of Solano and Sonoma County VMT:
S.F. Basin County Portion VMT_{MTC} = [S.F. Basin County Portion $VMT_{SFBayArea\text{-}EMFAC2000}$ / Total County VMT $_{SFBayArea\text{-}EMFAC2000}$] * Total County VMT_{MTC}

[4] SF Bay Area-EMFAC 2000 calculates VMT based on Smog Check odometer readings and DMV vehicle registration data for light duty vehicle classes, and instrumented truck data for the truck classes.

[5] VMT $correction_{county\ a}$ = SIP VMT_{CY2000} – MTC VMT_{CY2000}

[6] Target $VMT_{county\ a}$ = MTC $VMT_{county\ a}$ + VMT $correction_{county\ a}$

5. The county-specific target VMT in the conformity modeling runs will be achieved in SF Bay Area-EMFAC 2000 by modifying the county-specific vehicle populations in SF Bay Area-EMFAC 2000 using the What-if-Scenario (WIS) option. Since vehicle population and VMT are linearly related in SF Bay Area-EMFAC 2000, to obtain the "target" vehicle population, ARB staff will take the ratio between the SIP VMT estimates and the target VMT for each analysis year and apply them to the SIP vehicle population estimates for each respective analysis year.[7]

6. Once the target vehicle populations have been calculated, ARB staff will run SF Bay Area-EMFAC 2000 using the WIS option to adjust vehicle populations by county, and incorporate any updated speed distributions.

7. ARB staff will then apply control factors to the model output to adjust for emission reduction measures not included in the SF Bay Area-EMFAC 2000 emission factor model or changed since the model was developed.

8. Finally, ARB staff will compare the results to the SIP budgets for the conformity demonstration.

If you have questions regarding this submittal, you may contact me at (916) 445-4383, or have your staff contact Ms. Cynthia Marvin, Chief of the Air Quality and Transportation Planning Branch, at (916) 322-7236.

Sincerely,

/s/

Michael P. Kenny
Executive Officer

Enclosures

cc: See next page.

[7] Target Veh Pop = [((Target VMT – SIP VMT) / SIP VMT) * SIP Veh Pop] + SIP Veh Pop

cc: (w/o Enclosures)
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U.S. Environmental Protection Agency
Region IX
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San Francisco, California 94105

Ms. Ellen Garvey, Executive Officer
Bay Area Air Quality Management District
939 Ellis Street
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Mr. Steve Heminger, Executive Director
Metropolitan Transportation Commission
101 Eighth Street
Oakland, California 94607

Mr. Eugene Leong, Executive Officer
Association of Bay Area Governments
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Ms. Cynthia Marvin
Air Resources Board

January 2003

Recommended Methods for Use of EMFAC2002 To Develop Motor Vehicle Emissions Budgets and Assess Conformity

As the agency charged with estimating motor vehicle emissions for air quality plans, the Air Resources Board (ARB) has improved the EMFAC modeling tool for use in combination with estimates of vehicle population and activity to develop motor vehicle emissions budgets and assess transportation conformity. The most recent version of this tool, EMFAC2002, has been transmitted to the U.S. Environmental Protection Agency (U.S. EPA) for approval for use in State Implementation Plans (SIPs) and conformity assessments. This paper describes the recommended practices for ARB, air districts, metropolitan planning agencies (MPOs) and regional transportation planning agencies (RTPAs) to use vehicle activity in conjunction with EMFAC2002 emission rates to calculate emissions budgets and conduct conformity assessments.

The vehicle activity indicators commonly used to develop emissions inventories are vehicle trips and vehicle miles of travel (VMT) by speed, vehicle class and time of day. Though not a direct measure of travel activity, vehicle population may also be a variable for these purposes, as described below.

Vehicle trips. In California, MPOs and RTPAs use demographic forecasts and travel demand models to develop estimates of current and future daily VMT, daily vehicle trips and average travel speeds for links in the transportation network. ARB separately estimates daily vehicle trips, but defines trips as the number of times a vehicle is started, rather than a number of specific daily destinations. This distinction is important; ARB and U.S. EPA studies find that vehicles are started five to six times per day, while trips associated with destinations as reported through travel surveys and predicted in travel demand models occur three to four times per day. Because start emissions and the duration of time between starts are crucial to emissions estimation, ARB equates vehicle trips with vehicle starts. Though EMFAC2002 permits model users to alter estimates of vehicle trips used to estimate emissions, ARB recommends that the model's default estimates of vehicle trips (starts), developed from instrumented vehicle studies, be used for air quality planning and conformity purposes.[1] Alternatively, for vehicle classes where appropriate local data are made available for review through the interagency consultation process, use of trip factoring or other methods to fully account for vehicle starts may be employed. Such alternative approaches should be discussed in the interagency consulation process.

[1] An exception would occur when a user chooses to factor these start-based trips to account for trip reduction programs. EMFAC2002 start-based trips rather than destination-based trips should serve as the baseline for this adjustment. The adjustment would be made through the What-If Scenario (WIS) function of EMFAC2002 as follows, where TRS denotes the trip reduction scenario:

*WIS Input TRS Trips = EMFAC Default Trips * (RTPA TRS Trips / RTPA Baseline Trips)*

Vehicle speeds. Most travel demand models provide output of estimated average speed by time period and link that may be summarized for use in EMFAC2002. For each major vehicle class and up to 24 hourly time periods, total VMT is divided into 13 different speed "bins" (5 mph through 65 mph) and used as input to EMFAC2002. ARB recommends continuation of this current practice to develop emissions budgets and assess conformity. Travel from intrazonal trips should be assigned to the appropriate speed bin based on the speed assigned to that travel in the travel demand model. VMT for each speed bin and time period can be used as input through the WIS function of EMFAC2002. It is also possible to input this data specific to vehicle class if adequate and defensible local data are available.

Vehicle population. Vehicle trips (starts) in EMFAC2002 are estimated as a function of the number of vehicles, or vehicle population, by county. The population of each class of motor vehicle is estimated and forecast from Department of Motor Vehicles (DMV) registration data. EMFAC2002 assumes there is a relationship between vehicle population and VMT, carried through mileage accrual rates.[2] In the default case, the model assumes *vehicle population * mileage accrual = VMT.* ARB-preferred practice is to maintain this internal consistency, for reasons explained below.

Vehicle miles of travel. Daily VMT is both an emissions model input usually provided by MPOs/RTPAs and a model output used to estimate exhaust emissions. ARB staff reviews MPO/RTPA estimates of VMT and vehicle speeds, and supports these estimates for use in air quality plans whenever we agree they are reasonable and defensible. Use of the latest estimates of MPO/RTPA VMT and speeds in plan development facilitates the subsequent federal transportation conformity process. This is particularly important for any year for which the plan creates emissions budgets, as conformity rules allow no emissions budget exceedance, regardless of how small. As there may be some variance between default EMFAC2002 VMT and more recent MPO/RTPA estimates to be used for SIP development, we are recommending a procedure to more exactly incorporate into emissions budgets revised VMT estimates for emissions budget analysis years.

Although it is possible to directly input VMT into EMFAC2002 through the model's WIS function, it is generally not recommended to do this independent of vehicle population because of the desire to properly estimate start and evaporative emissions tied to the size of the vehicle fleet. A change in total forecasted miles of travel implies a change either in the number of vehicles traveling those miles or in mileage accrual rates. For future years, we generally recommend making vehicle population the variable, rather than mileage accrual. Thus, VMT adjustment would usually occur through vehicle population adjustment in the model's WIS function, according to this formula:

*WIS Input Population = EMFAC Default Population * (RTPA VMT / EMFAC Default VMT)*

[2] Accrual rates are miles traveled per year as a function of vehicle age, derived from the Bureau of Automotive Repair Smog Check database as described in Section 7.1 of the EMFAC2000 Technical Support Document, found via http://www.arb.ca.gov/msei/on-road/latest_revisions.htm#pcaccrual.

The result of this modification is that emissions estimates more precisely incorporate the daily VMT provided by each MPO/RTPA to calculate exhaust emissions, and vehicle population is adjusted for consistency with this assumption of higher or lower VMT, providing similarly modified start and evaporative emissions.[3] Though the emissions impact of using this approach will often be small, we believe the approach is appropriate given the desire to fully reflect the impacts of changes in travel activity on all emissions processes. Use of consistent methods in air quality plans and conformity assessments will both reduce potential conformity problems and preserve the integrity of the SIP and conformity processes.

Alternatively, local data may indicate that changes in VMT are tied more closely to changes in household or business rates of travel than to changes in vehicle ownership. Or, improved travel demand modeling may project auto ownership rates with a high degree of confidence. In such cases it may be appropriate to adjust total mileage accrual rather than vehicle population. It is also possible to derive a modified VMT forecast from adjustments to both variables in EMFAC2002. Planning agencies are encouraged to present alternative approaches for consideration in the interagency consultation process.

Recommendations

1. ARB recommends that the EMFAC2002 default estimates of vehicle trips, based on starts per day, be used for SIP development and conformity purposes. Model defaults for trips may be factored to account for trip reduction scenarios, but should not be replaced with estimates that do not account for all vehicle starts. Alternative approaches, such as the factoring of travel demand model trip outputs for appropriate classes to account for additional starts, may be considered through interagency consultation.

2. We recommend continuation of current practices for input of latest speed distributions for SIPs and conformity assessments. Travel from intrazonal trips should be assigned to the appropriate speed bin based on the speed assigned to that travel in the travel demand model.

3. To fully reflect the impacts of modified VMT forecasts on all emissions processes, in the calculation of SIP emissions budgets, and in the assessment of conformity with those budgets, vehicle population should be adjusted in EMFAC2002 proportional to the estimated VMT change. Local circumstances may alternatively support adjustment of mileage accrual rates, subject to interagency consultation.

[3] After adjusting VMT through use of the population variable in the WIS function of EMFAC, a user who desires to match VMT even more exactly (to the mile instead of the tens of miles) can then adjust VMT in the WIS without disturbing the population adjustment. This is unlikely to have a discernible impact on emissions, however.

Appendix G

CALIFORNIA
AIR RESOURCES BOARD

Gavin Newsom, Governor
Jared Blumenfeld, CalEPA Secretary
Mary D. Nichols, Chair

March 5, 2020

Elizabeth Adams
Director, Air and Radiation Division
Region 9
U.S. Environmental Protection Agency
75 Hawthorne Street
San Francisco, California 94105

Dear Ms. Adams:

With this letter, the California Air Resources Board (CARB) is providing to the U.S. Environmental Protection Agency (U.S. EPA) the attached EMission FACtor (EMFAC) Off-Model Adjustment Factors that account for the impacts of the Safer Affordable Fuel-Efficient (SAFE) rule. CARB is seeking U.S. EPA's concurrence that these factors are appropriate for metropolitan planning organizations and regional transportation planning agencies to use in their regional conformity determinations.

CARB has estimated the vehicle tailpipe and evaporative emissions impacts from the SAFE Vehicles Rule Part One: One National Program adopted by U.S. EPA and the National Highway Traffic Safety Administration (NHTSA). The SAFE Vehicles Rule Part One impacts some of the underlying assumptions in the EMFAC2014 and EMFAC2017 models. The attached document provides off-model adjustment factors that can be used to adjust emissions output from the EMFAC model (only EMFAC2014 and EMFAC2017) to account for the impacts of this rule.

If you have any questions or need further information, please contact Dr. Sam Pournazeri, Branch Chief, Mobile Source Analysis Branch at sam.pournazeri@arb.ca.gov or (916) 322-2022.

Sincerely,

Steven S. Cliff, Ph.D.
Deputy Executive Officer

Enclosures

cc: See next page.

cc: (via email)

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EMFAC Off-Model Adjustment Factors to Account for the SAFE Vehicle Rule Part One

November 20, 2019

Summary

Staff at the California Air Resources Board's (CARB) have estimated the vehicle tailpipe and evaporative emissions impacts from the "Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule Part One: One National Program" adopted by the U.S. Environmental Protection Agency (EPA) and the National Highway Traffic Safety Administration (NHTSA). The SAFE Vehicle Rule Part One impacts some of the underlying assumptions in the EMFAC2014 and EMFAC2017 models. This document provides the off-model adjustment factors that can be used to adjust emissions output from EMFAC model (only EMFAC2014 and EMFAC2017) to account for the impacts of this rule.

What is the SAFE Vehicle Rule Part One?

On September 27, 2019, the United States Environmental Protection Agency (U.S. EPA) and the National Highway Traffic Safety Administration (NHTSA) published the "Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule Part One: One National Program." (84 Fed. Reg. 51,310 (Sept. 27, 2019.) The Part One Rule revokes California's authority to set its own greenhouse gas emissions standards and set zero-emission vehicle mandates in California. California expects Part Two of these regulations to be adopted later in the Fall of 2019. We will not know the full impacts of these rules until Part Two is released.

How Does the SAFE Vehicle Rule Impact Criteria Emissions?

As CARB has previously stated[1], both the GHG emission standards and the ZEV sales standards reduce criteria pollutants. As a result of the loss of the ZEV sales requirements, there may be fewer ZEVs sold and thus additional gasoline-fueled vehicles sold in future years. This would increase criteria pollutant emissions in multiple ways. A ZEV inherently has zero evaporative emissions of hydrocarbons in the form of gasoline vapors, which escape from the tank and fuel lines during operation and while parked. A gasoline-fueled vehicle with evaporative emissions is assumed to take the place of each ZEV that will not be sold. This leads to an overall increase in hydrocarbon emissions. Additionally, tailpipe emissions of NOx, hydrocarbons, carbon monoxide, and particulate matter also increase as a result of each additional gasoline-fueled vehicle. This increase occurs for several reasons despite the presence of a criteria pollutant "fleet average" standard[2] that CARB has in place for hydrocarbons

[1] https://ww2.arb.ca.gov/carbs-comments-safe-proposal

[2] The Low Emission Vehicle III program requires manufacturers to average emissions from all vehicles in their fleet to meet the standard. In theory, the elimination of some ZEVs (which are counted in such an

and NOx. First, the fleet average does not apply to particulate matter and carbon monoxide, meaning each incremental gasoline-fueled vehicle generates additional tailpipe emissions of both pollutants. Second, because the fleet average is based on a single test cycle and does not fully capture all operating conditions, additional tailpipe emissions of all criteria pollutants occur for every incremental gasoline-fueled vehicle. Third and most significantly, both tailpipe and evaporative criteria pollutant emissions substantially increase over time due to deterioration of the emission controls on gasoline-fueled vehicles. ZEVs have no such deterioration. Thus, even with the fleet-average standard offsetting a portion of the tailpipe emissions by starting some gasoline-fueled vehicles at lower emission levels early in their life, this slight difference is overwhelmed by the increase in emissions from deterioration over the life of the vehicle.

More stringent ZEV and GHG standards are critical to reach attainment of air quality standards and meet climate needs. If standards cannot become more stringent, these mandates will be very difficult to meet. ZEV technologies, in particular, are needed in both light-duty and heavy-duty fleets to help commercialize this technology. As a result, the long-term threat to air quality is substantial as cleaner technologies, especially ZEVs, do not penetrate the fleet at the scale necessary and emissions are not reduced as needed.

What is EMFAC?

EMission FACtors (EMFAC) is California's federally-approved on-road mobile source emission inventory model that reflects California-specific driving and environmental conditions, fleet mix, and most importantly the impact of California's unique mobile source regulations such as the Low-Emission Vehicle (LEV) program including the LEV II and LEV III standards, California inspection and maintenance programs, and its in-use diesel fleet rules. The EMFAC model supports CARB's regulatory and air quality planning efforts and fulfills the federal Clean Air Act and the Federal Highway Administration's transportation planning requirements. The U.S. EPA has approved both EMFAC2014 and EMFAC2017 for use in state implementation plan (SIP) and transportation conformity analyses. For more information on EMFAC, please visit: https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/msei-modeling-tools.

How Did CARB Analyze the SAFE Vehicle Rule Part One's impact on vehicle emissions?

CARB estimated the change in vehicle emissions of the California light-duty vehicle fleet using its EMission FACtor (EMFAC) model. Both EMFAC2014 and EMFAC2017 default models, with an "annual average" setting, were run to estimate statewide vehicle emissions by calendar year, vehicle category, fuel type, and model year

average as zero emissions) would cause some of the remaining or increased number of gasoline-fueled vehicles to need to be certified to lower (cleaner) levels in order to still meet the same fleet average.

projected to occur under the existing Federal and CARB GHG standards and CARB ZEV requirements that were in place at the time of the analysis. These default results were then adjusted in a post-processing step to reflect the proposed SAFE Vehicle Rule[3]. As a result of freezing new ZEV sales at model year 2020 levels, the projected fleet for 2021 and beyond was modified to reflect a lower number of future ZEVs and a corresponding greater number of future gasoline internal combustion engine vehicles (and thus, a higher portion of vehicle miles traveled (VMT) by gasoline vehicles). The increased number of gasoline vehicles were put into appropriate criteria pollutant certification categories under CARB's Low Emission Vehicle (LEV) III criteria pollutant standards to maintain compliance with the required fleet average.

How is EMFAC impacted by the SAFE Vehicle Rule Part One?

Generally, after the SAFE Vehicle Rule Part One becomes effective on November 26, 2019, EMFAC2014 and EMFAC2017 will not accurately estimate future transportation emissions until they are updated with new assumptions reflecting the SAFE Vehicle Rule Part One in off-model adjustment factors provided by CARB.

What are Off-Model Adjustment Factors and how should they be applied?

CARB has prepared off-model adjustment factors for both the EMFAC2014 and EMFAC2017 models to account for the impact of the SAFE Vehicle Rule Part One. These adjustments provided in the form of multipliers can be applied to emissions outputs from EMFAC model to account for the impact of this rule. The adjustment factors are provided in Table 1 for EMFAC2014 and Table 2 for EMFAC2017 (Note these factors do not include upstream emissions associated with fuel demand, as EMFAC only estimates tailpipe and evaporative emissions).

[3] More details can be found in CARB's letter submitted to US EPA and NHTSA on November 6, 2019 available at: https://www.regulations.gov/document?D=NHTSA-2018-0067-12447

Table 1. Off-Model Adjustment Factors for Gasoline Light Duty Vehicle[4] Emissions in **EMFAC2014**

Adjustment Factors for **EMFAC2014** Gasoline Light Duty Vehicles					
Year	NOx Exhaust	TOG Evaporative	TOG Exhaust	PM Exhaust	CO Exhaust
2021	1.0001	1.0001	1.0001	1.0012	1.0004
2022	1.0002	1.0004	1.0001	1.0034	1.0013
2023	1.0005	1.0008	1.0003	1.0066	1.0026
2024	1.0010	1.0014	1.0005	1.0105	1.0041
2025	1.0016	1.0021	1.0009	1.0149	1.0058
2026	1.0022	1.0030	1.0012	1.0183	1.0076
2027	1.0029	1.0039	1.0016	1.0208	1.0095
2028	1.0036	1.0050	1.0020	1.0224	1.0116
2029	1.0044	1.0063	1.0025	1.0241	1.0139
2030	1.0052	1.0078	1.0030	1.0260	1.0162
2031	1.0061	1.0095	1.0036	1.0279	1.0186
2032	1.0071	1.0114	1.0042	1.0299	1.0210
2033	1.0081	1.0134	1.0050	1.0320	1.0235
2034	1.0091	1.0156	1.0059	1.0341	1.0260
2035	1.0103	1.0179	1.0070	1.0362	1.0285
2036	1.0114	1.0202	1.0082	1.0382	1.0309
2037	1.0125	1.0224	1.0096	1.0400	1.0332
2038	1.0137	1.0247	1.0111	1.0418	1.0353
2039	1.0148	1.0269	1.0126	1.0435	1.0372
2040	1.0158	1.0290	1.0141	1.0449	1.0389
2041	1.0167	1.0309	1.0154	1.0461	1.0404
2042	1.0176	1.0326	1.0168	1.0471	1.0418
2043	1.0183	1.0340	1.0180	1.0480	1.0429
2044	1.0190	1.0352	1.0190	1.0487	1.0439
2045	1.0195	1.0364	1.0199	1.0494	1.0448
2046	1.0200	1.0373	1.0206	1.0499	1.0454
2047	1.0204	1.0384	1.0213	1.0504	1.0461
2048	1.0208	1.0393	1.0218	1.0508	1.0467
2049	1.0209	1.0400	1.0221	1.0510	1.0470
2050	1.0210	1.0406	1.0224	1.0512	1.0472

[4] LDA, LDT1, LDT2 and MDV vehicle categories in EMFAC

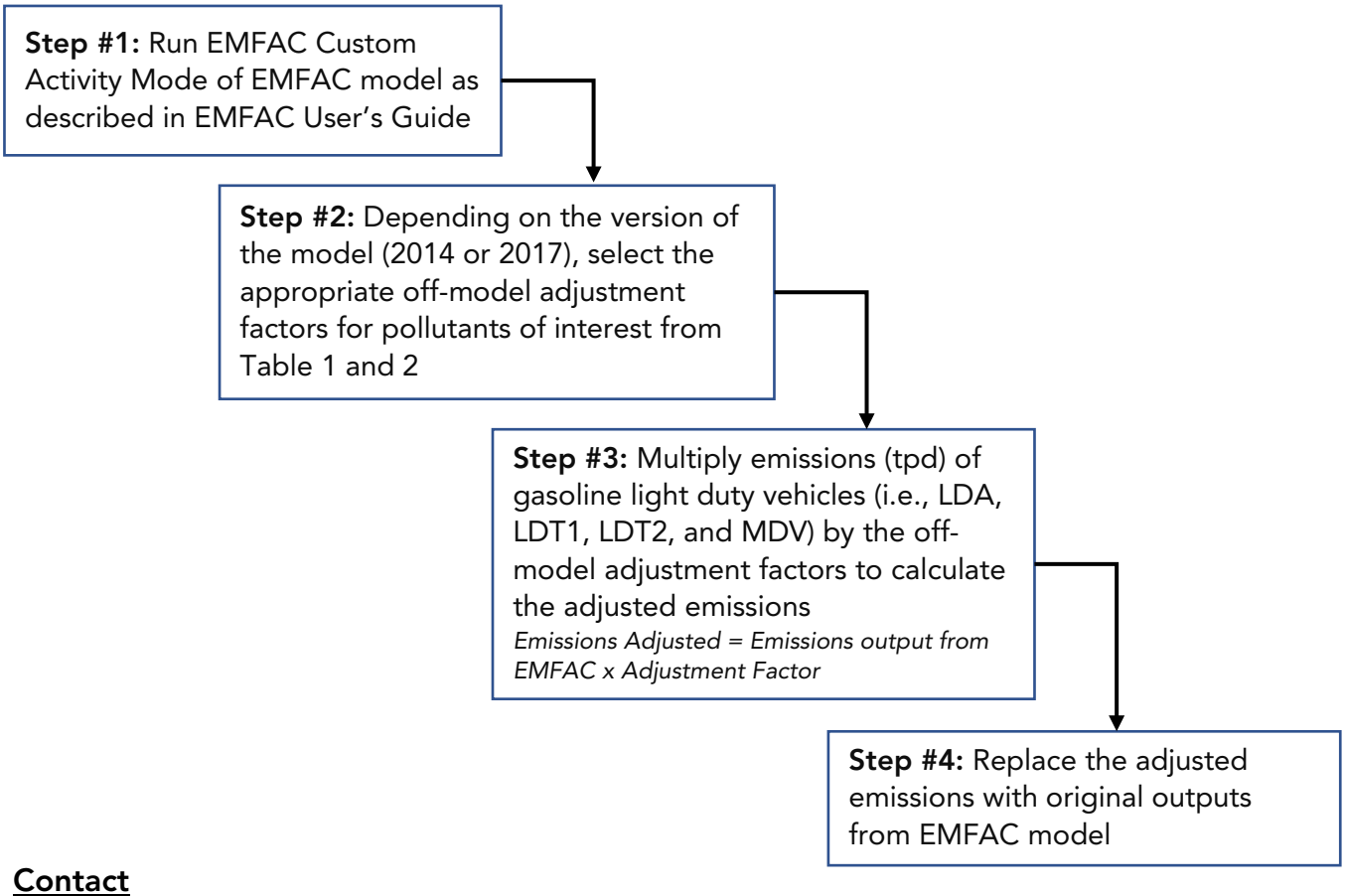
Table 2. Off-Model Adjustment Factors for Gasoline Light Duty Vehicle Emissions in **EMFAC2017**

Adjustment Factors for **EMFAC2017** Gasoline Light Duty Vehicles					
Year	NOx Exhaust	TOG Evaporative	TOG Exhaust	PM Exhaust	CO Exhaust
2021	1.0002	1.0001	1.0002	1.0009	1.0005
2022	1.0004	1.0003	1.0004	1.0018	1.0014
2023	1.0007	1.0006	1.0007	1.0032	1.0027
2024	1.0012	1.0010	1.0011	1.0051	1.0044
2025	1.0018	1.0016	1.0016	1.0074	1.0065
2026	1.0023	1.0022	1.0020	1.0091	1.0083
2027	1.0028	1.0028	1.0024	1.0105	1.0102
2028	1.0034	1.0035	1.0028	1.0117	1.0120
2029	1.0040	1.0042	1.0032	1.0129	1.0138
2030	1.0047	1.0051	1.0037	1.0142	1.0156
2031	1.0054	1.0061	1.0042	1.0155	1.0173
2032	1.0061	1.0072	1.0047	1.0169	1.0189
2033	1.0068	1.0083	1.0052	1.0182	1.0204
2034	1.0075	1.0095	1.0058	1.0196	1.0218
2035	1.0081	1.0108	1.0063	1.0210	1.0232
2036	1.0088	1.0121	1.0069	1.0223	1.0244
2037	1.0094	1.0134	1.0074	1.0236	1.0255
2038	1.0099	1.0148	1.0079	1.0248	1.0265
2039	1.0104	1.0161	1.0085	1.0259	1.0274
2040	1.0109	1.0174	1.0090	1.0270	1.0281
2041	1.0113	1.0186	1.0095	1.0279	1.0288
2042	1.0116	1.0198	1.0099	1.0286	1.0294
2043	1.0119	1.0207	1.0103	1.0293	1.0299
2044	1.0122	1.0216	1.0106	1.0299	1.0303
2045	1.0124	1.0225	1.0109	1.0303	1.0306
2046	1.0125	1.0233	1.0111	1.0308	1.0309
2047	1.0127	1.0240	1.0113	1.0311	1.0311
2048	1.0128	1.0246	1.0115	1.0314	1.0313
2049	1.0128	1.0252	1.0116	1.0316	1.0315
2050	1.0129	1.0257	1.0117	1.0318	1.0316

The off-model adjustment factors need to be applied only to emissions from gasoline light duty vehicles (LDA, LDT1, LDT2 and MDV). Please note that the adjustment factors are by calendar year and includes all model years.

For example, the Custom Activity Mode of EMFAC2014 and 2017 is designed to perform emissions assessments for determining conformity with the state implementation plan. These types of assessments are most often done by various transportation planning agencies and air districts throughout California which require the user to create custom activity data files containing vehicle miles travelled (VMT) and/or speed profile data. This customized activity data will then be used for scaling the default vehicle emissions produced by EMFAC model. The off-model adjustment factors provided in this document can be applied to gasoline light duty vehicle emissions outputs of the EMFAC Custom Activity Mode, as illustrated in Figure 1.

Figure 1. Process to apply EMFAC Off-Model Adjustment Factors



Contact

For questions regarding the EMFAC off-model adjustment factors, please contact us at: EMFAC@arb.ca.gov

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

MAR 12 2020

Steven Cliff, Ph.D.
Division Administration, California Division
California Air Resources Board
1001 I Street
Sacramento, California 95812

Dear Dr. Cliff:

I am responding to your letter of March 5, 2020, requesting U.S. Environmental Protection Agency concurrence that EMFAC2014 and EMFAC2017 off-model adjustment factors can be used for transportation conformity determinations in California.

We understand that the EMFAC off-model adjustment factors are multipliers that would be applied to gasoline vehicle emissions modeled by EMFAC2014 and EMFAC2017. EPA considers these factors to be acceptable for use because the effect of their application is more conservative than necessary. Therefore, these factors may be used in transportation conformity determinations and state implementation plan development.

If you have any questions regarding this letter, please contact me at (415) 972-3183 or Karina O'Connor at (775) 434-8176.

Sincerely,

Elizabeth J. Adams

Elizabeth J. Adams
Director, Air and Radiation Division

cc: Richard Corey, CARB
Kurt Karperos, CARB

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Federal Transit Administration
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90 7th Street
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March 2, 2020

John Busterud
Regional Administrator
U.S. Environmental Protection Agency, Region 9
75 Hawthorne Street
San Francisco, CA 94105

Subject: Appropriate Model for Transportation Conformity In California

Dear Mr. Busterud:

Clean Air Act (CAA) section 176(c) requires that Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) funded or approved highway and transit projects be consistent with ("conform to") the purpose of the State Implementation Plan (SIP). Under the U.S. Environmental Protection Agency's (EPA's) regulations, transportation conformity determinations must be based on the latest emission estimation model available. See 40 CFR section 93.111. The latest EPA approved California EMission FACtor (EMFAC) models are EMFAC2014 and EMFAC2017. See 84 FR 41717 (August 15, 2019).

On September 27, 2019, EPA and the National Highway Traffic Safety Administration (NHTSA) jointly issued the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule Part One: One National Program. This action withdrew the waiver EPA had previously provided to California for that State's greenhouse gas (GHG) program and Zero Emissions Vehicle (ZEV) mandate under section 209 of the Clean Air Act, and finalized regulatory text that made explicit that those State programs would also be preempted under NHTSA's authorities. *See* 84 FR 51310 (September 27, 2019).

In light of the One National Program rule, can you please confirm that FHWA and FTA should continue to use EMFAC2014 and 2017 for transportation conformity determinations in the State of California?

Sincerely yours,

Vincent Mammano
Division Administrator, California Division
Federal Highway Administration

Sincerely yours,

Ray Tellis
Regional Administrator, Region 9
Federal Transit Administration

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

MAR 12 2020

OFFICE OF THE
REGIONAL ADMINISTRATOR

Vincent Mammano
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Federal Highway Administration
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Sacramento, California 95814

Raymond Tellis
Regional Administrator, Region 9
Federal Transit Administration
90 7th Street
San Francisco, California 94103

Subject: Appropriate Model for Transportation Conformity in California

Dear Mr. Mammano and Mr Tellis:

I am responding to your letter of March 2, 2020, requesting the U.S. Environmental Protection Agency (EPA) to confirm that the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) should continue to use EMFAC2014 and EMFAC2017 for transportation conformity determinations in California.

Clean Air Act section 176(c)(1) requires that the latest emissions estimates be used in transportation conformity analyses. The EPA's last approval of an update to the EMFAC model was on August 15, 2019 when EPA approved EMFAC2017, the last major update to EMFAC 2014, the previous version of EMFAC.[1] In our approval action we initiated a two-year grace period for transition to EMFAC2017 for regional transportation conformity analyses and a one-year grace period for project level conformity analyses. The EPA-approved models in California continue to be EMFAC2017, and, during the EMFAC2017 conformity grace periods, EMFAC2014.

The California Air Resources Board (CARB) has developed and recently submitted to the EPA certain EMFAC adjustment factors.[2] We understand these off-model adjustment factors to be multipliers that would be applied to gasoline vehicle emissions modeled by EMFAC2014 and EMFAC2017. EPA considers these factors to be acceptable for use because the effect of their application is more conservative than necessary. Therefore, EPA has informed CARB that these factors may be used in transportation conformity determinations and state implementation plan development.

[1] 84 FR 41717.
[2] Letter dated March 5, 2020 from Steven S Cliff, Ph.D., Deputy Executive Officer, CARB to Elizabeth Adams, Director, Air and Radiation Division, EPA, Region 9.

If you have any questions regarding this letter, please contact me at (415) 947-4235 or Elizabeth Adams at (415) 972-3183.

Sincerely,

for John W. Busterud
Regional Administrator, Region IX.

cc Richard Corey, California Air Resources Board
Steven Cliff, California Air Resources Board
Kurt Karperos, California Air Resources Board

Appendix H

Glossary

Area Source Small stationary and non-transportation pollution sources that are too small and/or numerous to be included as point sources but may collectively contribute significantly to air pollution (e.g., dry cleaners).

Attainment Area An area considered to have air quality that meets or exceeds the U.S. EPA national ambient air quality standards, which EPA establishes according to the requirements of the Clean Air Act. An area may be an attainment area for one pollutant and a nonattainment area for others. Nonattainment areas are areas designated by EPA as not meeting a standard for a pollutant.

Carbon Monoxide (CO) A colorless, odorless, tasteless gas formed in large part by incomplete combustion of fuel. Human activities (e.g., transportation or industrial processes) are largely the source for CO contamination in ambient air.

Congestion Management and Air Quality Improvement (CMAQ) Program A categorical funding program under the Federal-aid Highway Program. CMAQ directs funding to projects that contribute to meeting or maintaining national ambient air quality standards in nonattainment and maintenance areas. CMAQ funds generally may not be used for projects that result in the construction of new capacity available to SOVs (single-occupant vehicles).

Emissions Inventory A complete list of sources and amounts of pollutant emissions within a specific area and time interval.

Environmental Protection Agency (EPA) The Federal regulatory agency responsible for administering and enforcing Federal environmental laws including the Clean Air Act, the Clean Water Act, the Endangered Species Act, and others.

Federal Highway Administration (FHWA) An agency of the U.S. Department of Transportation that provides financial and technical support for constructing, improving, and preserving America's highway system.

Federal Transit Administration (FTA) An agency of the U.S. Department of Transportation that provides stewardship of combined formula and discretionary programs to support a variety of locally planned, constructed, and operated public transportation systems throughout the United States.

High Occupancy Vehicles (HOVs) Generally applied to vehicles carrying two or more people; freeways, expressways, and other large volume roads may have lanes designated for use by carpools, vanpools, and buses. The term HOV is also sometimes used to refer to high-occupancy vehicle lanes themselves.

Highway Term applies to roads, streets, and parkways, and also includes rights-of-way, bridges, railroad crossings, tunnels, drainage structures, signs, guardrails, and protective structures in connection with highways.

Hydrocarbons (HC) Colorless gaseous compounds originating from evaporation and the incomplete combustion of fossil fuels.

Inspection and Maintenance Program (I/M) An emissions testing and inspection program implemented to ensure that the catalytic or other emissions control devices on in-use vehicles are properly maintained over time.

Land Use Refers to the manner in which portions of land or the structures on them are used (i.e., commercial, residential, retail, industrial, etc.).

Lapse Means that the conformity determination for a metropolitan transportation plan or TIP has expired, and thus there is no currently conforming metropolitan transportation plan and TIP.

Maintenance Area Any geographic region of the United States previously designated nonattainment pursuant to the CAA Amendments of 1990 and subsequently re-designated to attainment subject to the requirement to develop a maintenance plan under Section 175A of the CAA, as amended.

Metropolitan Planning Organization (MPO) The policy board of an organization created and designated to carry out the metropolitan transportation planning process.

Metropolitan Transportation Plan The official multimodal metropolitan transportation plan addressing no less than a 20-year planning horizon that is developed, adopted, and updated by the MPO through the metropolitan transportation planning process.

Metropolitan Transportation Plan/TIP Amendment A revision to a metropolitan transportation plan or TIP that involves a major change to a project included in a metropolitan transportation plan or TIP including the addition or deletion of a project or a major change in project cost, project/project phase initiation dates, or a major change in design concept or design scope (e.g., changing project termini or the number of through traffic lanes). Changes to projects that are included only for illustrative purposes do not require an amendment. An amendment is a revision that requires public review and comment, re-demonstration of fiscal constraint, or a conformity determination (for those involving "non-exempt" projects in nonattainment and maintenance areas).

Metropolitan Transportation Plan/TIP Update Making current a metropolitan transportation plan or TIP through a comprehensive review. Updates require public review and comment, a 20-year horizon year for the metropolitan transportation plan, a four-year program period for TIPs, demonstration of fiscal constraint, and a conformity determination (in nonattainment and maintenance areas).

Mobile Sources Include motor vehicles, aircraft, seagoing vessels, and other transportation modes. The mobile source related pollutants are carbon monoxide, hydrocarbons or volatile organic compounds, nitrogen oxides, and particulate matter.

Mode A form of transportation such as an automobile, bus, or bicycle.

Motor Vehicle Emissions Budget (MVEB) That portion of the total allowable emissions defined in the submitted or approved control strategy implementation plan revision or maintenance plan for a certain date for the purpose of meeting reasonable further progress milestones or demonstrating attainment or maintenance of the NAAQS, for any criteria pollutant or its precursors, allocated to highway and transit vehicle use and emissions.

National Ambient Air Quality Standards (NAAQS) Those standards established pursuant to Section 109 of the CAA. Conformity applies in areas that are nonattainment or maintenance for one or more of the NAAQS of the transportation-related pollutants: ozone, carbon monoxide, nitrogen dioxide, and particulate matter.

National Environmental Policy Act (NEPA) The National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 et seq.). It is the major legislation that requires Federal actions to address potential environmental impacts.

Nitrogen Oxides (NO_x) A group of highly reactive gases that contain nitrogen and oxygen in varying amounts. Many of the nitrogen oxides are colorless and odorless. NO_x is formed when the oxygen and nitrogen in the air react with each other during combustion. The primary sources of nitrogen oxides are motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuels.

Nonattainment Area Geographic region of the United States that the EPA has designated as not meeting the NAAQS.

Oxygenated Gasoline Gasoline enriched with oxygen-bearing liquids to reduce CO production by permitting more complete combustion.

Ozone (O_3) A pollutant that is not directly emitted from transportation sources. It is a secondary pollutant formed when HC and NO_x combine in the presence of sunlight. Ozone is associated with smog or haze conditions. Although the ozone in the upper atmosphere protects us from harmful ultraviolet rays, ground-level ozone produces an unhealthy environment in which to live. Ozone is created by human and natural sources.

Particulate Matter (PM, $PM_{2.5}$, PM_{10}) Any material that exists as solid or liquid in the atmosphere. Particulate matter may be in the form of fly ash, soot, dust, fog, fumes, etc. Particulate matter can be of such a small size that it cannot be filtered by the nose and lungs. PM_{10} is particulate matter that is less than 10 microns in size. $PM_{2.5}$ is particulate matter that is less than 2.5 microns in size. A micron is one millionth of a meter.

Parts Per Million (PPM) A measure of air pollutant concentrations.

Public Participation The active and meaningful involvement of the public in the development of metropolitan transportation plans and programs.

Public Transportation Generally refers to passenger service provided to the general public along established routes with fixed or variable schedules at published fares. Related terms include: public transit, mass transit, urban transit, and paratransit.

Reformulated Gasoline (RFG) Gasoline specifically developed to reduce undesirable combustion products.

State Implementation Plan (SIP) The State air quality plan for meeting the National Ambient Air Quality Standards ("NAAQS" or "air quality standards"). It is a compilation of legally enforceable rules and regulations prepared by a State or local air quality agency and submitted by the State's governor to EPA for approval. A SIP is designed to achieve better air quality by attaining, making progress toward attaining, or maintaining the NAAQS.

Stationary Source Relatively large, fixed sources of emissions (e.g., chemical process industries, petroleum refining and petrochemical operations, or wood processing).

Telecommuting The substitution, either partially or completely, of transportation to a conventional office through the use of computer and telecommunications technologies (e.g., telephones, personal computers, modems, facsimile machines, electronic mail).

Transportation Conformity Process to assess the compliance of any metropolitan transportation plan, program, or project with air quality implementation plans. The conformity process is defined by the Clean Air Act and regulated by the conformity rule.

Transportation Control Measures (TCMs) Any measure that is specifically identified and committed to in the applicable implementation plan, including a substitute or additional TCM that is incorporated into the applicable SIP through the process established in the CAA Section 176(c)(8), that is either one of the types listed in Section 108 of the CAA, or any other measure for the purpose of reducing emissions or concentrations of air pollutants from transportation sources by reducing vehicle use or changing traffic flow or congestion conditions. Notwithstanding the first sentence of this definition, vehicle technology-based, fuel-based, and maintenance-based measures that control the emissions from vehicles under fixed traffic conditions are not TCMs for the purposes of transportation conformity.

Transportation Improvement Program (TIP) A prioritized listing/program of transportation projects covering a period of four years that is developed and formally adopted by an MPO as part of the metropolitan transportation planning process, consistent with the metropolitan transportation plan, and required for projects to be eligible for funding under Title 23 USC and Title 49 USC Chapter 53.

Vehicle Miles Traveled (VMT) The sum of distances traveled by all motor vehicles in a specified region.

Volatile Organic Compounds (VOCs) VOCs come from vehicle exhaust, paint thinners, solvents, and other petroleum-based products. A number of exhaust VOCs are toxic, with the potential to cause cancer.

Source: FHWA 2017