METROPOLITAN
TRANSPORTATION
COMMISSION

Bay Area Metro Center
375 Beale Street, Suite 800
San Francisco, CA 94105
415.778.6700

Association of
Bay Area Governments

Bay Area Metro Center
375 Beale Street, Suite 700
San Francisco, CA 94105
415.820.7900

Plan BayArea 2040

April 12, 2017

Ms. Nicole Dolney
California Air Resources Board
1001 I Street
Sacramento, 95814

RE: Technical Methodology to Estimate Greenhouse Gas Emissions

Dear Ms. Dolney:

Please find enclosed a revised summary of the technical methods the Metropolitan Transportation Commission (MTC) plans to use in the development and analysis of our Sustainable Communities Strategy as required by Senate Bill 375. This methodology was revised through consultations with the California Air Resources Board (ARB).

On June 23, 2016, MTC submitted its initial summary of the technical methodology to estimate greenhouse gas emissions to ARB. Upon receipt, ARB reviewed the methodology and provided feedback on the technical methodology. In response, MTC revised the methodology to provide additional details, particularly in relation to Regional Forecasting and Off-Model Analyses. MTC and ARB worked collaboratively to ensure the proposed methodology would yield accurate estimates of greenhouse gas emissions. We seek written confirmation of your approval of this methodology as required by California Government Code Section 65080(b)(2)(J)(i).

If you have any questions about the enclosed document, please feel free to contact Adam Noelting at (415) 778-5366.

Sincerely,

Alix A. Bockelman
Deputy Executive Director, Policy

AB : an

Enc: Technical Methodology to Estimate Greenhouse Gas Emissions

TECHNICAL METHODOLOGY TO ESTIMATE GREENHOUSE GAS EMISSIONS

Per Senate Bill 375 (SB 375), the Metropolitan Transportation Commission (MTC) submits the following description of the technical methods we intend to use in the estimation of greenhouse gas (GHG) emissions for the San Francisco Bay Area's 2017 Regional Transportation Plan (RTP) and Sustainable Communities Strategy (SCS) (herein called "Plan Bay Area 2040").

INTRODUCTION

In July 2013, MTC and the Association of Bay Area Governments (ABAG) adopted *Plan Bay Area*[1], the Bay Area's first RTP/SCS as required by California SB 375. SB 375 gives MTC and ABAG joint responsibility for developing the SCS. In general, ABAG is responsible for regional households and jobs forecasts, and MTC for identifying transportation needs and forecasting travel data. The legislation also states that the two agencies are jointly responsible for "set(ting) forth a forecasted development pattern for the region, which, when integrated with the transportation network, and other transportation measures and policies, will reduce the greenhouse gas emissions from automobiles and light trucks to achieve, if there is a feasible way to do so, the greenhouse gas emission reduction targets approved by the state board."

The Air Resources Board (ARB) approved per-capita GHG emission reduction targets for the Bay Area are 7% in 2020 and 15% in 2035, relative to 2005. An overview of the technical methods we intend to use to estimate GHG emissions from Plan Bay Area 2040 are described in the "Technical Methodology" section below.

TECHNICAL METHODOLOGY

Regional Forecasting

By regional forecasting, we mean the process of creating regional estimates of households and jobs. The regional forecasting approach for Plan Bay Area 2040 uses a combination of two widely accepted models for population and employment analysis, customized for the Bay Area.

ABAG uses both customized and in-house models to project economic activity, population growth and composition, household growth, income distribution, and the regional housing control total. These are schematically diagrammed in Figure 1.

The Pitkin-Myers model for the Bay Area produced an initial range of population projections based on different levels of in-migration to the region and a benchmark for comparison of the demographic composition of the population. The ABAG Economic-Demographic Model is built on the structure of a Regional Economic Modeling Inc. (REMI) regional model, with adjustments to reflect characteristics of the Bay Area economy and expectations for sectoral change at the national level through 2040. The ABAG-REMI model produces projections of employment, gross regional product, and labor force. This model also produces the final population projection, after verification with the earlier population analysis, to maintain consistency between the population, employment, output and total personal income estimates.

[1] Additional information on *Plan Bay Area* is available at http://planbayarea.org/the-plan/adopted-plan-bay-area-2013.html

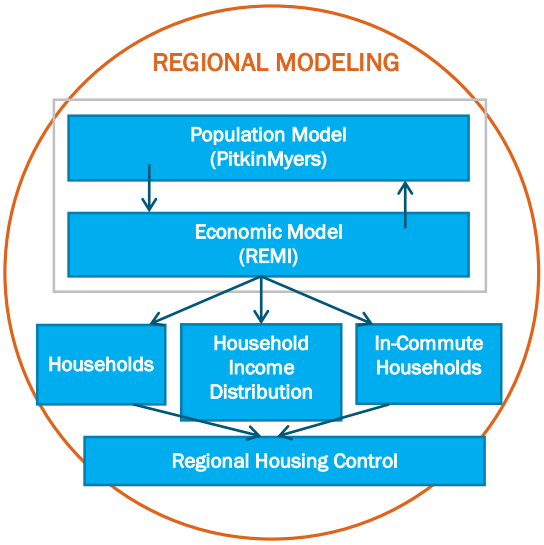


Figure 1:
Components the Regional Forecasting Process

The household, income distribution, in-commuting and regional housing control total estimates are each built around the projections from the ABAG-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, middle-low, middle-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.

In-commuting is estimated through two different methods, based on the ABAG-REMI output. The regional housing control total combines information from the household projections module and the in-commuting assessment to produce an estimate of total housing units needed for the region. The housing stock is assumed to allow a five percent vacancy, while providing housing units for the projected households plus for the number of households that would be associated with any increase in in-commuting.

ABAG consulted with a technical advisory committee in the initial stages of model design and before selection of the first draft forecast, with experts on the structure of the models (John Pitkin, Dowell Myers, and REMI staff), and with Stephen Levy or the Center for Continuing Study of the California Economy in developing the regional projections. The projections process was also presented in workshop and conference settings. ABAG's Executive Board adopted the regional forecast in February 2016.[2]

Land Use Development Simulation Tool

The regional forecasting tools described above provide regional growth control totals to MTC's land use development simulation tool, which we refer to as *Bay Area UrbanSim*. *Bay Area UrbanSim* is a spatially explicit economic model that forecasts future firm and household locations. We used a version of the *Bay Area UrbanSim* model to inform the environmental assessment of our first RTP/SCS. Significant upgrades to the model have been made since then, including updating the base year data, refactoring the application software, and refining the model specifications.

Bay Area UrbanSim forecasts future land use change starting from an integrated (across different source data) base year database containing information on the buildings, households, firms and land use policies within the region. Running in annual steps, the model predicts that some households will relocate and a number of new households will be formed or enter the region (as determined by the adopted regional forecast). The model system micro-simulates the behavior of both these types of currently unplaced households and assigns each of them to a currently empty housing unit. A similar

[2] Additional information and documentation on the regional forecast is available at http://reports.abag.ca.gov/other/Regional_Forecast_for_Plan_Bay_Area_2040_F_030116.pdf

process is undertaken for businesses. At the end of each simulated year, *Bay Area UrbanSim* micro-simulates the choices real estate developers make on how much of, what, and where to build. This adds additional housing units and commercial space in profitable locations (i.e., land use policies at the site allow the construction of a building that is profitable under forecast demand).

In this way, the preferences of households, businesses and real estate developers are combined with the existing landscape of building and policies to generate a forecasted development pattern. The land use policies in place in the base year can be changed (e.g., allowable zoned residential density could be increased) and *Bay Area UrbanSim* responds by forecasting a different development pattern consistent with the constraints or opportunities resulting from the change. Each year the model produces a Traffic Analysis Zone (TAZ) output file that contains household counts by type and employee counts by sector. This provides the travel model with information on land use intensity in different locations and the spatial distribution of origins and destinations within the region. Documentation for *Bay Area UrbanSim* is available online.[3]

To build Plan Bay Area 2040's forecasted development pattern, *Bay Area UrbanSim* is used to iteratively build scenarios that are vetted and assessed for realism by regional planners and feedback from local jurisdictions. Through this iterative process, we intend to create a forecasted development pattern that incorporates input from both human planners and computer simulation tools.

Travel Simulation Tool

The *Bay Area UrbanSim* model provides detailed estimates of land use to MTC's travel simulation tool, which we refer to as *Travel Model One*. *Travel Model One* is a regional activity-based travel model for the Bay Area. This model is a set of individual models that perform different functions leading to forecasts of Bay Area travel data. We used a version of *Travel Model One* (v0.3) to estimate travel data in our first RTP/SCS. We are using *Travel Model One* (v0.6) for the development of Plan Bay Area 2040.

Travel Model One (v0.6) includes small bugs fixes found in *Travel Model One* (v0.3) related to the application of the model, specifically with the destination choice model and with the usual elementary/middle school choice model. It also includes representation of state-of-good repair conditions on travel data by affecting auto operating costs, truck operating costs, bus operating costs and transit delays. This is done in several ways:

- For auto and truck travel, the monetary cost of a link has been updated based on link attributes rather than assuming a uniform operating cost (per-mile) throughout the network;
- For transit travel, additional boarding and in-vehicle delays are assessed based on the distance traveled for specific transit modes; and,
- Documentation on implementation and theoretical approach are available online.[4]

Travel Model One is supported by extensive documentation[5], including the following:

- Detailed model calibration and validation reports, slide decks and interactive data summaries, including validation of three separate base years (2000, 2005 and 2010);
- Extensive sensitivity tests; and,
- A peer review conducted in April 2013.

---

[3] *Bay Area UrbanSim* documentation is available at: http://metropolitantransportationcommission.github.io/baus_docs
[4] *Travel Model One* documentation is available at: http://analytics.mtc.ca.gov/foswiki/Main/TravelModelOneV05
Theoretical approach on roadways is available at: https://mtcdrive.app.box.com/s/s3li252qowpnkdjtn9foulvvlr5f3xsx
Theoretical approach on transit is available at: https://mtcdrive.app.box.com/s/uyod7q3dkbrlhjdckbuqulprtyy8dvxm
[5] *Travel Mode One* documentation is available at: http://analytics.mtc.ca.gov/foswiki/Main/Development

Emissions Modeling and Air Quality Conformity

Travel Model One generates spatially- and temporally- specific estimates of travel data—roadway usage and speed. This information is then input into an emissions model to estimate emitted criteria pollutants as well as carbon dioxide and other GHG. We intend to use the latest version of ARB's emissions factor model (EMFAC2014) to estimate Plan Bay Area 2040's emissions.

Per the 1990 Clean Air Act, the RTP/SCS must conform to the latest U.S. Environmental Protection Agency transportation conformity regulations and the Bay Area Conformity State Implementation Plan. The Bay Area is currently designated as nonattainment for the national 8-hour ozone standard; a maintenance area for the national 8-hour carbon monoxide standard; and a nonattainment area for the national 8-hour fine particle ($PM_{2.5}$) standard.

In terms of SB 375, ARB set the regional GHG emission reduction targets in 2009 using the emission rates embedded in EMFAC2007 as a guide. As ARB has acknowledged in its guidance document, Methodology to Calculate CO_2 Adjustments to EMFAC Output for SB 375 Target Demonstrations, using EMFAC2014 has the potential to distort our results relative to the SB 375 targets for reasons unrelated to transportation or land use. As a result, the EMFAC2014 GHG emissions outputs have been converted to EMFAC2007 equivalents by applying the adjustment methodology described below in accordance with ARB staff's guidance and consultation. As required by SB 375, the EMFAC2014 GHG emission outputs will exclude reductions due to the implementation of Pavley and ACC regulations.

As noted above, we intend to use EMAFC 2014 (version 1.07) to estimate GHG emissions. For the purposes of computing GHG emission reductions per SB 375, we will execute the following steps:

1. Re-estimate GHG emissions for simulation year 2005 travel data using *Travel Model One* (v0.6) and EMFAC2007, using a simulation year 2000 baseline for EMFAC;
2. Estimate GHG emissions for simulation years 2020 and 2035 travel data using *Travel Model One* (v0.6) and EMFAC2007, again using a simulation year 2000 baseline for EMFAC;
3. Compute the per-capita GHG emission reductions using 1) and 2) for simulation years 2020 and 2035;
4. Estimate GHG emissions for simulation years 2020 and 2035 using *Travel Model One* (v0.6) and EMFAC2014, using a simulation year 2010 baseline for EMFAC and the same activity data as in 2);
5. Compute the per-capita GHG emission reductions using 1) and 4) for simulation years 2020 and 2035; and
6. Calculate the adjustment difference in percent reductions between 5) and 2).

The detailed steps above are consistent with ARB staff's written and verbal guidance. A retrospective analysis of our first RTP/SCS estimates a marginally "better" (<1%) SB 375 outcome from EMFAC2007 than EMFA2014 for both simulation years 2020 and 2035.

Off-Model Analyses

Travel Model One is not sensitive to the full range of GHG emission reduction policies we are pursuing in Plan Bay Area 2040. For example, a smart driving campaign (e.g., keep your tires inflated, accelerate smoothly, slow down, etc.) has the potential to change behavior in ways that will very likely result in GHG emission reductions. *Travel Model One* (v0.6) and EMFAC2014 do not estimate GHG emission reductions in response to these types of changes in traveler behavior. As such, to quantify the GHG emission reduction benefits of these important programs, we use so-called "off-model" strategies.

The Climate Initiatives Program explores a variety of strategies and programs that lead to reduce GHG emissions. These "off-model" strategies complement Plan Bay Area 2040's GHG emission reducing development pattern and transportation investments, already accounted for in *Travel Model One* (v0.6) and EMFAC2014.

The climate program's primary objectives are to invest in strategies that reduce transportation-related GHG emissions and vehicle miles traveled (VMT), and encourage the use of cleaner fuels. The program focuses on three categories of strategies: 1) Transportation Demand Management, 2) Alternative Fuel and Vehicle Incentives and Infrastructure, and 3) Car Sharing and Vanpool Incentives. The strategies incorporate emerging trends and technological advances to efficiently reduce GHG emissions and provide a variety of travel options for all Bay Area residents.

In 2015, we directed ICF International to assess and explore potential GHG emission reduction strategies for inclusion in Plan Bay Area 2040. This assessment included the strategies from *Plan Bay Area*, the previous RTP/SCS, the findings from the *Climate Initiatives Program Evaluation Summary Report*, as well as new and emerging strategies not included in *Plan Bay Area*.

Based on the ICF assessment, we plan to include many of the climate strategies that were included in the previous RTP/SCS, namely:

- Commuter Benefits Ordinance;
- Car Sharing;
- Vanpool Incentives;
- Clean Vehicles Feebate Program;
- Smart Driving; and
- Electric Vehicle Incentives and Infrastructure.

Two strategies have been added to the climate program: 1) Targeted Transportation Alternatives and 2) Trip Caps. Revised calculators determining the GHG emission reductions were completed for the new and continuing strategies based on land use and travel modeling results associated with Plan Bay Area 2040. The degree to which each climate strategy reduces GHG emissions varies. Descriptions of the strategies are included below.

TRANSPORTATION DEMAND MANAGEMENT STRATEGIES

Commuter Benefits Ordinance (continued strategy)

Senate Bill 1128, which passed the State Legislature without any opposition in 2016, authorizes MTC and the Bay Area Air Quality Management District (BAAQMD) to jointly administer the Bay Area Commuter Benefits Program. The program requires employers with 50+ full-time employees in the Bay Area to offer commuter benefits to their employees. The goal of the program is to reduce GHG emissions and traffic congestion by using the federal tax code to encourage employees to commute sustainably.

Targeted Transportation Alternatives (new strategy)

Bay Area residents have access to variety of transportation options, including bicycle and pedestrian networks, transit, carpooling, vanpooling and car sharing. For the most part, these options remain underutilized as most trips are made driving alone. The targeted transportation alternatives program uses a personalized travel outreach and assistance approach to encourage Bay Area residents and employees to reduce single occupancy vehicle trips by understanding and using the variety of travel options available for all types of trips.

Targeted transportation alternatives programs include 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. These programs are "targeted" because they tailor activities and materials to focus on the travel needs and transportation options that are available in specific residential neighborhoods or job centers. 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 programs to different communities. Examples from other jurisdictions operating programs ten years or longer with impactful results include Portland, Oregon's SmartTrips and Seattle, Washington's InMotion programs. In the Bay Area, Connect Redwood City and Connect San Mateo have recently been launched and the concept is being adopted by other cities in California, including Santa Monica.

Our last travel survey was conducted in 2010 and does not capture the impacts of new strategies that change travel behavior, such as this one. Once these strategies have been implemented and have influenced people's behavior, future travel surveys could capture the change in travel behavior to inform *Travel Model One*. Currently, this strategy is not captured by *Travel Model One* (v0.6).

Trip Caps (new strategy)

Trip caps sets limits on the number of vehicle trips to and from new office and commercial development. Property owners conduct regular traffic counts to monitor compliance with trip caps and report results to transportation or planning agencies, which levy fines or other penalties on employers that exceed their caps. Some local governments, including Mountain View, Sunnyvale, Cupertino, Menlo Park and Los Angeles, have been using trip caps to minimize the traffic impacts of new office or commercial development.

Trip caps complement, but do not duplicate, other commute TDM strategies included in the off-model analysis, such as the Commuter Benefits Ordinance (CBO). These other strategies act as "carrots" that provide employees with alternatives to driving and offer incentives to use them. Trip caps are a "stick" that require employers to reduce trips by employees or face fines. Trip caps also apply to different employers than the other TDM strategies; for example, the CBO applies to all employers with 50+ employees throughout the Bay Area whereas trip caps apply to all new businesses, regardless of size, in designated employment areas.

ALTERNATIVE FUEL AND VEHICLE STRATEGIES

Implementation of all alternative fuel and vehicle strategies will be conducted in close coordination with the BAAQMD.

Infrastructure

Regional EV Charger Deployment (continued strategy)

This program establishes a regional public network of electric vehicle supply equipment (EVSE) for plug-in hybrid electric vehicles.

Incentives

Clean Vehicles Feebate Program (continued strategy)

A feebate program provides a rebate to purchase a vehicle emitting less on a gram per mile basis than a standard vehicle, and applies a fee to any vehicle that emits more than the standard.

Vehicle Buy-Back/Electric Vehicle Purchase Incentive (continuing strategy)

This program provides an opportunity for consumers to trade-in an older, less efficient vehicle for a new plug-in hybrid electric or battery electric vehicle to accelerate turnover of vehicles for clean vehicles.

Marketing and Education

Smart Driving (continued strategy)

The smart driving program is made up of two distinct subcomponents, a social marketing campaign and an in-vehicle device rebate program. Both subcomponents are easy-to-implement actions by the target audience, including change in driving style and regular vehicle maintenance, which can reduce GHG emissions through more efficient use of the vehicle.

CAR SHARING AND VANPOOL INCENTIVES STRATEGY

Car Sharing (continued strategy)

Car sharing allows individuals to rent vehicles usually for short-term use, providing access to an automobile without the costs of individual ownership. Car sharing is constantly evolving and growing in the Bay Area through traditional roundtrip, one-way and peer-to-peer models. After joining a car sharing program, households often shed one or all their vehicles. With reduced car ownership, other benefits are realized that reduce GHG emissions including alleviated parking and traffic congestion, and increased walking, biking and public transit use.

Vanpool (continued strategy)

MTC has coordinated a vanpool program since 1981 to encourage cost-effective and sustainable commuting and reduce congestion and emissions. To date, the vanpool program has included online passenger and driver matching, employer outreach, $500 start-up fee incentives, free bridge tolls and other incentives.

OTHER CONSIDERATIONS

Also under consideration and evaluation are the expansion of bicycle infrastructure and bike share strategies. *Travel Model One* accounts for bicycle trips based on distance alone, and does not capture the quality of bike infrastructure. Therefore, increases in the demand for bicycling because of infrastructure are not captured in the model. Off-model analysis is required to account for projects that improve the quality of bicycle infrastructure. We expect the expansion of bicycle infrastructure and bike share programs will contribute to additional GHG emissions reductions, especially at the funding levels included in PBA 2040.

Expanded Bike Share System

Bay Area Bike Share's operator Motivate, which manages the program under a contract with MTC, will be expanding the Bikeshare network to include 7,000 additional bicycles over the next seven years, and has recently negotiated corporate sponsorship. Expanded reach and investment in the bike share system is expected to help reduce GHG emissions in the region.

Expanded Bicycle Infrastructure

Given the significant investment in bicycle infrastructure across the region, GHG emission reductions are expected to increase as bicycle mode share increases.

Attachment A summarizes the calculations and assumptions for each of the off-model strategies proposed for Plan Bay Area 2040. For strategies included in the previous RTP/SCS, assumptions

remain the same or similar. Full documentation of the methodologies and assumptions for calculating GHG emission reductions for the previous RTP/SCS was provided in MTC's Summary of Predicted Traveler Responses (July 2013). Revised methodologies and assumptions for the strategies included in Plan Bay Area 2040 will be documented with the release of draft plan document.

Sufficiency Determination

Two sets of standards have been established to guide regional planning agencies in determining whether their selected technical approach is adequate. First, Section 1 (e) of SB 375 states: "Current planning models and analytical techniques used for making transportation infrastructure decisions and for air quality planning should be able to assess the effects of policy choices, such as residential development patterns, expanded transit service and accessibility, the walkability of communities, and the use of economic incentives and disincentives." Our analytical approach, as described above, can provide robust insights into each of the example policies listed in SB 375.

The second standard, from Recommendations of the Regional Targets Advisory Committee (RTAC) Pursuant to Senate Bill 375: A Report to the California Air Resources Board, states, "a rigorously tested and validated travel demand model with well documented expert peer review will add to the credibility of greenhouse gas estimates." *Travel Model One*, as previously noted, is supported by extensive documentation including a peer review that was conducted in April 2013.

DEVELOPING THE RTP/SCS

Public Participation Plan

In February 2015, MTC adopted its Public Participation Plan (PPP)[6], as a guide for outreach efforts throughout the development of Plan Bay Area 2040.[7] Appendix A, A Public Participation Plan for the 2017 Update to Plan Bay Area details the update process and schedule, describes key milestones, and outlines the ways that we will work to involve Bay Area residents and public officials in the update process.

Scenario Planning

Scenarios are a vital step of the Plan Bay Area 2040 development by representing alternative Bay Area futures composed of distinct forecasted land use development patterns and supportive transportation investment strategies. Three scenarios were developed using the technical methods described above. We used *Bay Area UrbanSim* to analyze the effects that different land use policies had on the region's forecasted development pattern. Transportation investment strategies were then paired with the three-forecasted land use development patterns and their respective travel-related outcomes were estimated using *Travel Model One*.

Performance Framework

Beginning in late April through May 2015, Bay Area residents attended open houses[8] hosted by MTC and ABAG to kick-off the development of Plan Bay Area 2040. As described in the PPP, the open houses were the first in a three-part series and designed to:

---

[6] Documentation is available at: http://mtc.ca.gov/sites/default/files/FINAL_Combined-2015_PPP_and_Appendix_A.pdf
[7] Additional documentation on the development of Plan Bay Area 2040 is available at http://planbayarea.org/index.php
[8] Additional documentation of comments from the Spring 2015 open houses is available at http://planbayarea.org/your-part/your-comments.html

- Introduce the Plan Bay Area 2040 development process, key milestones and issues under consideration;
- Review the linkages between the RTP/SCS and local transportation and land use priorities; and,
- Review and seek comments on the goals and performance framework for Plan Bay Area 2040.

Beginning in late May through June 2016, MTC and ABAG held the second series of open houses to present and discuss the results of the scenario evaluation.[9] As a final step of the scenario planning process, we evaluated the three scenarios using our adopted Plan Bay Area 2040 performance framework,[10] including the SB 375 GHG emission reduction targets.

Adopting the Preferred Scenario

The preferred scenario was adopted in November 2016 and encompasses a regional forecasted development pattern and fiscally-constrained transportation investment strategy. The adoption of the preferred scenario will lead to the draft plan document. Attachment B summarizes the preferred scenario development process.

The Draft Plan

The *Draft Plan Bay Area 2040*, released on April 3, 2017, document provides a narrative to the preferred scenario's forecasted development pattern and transportation investment strategy. The document discusses how the Bay Area will grow over the next two decades and identifies transportation and land-use strategies to enable a more sustainable, equitable and economically vibrant future. The document is organized into five chapters, which are listed and briefly summarized as follows.

- The Bay Area Today: This chapter provides an overview of the existing housing conditions in the Bay Area and congestion and capacity challenges associated with the transportation system.

- What is Plan Bay Area 2040?: This chapter provides an overview of the purpose of the proposed Plan, public participation processes, and goals and targets of the proposed Plan.

- Forecasting the Future: This chapter provides an overview of the primary "inputs" to Plan Bay Area 2040: specifically, 24-year regional household, employment and transportation revenue forecasts.

- Strategies and Performance: This chapter describes land use and transportation scenarios that distributed the total amount of expected growth across the region. These scenarios were evaluated against adopted performance targets (described in Chapter 2) to measure how well they address regional goals including climate protection, transportation system effectiveness, economic vitality and equitable access.

- Action Plan: This chapter identifies action items for MTC, ABAG, and other stakeholders to make meaningful progress on Plan Bay Area 2040's performance targets. The Action Plan will focus on those areas where Plan Bay Area 2040 is moving off trajectory: housing and transportation affordability, displacement risk, access to jobs and roadway maintenance.

The draft plan is available at http://2040.planbayarea.org. The release of the draft plan will begin the third series of open houses. The final plan is anticipated to be adopted in summer 2017.

[9] Additional information on the Spring 2016 open houses is available at http://planbayarea.org/your-part/PlanBayArea2040-2016-Meeting-Materials.html
[10] Documentation is available at http://planbayarea.org/the-plan/plan-details/goals-and-targets.html

ATTACHMENT A: SUMMARY OF CALCULATIONS AND ASSUMPTIONS

	Basis for Calculations	Key Assumptions/Notes
Previous Strategies		
Commuter Benefits Ordinance	• Data on average VMT/GHG reductions per employee effected come from MTC's evaluation of the Bay Area Regional CBO • VMT/GHG reductions are scaled based on the number of employees effected. Data come from MTC, and are consistent with previous PBA analysis of the CBO • Accounts for employees who already received benefits prior to enactment of regional CBO	• Assumes that the current CBO, which applies to all workplaces with 50+ employees, would continue unchanged
Car Sharing	• Car sharing members reduce GHG emissions by driving less and by using more fuel efficient vehicles • GHG reductions are based on research about car sharing fleets and members' behavior • Cost estimates are based on grant applications for car sharing projects • Estimates account for the expansion of peer-to-peer and one-way car sharing models. (Conservative assumption because one-way car share results in less GHG reduction than traditional car share.) • Program aims to expand car sharing to new communities; benefits are scaled based on the percentage of the eligible population (age 20-64) who become car sharing members	• Assumes lower carsharing adoption rates than PBA to account for competition from ride-sourcing (e.g., Uber/Lyft) (there is no research demonstrating GHG reductions due to ride-sourcing) • Assumes 10% of the eligible population in dense urban areas (population density > 10 residents/acre) become car sharing members • Assumes 3% of the eligible population in suburban areas (population density < 10 residents/acre) become car sharing members
Vanpool Incentives and Shuttles	• Vanpool GHG reductions are based on the projected increase in vanpooling due to incentives and county-level average mode share and regional average vanpool trip length • Vanpool cost estimates assume a $300/month/van incentive, down from $400/month/van in PBA (consistent with recommendation from Transit Finance Working Group) • Employer shuttle GHG reductions are based on current (2013) ridership data collected from multiple private shuttle operators and regional average mode share and trip length for displaced trips • Shuttle GHG reduction results account for emissions from shuttles; emissions rates are assumed to be equivalent to urban buses • No MTC funding is required for the employer shuttles; no growth in employer shuttle usage is assumed in order to avoid double-counting with reductions from the CBO	• Assumptions are consistent with PBA • Assumes average vanpool occupancy of 10.8 passengers • Assumes 700 vanpools in operation in 2020 and 1,030 in 2035 (doubling the current fleet) based on MTC projections. • Uses historical MTC data from 2005-2011 on vanpool occupancy and trip length (prior to CBO implementation) • Assumes average shuttle occupancy of 30 passengers • Assumes shuttle round trip length of 40 miles

	Basis for Calculations	Key Assumptions/Notes
Clean Vehicles Feebate Program	• Estimated impact of feebates on average fuel economy for new vehicles and cost to MTC comes from ARB studies (Bunch & Greene, 2011) • Resulting fleet-wide fuel economy is based on vehicle turnover rates and EMFAC data • GHG reduction estimates account for well-to-wheels emissions • Both scenarios assume that the state passes legislation to enable feebate implementation	• Assumptions are consistent with PBA • Applies lower-end estimate of impact of feebates on average fuel economy (1.6%) from Bunch & Greene (2011) • Assumes an initial start-up budget of $1m and an annual administrative budget of $965k
Vehicle Buy-Back/Electric Vehicle Purchase Incentive	• Resulting change in fleet average fuel economy is based on EMFAC data • Assumes that the incentive level averages about $1,500 per PHEV and $2,500 per BEV • Assumes that this strategy will not be initiated until 2020	• Assumes an additional 94,000 EVs in the Bay Area due to the buy-back program • Estimated deployment of new EVs assumes that new vehicles would be evenly split between BEVs and PHEVs
Regional EV Charger Deployment	• Assumes that other entities will supply chargers before 2020 and that MTC will be responsible for funding chargers thereafter, providing $1,000 incentives for chargers • GHG reductions are based on the increase in electric miles vs. gasoline-powered miles for PHEVs	• Assumes an increase from 40% to 80% electric miles for PHEVs due to the regional charger network • Assumes roughly 1 charger for every 5 EVs, for costing purposes
Smart Driving Strategy	• GHG reductions for both the education campaign and in-vehicle devices are calculated from the assumed adoption rate and percent increase in fuel efficiency due to changes in driving behavior • Adoption rates for the education campaign are based on MTC surveys of willingness to adopt smart driving behaviors and on MTC marketing research on the effectiveness of marketing campaigns • Cost estimates for the educational campaign assume a strong $5m/yr initial campaign, reduced to $2m/yr after 4 years • At least 90,000 in-vehicle devices will be distributed through the $90m investment; displays included by auto manufacturers reduce the need for further MTC funding	• Assumptions have been updated from PBA to be in line with recent research • Assumes 3% fuel economy increase from reduced heavy acceleration and deceleration (PBA used 10%) • Assumes 5% adoption of smart driving among likely adopters exposed to the educational campaign in order to avoid double-counting GHG reductions from in-vehicle devices (PBA used 10%) • Does not assume any fuel economy increase due to trip planning (PBA used 5%) • Assumes 3% fuel economy increase from in-vehicle devices (PBA used 5.6%) • Assumes in-vehicle devices will be 50% distributed by 2020 and 100% distributed by 2025

New Strategies		
Targeted Transportation Alternatives	• Calculations are based on the amount invested by MTC in programs • Data on program cost-effectiveness and vehicle trip reductions per effected HH/employee come from Portland-area household and employer marketing programs • Vehicle trip reductions are converted to VMT/GHG reductions using data from MTC's travel model • Use the number of HHs and employees that are within ½ mile of rail, from CTOD TOD database, adjusted for pop growth, as a "reality check" to ensure that MTC is not marketing to more people than we would expect to change behavior	• Assumes penetration rates and mode shift impacts are similar to Portland-area programs (29% of households and 33% of employees who are targeted by marketing efforts change their behavior due to programs; participating households reduce SOV trips by 11% and participating employees reduce SOV trips by 9%) • Assumes that behavior change lasts for 5 years • Assumes MTC annual investment of $1M - $2M (with most going toward residential programs) • Using the number of people who live within a ½ mile of high quality transit is a "reality check" and is not used in the calculations. This strategy targets those who live or work near transit but do not use transit and other alternatives to driving as much as they could
Trip Caps	• VMT/GHG reductions are based on the number of employees reached and on the effectiveness of trip caps in reducing commute trips • Trip caps affect only employees in new development (employment growth) • Trip cap effectiveness is based on the Mountain View North Bayshore trip cap (34% reduction in trips per employee per day) • Data on planned employment growth and commute characteristics comes from MTC's travel model	• Assumes that trip caps are feasible only in areas that are urban or suburban (but not rural) • Assumes trip caps are feasible only in areas that have a greater number of employees than households
Strategies under consideration to be included based on investment levels		
Expanded Bike Share System	• Data on planned bike share service areas come from MTC • Number of bike share trips is based on the density of jobs and residents in bike share service areas and data from U.S. bike share systems compiled by ITDP (between 4 and 12 trips per 1,000 people; varies by city) • Average VMT/GHG reductions due to bike share trips are based on Bay Area Bike Share evaluation	• Calculates bike share usage based on residential and job density in services areas, in line with ITDP's approach
Expanded Bike/Ped Infrastructure	• Mileage and cost of planned bicycle infrastructure comes from local and regional bicycle plans • Apply elasticities relating bicycle trips and infrastructure from research • Do not account for pedestrian trips (which are likely to produce minimal GHG reductions because they are short) due to a lack of supporting research	• Mode shift is based on infrastructure included in the MTC Regional Bicycle Plan and in local plans • Applies the elasticity of bike mode share with respect to bike lane density (0.01) as reported in Dill and Carr (2003); consistent with method used by SANDAG in San Diego Forward

ATTACHMENT B: PLAN BAY AREA 2040 DEVELOPMENT PROCESS

Plan BayArea 2040

Early 2015

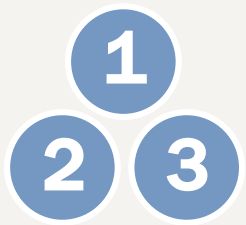
Policy Development

- Conducted open houses to solicit public input on updated goals and performance targets for Plan Bay Area 2040
- MTC Commissioners and ABAG's Executive Board members considered and approved a partial list of Plan Bay Area 2040 goals and targets. More action expected in November 2015.

Late 2016

Scenario Development

- Generate updated Plan Bay Area 2040 regional forecasts for jobs, housing, population, travel demand and transportation revenue
- Assess transportation projects and programs to be included in Plan Bay Area 2040
- Create preliminary scenario concepts for housing, jobs and transportation investments
- Solicit feedback from key stakeholders to refine and improve preliminary scenario concepts for housing, jobs and transportation investments



Refine Scenario Framework

Late 2016

Preferred Scenario Selection

- Release scenario and targets evaluation
- Conduct public workshops to solicit input on alternative scenarios for housing, jobs and transportation investments
- Adopt preferred scenario based on public input, feedback from key stakeholders, and technical analysis, fall 2016

Preferred Scenario

Early 2017

Draft Plan and Draft EIR

- Release Draft Plan Bay Area 2040 and Draft Environmental Impact Report for public comment
- Conduct public workshops to solicit input on Draft Plan Bay Area 2040 and draft Draft Environmental Impact Report
- Adopt Plan Bay Area 2040 and final EIR, summer 2017

Plan Bay Area 2040

Revised June 2016

Public Workshops and Outreach