

**TECHNICAL EVALUATION OF THE
GREENHOUSE GAS EMISSIONS REDUCTION QUANTIFICATION FOR
ASSOCIATION OF MONTEREY BAY AREA GOVERNMENTS'
SB 375 2018 SUSTAINABLE COMMUNITIES STRATEGY**

November 2018



Electronic copies of this document can be found on CARB's website at <http://www.arb.ca.gov/cc/sb375/sb375.htm>.

This document has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the California Air Resources Board, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.

Electronic copies of this document are available for download from the California Air Resources Board's internet site at: <http://www.arb.ca.gov/cc/sb375/sb375.htm>. In addition, written copies may be obtained from the Public Information Office, California Air Resources Board, 1001 I Street, 1st Floor, Visitors and Environmental Services Center, Sacramento, California 95814, (916) 322-2990.

For individuals with sensory disabilities, this document is available in Braille, large print, audiocassette, or computer disk. Please contact CARB's Disability Coordinator at (916) 323-4916 by voice or through the California Relay Services at 711, to place your request for disability services. If you are a person with limited English and would like to request interpreter services, please contact CARB's Bilingual Manager at (916) 323-7053.

TABLE OF CONTENTS

Background	1
CARB Determination	1
Scope and Methodology.....	2
Changes from the Region’s Previous SCS GHG Quantification.....	2
Land Use and Transportation Strategies.....	3
Model and Off-Model Calculations	4
Regional Land Use and Transportation Performance Indicators	5
Implementation of AMBAG’s First SCS	7
Other Findings and Recommendations	11
References.....	11
Appendix A: Further Discussion of 2018 SCS Changes.....	A-1
Appendix B: Travel Demand Model Sensitivity Analyses	B-1
Appendix C: Data Table	C-1
Appendix D: Performance Indicators.....	D-1

LIST OF TABLES

Table 1. Summary of Demographic, Land Use, and Transportation Changes in AMBAG’s 2018 SCS Compared to the 2014 SCS	3
Table 2. Key Changes in Model and Off-Model Processes of AMBAG’s 2018 SCS	4
Table 3. Performance Indicators	6
Table 4. Comparison of Population, Housing, and Employment Estimates in the AMBAG 2014 and 2018 SCS	A-1
Table 5. Model Sensitivity Analysis Result for Job-Housing Balance	B-4
Table 6. Mixed-Use Developed Acres in AMBAG	D-2

LIST OF FIGURES

Figure 1. AMBAG SCS Transportation Budget by Mode (2014 vs. 2018)	A-4
Figure 2. Area of CA-1 Widened for Sensitivity Test	B-2
Figure 3. Geographic Area Affected by the Road Capacity Sensitivity Test	B-3
Figure 4. Total Households and Employment within 1/2 Mile of Transit Stations and Stops	D-1
Figure 5. Per Capita Passenger VMT	D-3
Figure 6. Bus Rapid Transit Operation Miles	D-4

BACKGROUND

The Sustainable Communities and Climate Protection Act of 2008 (SB 375) is intended to support the State's broader climate goals by encouraging integrated regional transportation and land use planning that reduces greenhouse gas (GHG) emissions from passenger vehicle use. California's metropolitan planning organizations (MPO) develop regional Sustainable Communities Strategies (SCS) containing land use, housing, and transportation strategies that, if implemented, can meet the per capita passenger vehicle-related GHG emissions reductions targets (targets) for 2020 and 2035 set by the California Air Resources Board (CARB or Board). Once an MPO adopts an SCS, SB 375 directs CARB to accept or reject an MPO's determination that its SCS, if implemented, would meet the targets.

On August 23, 2018, the Association of Monterey Bay Area Governments (AMBAG), which serves as the MPO for the Monterey Bay region, completed submittal of its 2018 SCS and necessary supporting information for CARB to review. AMBAG's 2018 SCS estimates a 4.3 percent and 6.6 percent decrease in GHG per capita emissions from light-duty passenger vehicles by 2020 and 2035 compared to 2005, respectively. The region's per capita GHG emissions reduction targets are 0 percent in 2020 and 5 percent in 2035, compared to 2005 levels. This report reflects CARB's technical evaluation of AMBAG's 2018 SCS GHG quantification.

CARB DETERMINATION

ACCEPT

Based on a review of all available evidence, including model inputs, outputs, SCS strategies, performance indicators, and implementation efforts so far, CARB accepts AMBAG's determination that its 2018 SCS would, if implemented, meet the targets of a 0 percent reduction in 2020 and a 5 percent reduction in 2035, compared to 2005 levels.

AMBAG's 2018 SCS contains nearly the same strategies as the first SCS, which CARB reviewed and accepted as meeting the targets in November 2014. For the 2018 SCS, AMBAG incorporated modeling improvements and updated inputs and assumptions for housing and employment, as well as higher transportation revenues. These changes, coupled with new off-model adjustments for electric vehicles, contributed to differences in the quantification of GHG reductions from their previous 2014 SCS. AMBAG's forecasted reduction in per capita GHG emissions compared to 2005 levels under SB 375, for 2020, increased from 3.5 percent in its previous SCS to 4.3 percent in this SCS, and for 2035, increased from 5.9 percent in its previous SCS to 6.6 percent in this SCS.

SCOPE AND METHODOLOGY

CARB examined AMBAG's modeling inputs and assumptions, model responsiveness to variable changes, model calibration and validation results, and performance indicators using the general method described in CARB's July 2011 document entitled [*Description of Methodology for ARB Staff Review of Greenhouse Gas Reductions from Sustainable Communities Strategies Pursuant to SB 375*](#).¹

In addition, as AMBAG's 2018 SCS is an update to its adopted 2014 SCS, CARB also performed a qualitative review of AMBAG's implementation actions over the past four years. CARB looked for evidence that AMBAG has put in place enabling project investments, programs, incentives, or guidance to help demonstrate the region's commitment to implementing the first SCS, and has established a foundation for continued implementation of policies and programs reflected in both their 2014 and 2018 plans.

CHANGES FROM THE REGION'S PREVIOUS SCS GHG QUANTIFICATION

CARB focused its review on identifying and evaluating changes AMBAG made between the current 2018 SCS and the previous 2014 SCS² with the potential to affect land use, transportation, and the SCS GHG emissions quantification. AMBAG describes the 2018 SCS as a technical update to its previous plan. CARB staff reviewed changes made to demographic assumptions, the transportation strategies included within the SCS, the model and off-model methods used to calculate passenger travel-related GHG emissions, as well as expected regional land use and transportation performance indicators. Table 1 summarizes the changes in plan assumptions for demographics, land use, and transportation.

Table 2 summarizes the changes in AMBAG's model and off-model GHG emissions calculations.

¹ Available at: https://www.arb.ca.gov/cc/sb375/scs_review_methodology.pdf.

² CARB's acceptance and technical evaluation of AMBAG's first SCS was completed in November 2014, and contains detailed information about the methods AMBAG used to quantify GHG emissions. That information is still relevant for this technical evaluation and can be accessed at https://www.arb.ca.gov/cc/sb375/ambag_tech_eval.pdf.

LAND USE AND TRANSPORTATION STRATEGIES

AMBAG’s 2018 SCS maintains a set of land use and transportation strategies that are similar to those adopted in their previous 2014 SCS, with updates to assumptions used in the adopted scenario for land use and an increase in transportation revenues, as further explained below. The adopted scenario focuses growth in high-quality transit corridors and seeks to improve the job-housing balance, especially in communities that currently offer housing but lack employment opportunities.

The 2018 SCS also incorporates minor updates to the region’s forecasted population, employment, and housing growth. Table 1 summarizes these changes and provides CARB’s assessment based on consistency with best available information and practice.

Table 1. Summary of Demographic, Land Use, and Transportation Changes in AMBAG’s 2018 SCS Compared to the 2014 SCS

Action	CARB Assessment	Finding
Revised Regional Growth Forecast	Reasonable	AMBAG updated population, housing, and employment growth estimates for its 2018 SCS. Population and housing in 2035 would be 2-3 percent lower in the 2018 SCS compared to the 2014 SCS, while employment would be 3 percent higher. See Appendix A for more detail.
Updated Land Use Scenario	Reasonable	AMBAG met with over 100 staff from local governments and other agencies and incorporated new demographic data to update its land use scenario and local growth forecasts for population, housing, and employment growth. These changes reflect differences in how growth occurred in the years 2010-2015 and updates to current and planned projects. See Appendix A for more detail.
Updated Revenue Projections and Transportation Project List	Reasonable	The 2018 SCS updates both transportation revenue projections and expenditures. The 2018 SCS includes nearly 30 percent more revenue, largely due to the passage of The Road Repair and Recovery Act of 2017 (Senate Bill 1) and Measure X and Measure D in Monterey and Santa Cruz Counties. See Appendix A for more detail.

MODEL AND OFF-MODEL CALCULATIONS

AMBAG used the same modeling tools to evaluate its 2018 SCS and 2014 SCS with refined input data that slightly affect the quantification of model outputs of vehicle miles traveled (VMT) and GHG emissions.

Table 2 summarizes these changes along with CARB’s assessment and findings based on consistency with best available information and modeling practice. In the 2018 SCS, AMBAG maintains a similar set of strategies quantified off-model, with one additional method added for GHG emissions reductions expected from its electric vehicle (EV) incentive program.

Table 2. Key Changes in Model and Off-Model Processes of AMBAG’s 2018 SCS

Modeling Component	CARB Assessment	Finding
Adjustment to EMFAC Outputs	Reasonable	AMBAG followed the procedure demonstrated in CARB’s memo titled “ <i>Methodology to Calculate CO2 Adjustment to EMFAC Output for SB 375 Target Demonstrations.</i> ”
Sensitivity Analysis	Somewhat Reasonable	AMBAG conducted 3 sensitivity analyses to test the responsiveness of VMT to road expansion, job-housing balance, and transit in the Regional Travel Demand Model. The sensitivity analyses show that the model only moderately captures the input variable changes. Therefore, off-model adjustments are needed. See the Recommendations section for additional discussion.
Off-Model Adjustments for Multiple Strategies	Somewhat Reasonable	AMBAG implemented a series of off-model strategies in its 2014 SCS. This time, AMBAG applied the same methodology and assumptions, with updated baseline GHG emissions estimates. However, AMBAG did not reduce the off-model adjustments when the budget to be spent in a category declined. See the Recommendations section for additional discussion.

Off-Model Adjustments for EV-related investment	Somewhat Reasonable	AMBAG included a new EV incentive program strategy in its 2018 SCS and used an off-model analysis method to quantitatively estimate strategy performance of the strategy. The method used is oversimplified when considering how future year EVs are forecast, benefit estimation assumptions, benefit apportionment, and other procedures. This may overestimate the GHG emissions reduction benefits. See the Recommendations section for additional discussion.
---	---------------------	--

REGIONAL LAND USE AND TRANSPORTATION PERFORMANCE INDICATORS

CARB also reanalyzed several land use and transportation modeled indicators against relationships expressed in the empirical literature between each metric, and VMT and/or GHG emissions to understand whether changes were consistent with forecasted GHG emissions reduction trends. Table 3 shows a summary of AMBAG’s 2018 SCS performance indicators. Data shown in this analysis came from AMBAG’s modeling data table, see Appendix C. Supporting data and charts for performance indicators are provided in Appendix D.

Table 3. Performance Indicators

Performance Indicator	CARB Assessment	Finding
Land Use Indicators		
Housing Units near Transit	Consistent with reducing VMT/ GHG	AMBAG's 2018 SCS assumes a 10 percent increase in housing units within ½ mile of transit stations and stops in 2035, compared to today (i.e., 2015).
Employment near Transit	Consistent with reducing VMT/ GHG	AMBAG's 2018 SCS assumes a 13 percent increase in employment within ½ mile of transit stations and stops in 2035, compared to today (i.e., 2015).
Transportation Indicators		
Per Capita Passenger VMT	Inconclusive	AMBAG's travel demand model shows a decline in per capita passenger VMT between base year (i.e., 2005) and 2015, and then a continuous increase to 2040. Given that AMBAG's 2018 SCS includes off-model strategies that are expected to reduce VMT that are not captured by the MPO's transportation modeling, CARB staff found that this indicator is neither consistent nor inconsistent with AMBAG's claimed GHG emissions reductions.
Transit Operation Miles	Consistent with reducing VMT/GHG	By 2035, bus rapid transit operation miles are assumed to increase by over 100 percent compared to today (i.e., 2015).
Daily Transit Service Hours	Consistent with reducing VMT/GHG	Total daily transit service hours are assumed to increase by over 100 percent from 2015 to 2035.

IMPLEMENTATION OF AMBAG'S FIRST SCS

Actions by AMBAG and its member local and regional agencies over the past four years demonstrate the region's commitment to implementing their first SCS and to establishing a foundation for continued implementation of the policies and programs that are included in both the 2014 and 2018 SCSs.

The key strategies of the 2014 and 2018 SCSs include focusing growth in high-quality transit corridors, improving the job-housing balance via job creation in low-employment areas that are high in housing, and increasing travel choices and accessibility by expanding transit, roadways, and the active transportation network. Since publication of the first SCS in 2014, multiple regional and local community plans have been updated and adopted:



- The City of Monterey adopted a Waterfront Master Plan & Lighthouse Area Specific Plan, and amended the Downtown Specific Plan
- Santa Cruz County adopted the Sustainable Santa Cruz County Plan
- The City of Capitola comprehensively updated its Zoning Code and adopted its first Climate Action Plan
- The City of Santa Cruz amended its Downtown Plan
- San Benito County adopted a new General Plan

A number of plan updates are also underway or in the process of launching. Examples include: Visión Salinas, the General Plan for the City of Scotts Valley, a Watsonville Downtown Specific Plan, an update to the City of Santa Cruz Climate Adaptation Plan, an update to Carmel-By-The-Sea's Residential and Commercial Zoning and Residential Design Guidelines, and the Moss Landing Community Plan Update.

In addition, to foster local government implementation of strategies in the SCS, AMBAG created a toolkit with sections on Infill Housing, Economic Development, and

Transportation.³ The toolkit identifies strategies appropriate for different “place types” or settings in the region. It provides both policy guidance, as well as real-world case studies and examples. The Infill Housing section includes a number of building prototypes illustrating how higher-density development could fit seamlessly into Monterey region communities. The Economic Development section seeks to assist local governments wishing to promote job creation in existing communities where fewer jobs are situated, to promote a greater job-housing balance.

For the 2018 SCS, AMBAG worked with local governments to update a set of Opportunity Areas. These areas qualify for streamlining under SB 375.⁴ The Opportunity Areas were then used to identify potential priority transit projects to support SCS implementation.

Both the 2014 and 2018 SCS also focus growth in existing communities and forecast that 97 percent of existing farm and ranching land will continue to be used for agriculture. Between 2014 and 2016, the region saw a net increase in total agricultural land, driven by increases in grazing land, with only 320 acres converted to urban uses, suggesting that the region may be on track in this area.⁵

Enhancing Transportation Options

AMBAG and its member agencies have delivered, or are nearing completion on a number of transportation projects to implement their 2014 SCS. Projects include:

- Castroville Bicycle / Pedestrian Trail and Railroad Overcrossing Bridge
- The La Selva Rail Trestle
- Shugart Park Pathway and Footbridges & Vine Hill School Road and Tabor Drive Sidewalk and Bike Lanes, two bicycle / pedestrian paths connecting parks and schools in the City of Scotts Valley

³ Toolkits are available at <http://www.ambag.org/programs-services/planning/metro-transport-plan/sustainable-communities-strategy-implementation>. Last accessed October 2018.

⁴ To align with State guidelines, AMBAG has defined Opportunity Areas as “an area within ½ mile of an existing or planned ‘high quality transit corridor’ (per definition in California Public Resources Code Section 21155(a)) or ‘major stop’ (per California Public Resources Code Section 21064.3) that has the potential for transit oriented development including mixed use. High quality transit is service with headways of 15 minutes or less during peak period or rail service.”

⁵ Source: California Department of Conservation Farmland Mapping and Monitoring Program county data: http://www.conservation.ca.gov/dlrp/fmmp/Pages/county_info.aspx. The definitions for different land types may vary between this research and those of the MPO.

- As part of the Via Salinas Valley project, numerous road, sidewalk, and bikeway improvements to improve pedestrian and cyclist safety that were carried out jointly by Monterey County Health Department, Transportation Agency of Monterey County (TAMC), King City, and the Cities of Salinas, Gonzales, Soledad, and Greenfield, along with community education and planning for active transportation projects
- A new 31,000 square foot Operations and Maintenance Facility for Monterey-Salinas Transit

Other important projects either recently broke ground or will soon begin, such as:

- Salinas Train Station, Phase 1 of the Monterey County Rail Extension to connect Salinas to the Bay Area Caltrain system in Gilroy
- Thirteen miles of the 50-mile Monterey Bay Sanctuary Scenic Trail Network (Coastal Rail Trail)

Other news of note and innovative efforts include:

- In 2015, the City of Santa Cruz was selected as a Gold-level Bicycle Friendly Community
- In 2018, bike-sharing service from Jump Bikes launched in the City of Santa Cruz
- Several cities including Salinas and Gonzalez hosted Ciclovía events in which community members took over city streets

Policy Guidance and Strategic Planning Documents

AMBAG and its member jurisdictions have also prepared many transportation- and transit-related regional and local planning documents that support implementation of the 2014 SCS. The following planning efforts were completed or have been underway since 2014:

- AMBAG created a toolkit for local agencies that included Transportation Measures appropriate for different “place types”⁶
- AMBAG completed a Transportation Alternatives for Rural Areas study⁷

⁶ Toolkits are available at <http://www.ambag.org/programs-services/planning/metro-transport-plan/sustainable-communities-strategy-implementation>. Last accessed October 2018.

⁷ Association of Monterey Bay Area Governments. 2017. Transportation Alternatives for Rural Areas: A Regional Study. Accessed October 2018 at: http://ambag.org/programs/Planning/TransportationAlternativesForRuralAreasFinalDraft_April%202017.pdf. Last accessed October 2018.

- The San Benito County Local Transportation Authority (LTA) adopted the Future Horizons for San Benito County: Short- and Long-Range Transit Plan
- The Santa Cruz County Regional Transportation Commission published the draft Environmental Impact Report for the North Coast Rail Trail from Wilder Ranch State Park north to Davenport
- The Santa Cruz County Regional Transportation Commission created a Bicycle Route Signage Implementation Plan, with Phase I already funded and to be completed by 2021
- Similarly, the Transportation Agency of Monterey County (TAMC) created a Regional Bicycle and Pedestrian Wayfinding Plan for Monterey County
- The Santa Cruz Branch Rail Line Rail Transit Feasibility Study, completed by the Santa Cruz County Regional Transportation Commission, evaluates the potential of using the Santa Cruz Branch Rail Line, which parallels Highway 1, for passenger transit
- Monterey-Salinas Transit (MST) completed a feasibility study for the operations of buses on roadway shoulders to bypass congested roadways
- The Visualizing Sustainable Transportation project by the Santa Cruz County Regional Transportation Commission used on-site installations of augmented reality technology to allow members of the public to visualize multimodal hubs in two locations, technology which will next be used to support the downtown Watsonville Complete Streets Plan
- San Benito Council of Governments completed a Short and Long Range Transit Plan
- The Monterey County Active Transportation Plan was completed by TAMC
- The Pacific Grove Hwy 68 Corridor Study, conducted by TAMC in collaboration with the City of Pacific Grove and Caltrans, identified needs and strategies to make Highway 68 a more complete street
- TAMC is leading the Canyon Del Rey Boulevard (State Route 218) Corridor Study, which will identify a set of complete streets, storm water drainage, active transportation, and environmental and wildlife-related improvements for Canyon Del Rey Blvd from Highway 1 to Highway 68
- The SR 68 Scenic Highway Plan, conducted by TAMC, evaluates travel between Salinas and the Monterey Peninsula both now and in the future, considering mid-term operational and capacity improvements and wildlife connectivity enhancements, to improve safety, access, operations, and wildlife connectivity while reducing congestion and greenhouse gas emissions

In addition, the three counties in the Monterey Bay Area have continued to build upon and educate their local jurisdictions about the Complete Streets Guidebook that was

completed in 2013 under the auspices of AMBAG and funded by the Strategic Growth Council. They continue to support active transportation via efforts like updating county bicycle maps, coordinating Bike Month activities, secure bike parking, and safety education.

OTHER FINDINGS AND RECOMMENDATIONS

Improve tools to quantify impacts of land use and transit strategies

In the current SCS, AMBAG used the same travel demand model as used in the previous SCS. However, the current model is insensitive to several important variables, as discussed in Appendix B. Therefore, AMBAG's model results do not represent the impact of SCS strategies on VMT very well, leading AMBAG to need to rely on off-model calculation methods to demonstrate how the region meets their SB 375 regional targets. If the model cannot easily calculate the impacts of varied approaches to these strategies, it may lead those strategies to receive lower priority during the policy-making process. CARB staff is aware that AMBAG is developing a new activity-based model for future SCSs. As AMBAG works to make this transition, CARB staff recommends that AMBAG improve their model's sensitivity to land use and transit accessibility variables to better quantify the impacts of the region's core SCS strategies (e.g., land use and transit service). AMBAG should include improvements to other factors including: auto ownership, auto operating cost, and activity patterns. Together, these are critical to capturing travel behavior and travel choices in the region and to better estimate number of trips and vehicle miles traveled.

In addition to the above suggestions, CARB staff recommends that AMBAG conduct comprehensive sensitivity analyses of the model, as well as conduct model validation and calibration using the latest travel data (e.g., American Community Survey (ACS), Census Transportation Planning Package (CTPP), National Household Travel Survey (NHTS), and the National Transit Database) or other new innovative travel data for testing.

As a result of anticipated improvements in modeling tool and data reliability, CARB also anticipates that AMBAG will be able to provide additional performance indicators to demonstrate and explain their SCS performance in future SCSs, and quantify policy inputs, compared to what is currently provided.

CARB's forthcoming SCS evaluation guidelines, to be published in fall 2018, can be a useful resource for AMBAG for model improvements.

Improve off-model strategy calculation methods

AMBAG currently relies on several off-model strategies to meet its 2020 and 2035 regional SB 375 targets, including transportation system management (TSM), telecommute, transportation demand management (TDM), active transportation, transit system enhancement, and electric vehicle (EV)-related strategies. AMBAG applied the same assumptions and quantification method for most strategies as in its first SCS. CARB staff recommends that if AMBAG continues to quantify these strategies off-model in the future, they should revise their quantification methods. AMBAG should also provide clearer documentation related to the funding sources, methods, and assumptions of individual off-model strategies. Each individual strategy needs to clearly identify the target populations (e.g., size, occupation, etc.). CARB's forthcoming SCS evaluation guidelines, to be published in fall 2018, will be a useful resource for this purpose.

Specifically, if assumptions about the aggressiveness or funding available for SCS-included strategies change from SCS to SCS, those should likewise be updated in and reflected as updates to off-model calculations. For example, the 2018 SCS includes 25 percent less spending in the active transportation category than did the 2014 SCS, and yet the plans both include approximately the same reduction. AMBAG explains that many active transportation projects are funded as part of larger road maintenance projects, a funding category that increased. Future SCSs will need to quantify the approximate active transportation expenditures within other spending categories.

Furthermore, for EV-related emissions reduction calculations, AMBAG should clearly distinguish EV incentive programs and EV infrastructure programs, as they have distinct calculation methods and impacts on users. For EV incentive programs, AMBAG should also clearly distinguish the VMT impacts of its regional program(s) from the VMT impacts of State programs, such as Pavley and Advanced Clean Cars, which cannot be used to meet SB 375 GHG targets. All assumptions related to the off-model analysis and the step-by-step calculations need to be documented for public review.

Quantification of regional VMT

For this plan, AMBAG calculates interregional VMT using the formula of II (trips with internal origins and destinations) VMT plus $\frac{1}{2}$ of the total VMT of all trips with either the origin or destination external to the region (IX-XI). This is not the current practice followed by other MPOs. CARB staff recommend AMBAG use the formula of II+IX/XI to calculate regional VMT and GHG in future SCSs. This method is the current best practice amongst most other MPOs, which includes 100 percent IX-XI VMT that occurs

within the MPO regional boundaries. CARB staff also recommend AMBAG validate the traffic volumes in major freeways with its neighboring MPOs.

REFERENCES

- Association of Monterey Bay Area Governments. 2014. *Moving Forward: Monterey Bay 2035. 2035 Metropolitan Transportation Plan / Sustainable Communities Strategy*. Accessed in October 2018 at http://ambag.org/programs/met_transp_plann/documents/Final_2035_MTP_SCS/MovingForwardMontereyBayFinal.pdf.
- Association of Monterey Bay Area Governments. 2018. *Moving Forward: Monterey Bay 2040. 2040 Metropolitan Transportation Plan / Sustainable Communities Strategy*. Accessed October 2018 at: http://ambag.org/programs/met_transp_plann/documents/Final_2040_MTP_SCS/AMBAG_MTP-SCS_Final_EntireDocument.pdf.
- Association of Monterey Bay Area Governments. 2018b. *Moving Forward: Monterey Bay 2040 Appendix A: Regional Growth Forecast Technical Documentation*. Accessed October 2018 at: http://ambag.org/programs/met_transp_plann/documents/Final_2040_MTP_SCS/08-AMBAG_MTP-SCS_AppendixA.pdf.
- California Air Resources Board. 2011. Description of Methodology for ARB Staff Review of Greenhouse Gas Reductions from Sustainable Communities Strategies (SCS) Pursuant to SB 375. Accessed October 2018 at: http://www.arb.ca.gov/cc/sb375/scs_review_methodology.pdf
- California Air Resources Board. 2014. Technical Evaluation of the Greenhouse Gas Emission Reduction Quantification for Association of Monterey Bay Area Governments' SB 375 Sustainable Communities Strategy, Staff Report. November 2014. Accessed October 2018 at: https://www.arb.ca.gov/cc/sb375/ambag_tech_eval.pdf.
- California Department of Conservation. Farmland Mapping and Monitoring Program Table A-20: Monterey County 2014-2016 Land Use Conversion. Table A-27: San Benito County 2014-2016 Land Use Conversion. Table A-35: Santa Cruz County 2014-2016 Land Use Conversion. Accessed October 2018, by county, at: http://www.conservation.ca.gov/dlrp/fmmp/Pages/county_info.aspx.
- California Department of Finance, Demographic Research Unit. 2018. Table P1: Total Estimated and Projected Population for California and Counties: July 1, 2010 to July 1, 2060 in 1-year Increments. Accessed October 2018 at: <http://www.dof.ca.gov/Forecasting/Demographics/Projections/>.
- California Department of Transportation (Caltrans), Economic Analysis Branch Office of State Planning, prepared by The California Economic Forecast. California County-Level Economic Forecast 2015-2040. Accessed October 2018 at: <http://dot.ca.gov/hq/tpp/offices/eab/docs/Full%20Report%202015.pdf>.

California Employment Development Department. 2018. Long-Term Occupational Employment Projections. Accessed October 2018 at:
<https://data.edd.ca.gov/Employment-Projections/Long-Term-Occupational-Employment-Projections/4yzm-uyfq>

APPENDIX A: FURTHER DISCUSSION OF 2018 SCS CHANGES

Revised Population, Employment, and Housing Growth Forecast

AMBAG updated its Regional Growth Forecast for its 2018 SCS. The update utilized the same employment-driven method as the 2014 SCS, but changed the base year from 2010 to 2015 and extended the horizon year from 2035 to 2040. AMBAG's forecast method uses data from sources including the California Department of Finance, U.S. Bureau of Labor Statistics, the California Employment Development Department, and the California Department of Transportation.

Table 4 below compares population, housing, and employment used in the 2014 and 2018 SCSs. The forecast for 2020 and 2035 include a stronger recovery in employment than in the previous SCS and slightly slower growth in population and housing. While the end-year forecasts are fairly similar, compared to the last plan, this plan expects approximately 20 percent less population growth, 2 percent higher housing growth, and 11 percent less employment growth.

Table 4. Comparison of Population, Housing, and Employment Estimates in the AMBAG 2014 and 2018 SCS

		2014 SCS	2018 SCS	Difference
Population	2020	800,000	791,600	-1%
	2035	885,000	862,200	-3%
Households	2020	257,685	250,757	-3%
	2035	280,721	272,686	-3%
Housing units	2020	280,765	273,606	-3%
	2035	303,245	297,851	-2%
Employment	2020	344,500	351,800	2%
	2035	372,800	384,800	3%

Source: AMBAG 2014 and 2018 data tables

The final population projections are just slightly lower (97 to 99 percent) than those of the California Department of Finance Demographic Research Unit, with the gap growing in later years of the plan.⁸ Between 2015 and 2040, AMBAG's SCS expects only 86 percent as much population growth as the Department of Finance 2018 forecast over

⁸ Demographic Research Unit, California Department of Finance. January 2018. "Total Estimated and Projected Population for California and Counties: July 1, 2010 to July 1, 2060 in 1-year Increments." Table P1. Source: <http://www.dof.ca.gov/Forecasting/Demographics/Projections/>. Accessed October 2018.

the same time period. AMBAG's Regional Growth Forecast employment-driven methodology was selected in 2014 after validating it against Department of Finance estimates, as well as a more traditional cohort-component method. As noted above, the estimate for 2018 was revised to reflect slowing state and national growth rates and updated 2015 Department of Finance data suggesting that the fall in fertility rates and international migration due to the recession had not yet rebounded.⁹

The employment projections are slightly higher¹⁰ (by 8 to 9 percent) than those of the California Department of Transportation, with the smallest gap in 2020.¹¹ Between 2015 and 2020, AMBAG's SCS only expects 90 percent as much employment growth, but by 2035 and 2040, AMBAG's SCS expects employment growth that is 5 to 6 percent higher than does Caltrans. However, AMBAG's growth rate appears to be lower than that of the California Employment Development Department, putting it within a range of estimates created by State agencies.¹²

AMBAG's growth was then sub-allocated to local jurisdictions within the region. This growth allocation did change between the 2014 and 2018 plan. AMBAG derived these sub-regional growth allocations separately for employment, population, and housing, by updating each localities' demographic data to the 2015 baseline, creating draft allocations using historical trends and other data, and then revising them through discussions with local agency staff and others with knowledge of local growth plans (e.g., university officials).

⁹ Source: AMBAG. SCS Appendix A: Regional Growth Forecast Technical Documentation. Adopted June 13, 2018.

¹⁰ The population projections of the Department of Finance and the employment projections of Caltrans are derived using different methodologies and thus would not be expected to align. The fact that the SCS is higher than one source and lower than another says as much about those two distinct external data sources as it does about the SCS and is not considered to be an inconsistency.

¹¹ Prepared for Economic Analysis Branch Office of State Planning, California Department of Transportation (Caltrans) by The California Economic Forecast. California County-Level Economic Forecast 2015-2040. <http://dot.ca.gov/hq/tpp/offices/eab/docs/Full%20Report%202015.pdf>. Accessed October 2018.

¹² CARB reviewed information from the Employment Development Department for Santa Cruz and Monterey Counties from 2016 to 2026. Data for San Benito County alone was not available. This forecast expects employment in those counties to grow by 15 percent over 10 years. The SCS expects employment in the three counties combined to grow by 17 percent from 2015 to 2040. Source: Employment Development Department. July 26, 2018. Long-Term Occupational Employment Projections. <https://data.edd.ca.gov/Employment-Projections/Long-Term-Occupational-Employment-Projections/4yzm-uyfg>. Accessed October 2018.

Revised Transportation Expenditure Plan

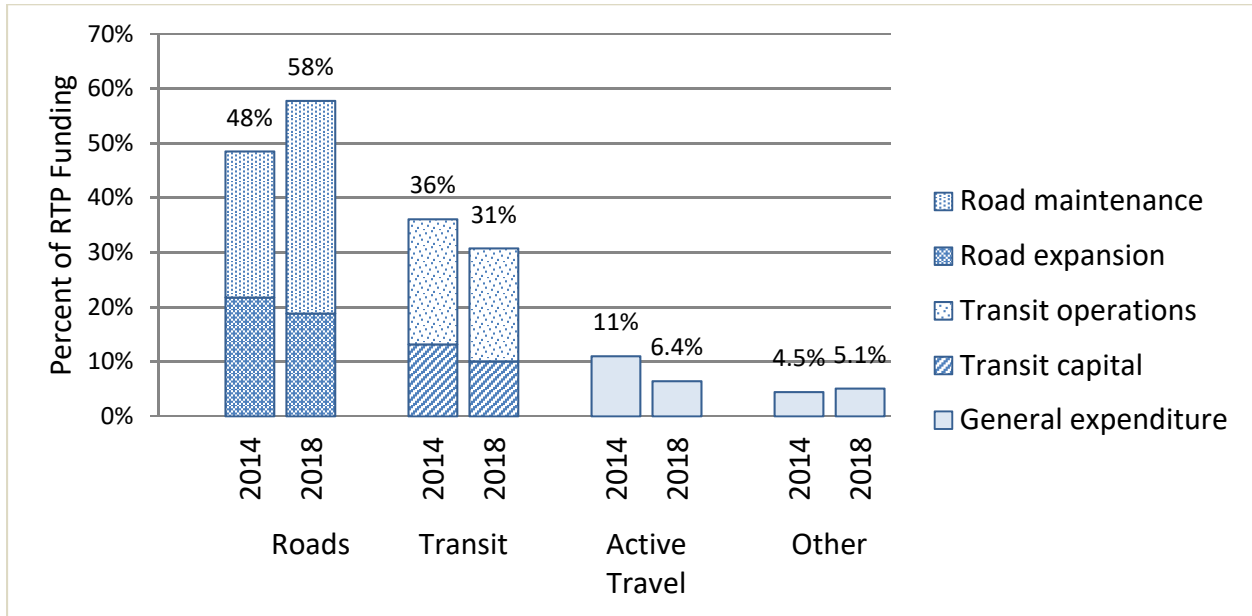
For the 2018 SCS, AMBAG updated the transportation expenditure plan. Total spending increased by nearly thirty percent, from approximately \$9.1 billion to \$11.7 billion.¹³ The largest increase in projected revenue came from State sources, which grew by \$1.3 billion (58 percent), especially with the passage of SB 1, and now represents just under one-third of revenues. Over half of the budget comes from local funds, and these projected receipts grew by \$787 million (14 percent). The largest sources of this increase in local funds are increases to the gas receipts allocated to local agencies following SB 1 and the November 2016 passage of sales tax Measures X and D in Monterey and Santa Cruz Counties, respectively.¹⁴

The pattern of spending changed as well. The spending allocations by mode are shown in Figure 1. These spending changes reflect changes in the Regional Transportation Plans (RTPs) of AMBAG's three county regional transportation planning agencies (RTPAs), which AMBAG compiles from the Transportation Agency for Monterey County, the Santa Cruz County Regional Transportation Commission and the San Benito County Council of Governments.

¹³ All figures represent escalated Year of Expenditure dollar values.

¹⁴ The previous SCS had included estimates for SB 1-type revenues and county sales tax measures, so these increases reflect only the adjustment to previous revenue expectations once the details became final, not the total funds expected from these sources.

Figure 1. AMBAG SCS Transportation Budget by Mode (2014 vs. 2018)



Sources: AMBAG's SB 150 Data Submittal to CARB (2014 SCS Funding), MTP/SCS Table 3-2: Total Expenditures by Project Type (2018 SCS Funding). All dollar values used in calculations are in Year of Expenditure.

The portion of the plan devoted to roads and highway spending grew by \$2.4 billion (54 percent), a significant increase from 48 to 58 percent of a budget that is itself growing. This increase occurred largely in the category of maintenance and operations, which grew by \$2.1 billion (88 percent). Spending on transit increased by \$339 million (10 percent), but because the overall budget grew so significantly, the portion of the plan devoted to transit fell from 36 to 31 percent. Per AMBAG staff communication, the higher transit expenditures serve to make up for recent funding shortfalls and a large restructuring at Santa Cruz Metro. Spending budgeted for projects that are exclusively active transportation decreased by \$243 million (25 percent) between the two plans, though many road maintenance and operations projects include funding for bicycle and pedestrian elements.¹⁵

¹⁵ Project descriptions can be seen in Tables C-1e, C-2e and C-3d of Appendix C of AMBAG's 2018 SCS: http://ambag.org/programs/met_transp_plann/documents/Final_2040_MTP_SCS/10-AMBAG_MTP-SCS_AppendixC.pdf.

Travel Demand Model

The primary transportation demand model that AMBAG employs is a traditional trip-based, four-step model run in TransCAD version 7.0 platform and includes Monterey, San Benito and Santa Cruz Counties. The main structure of the model is the same as used from AMBAG's previous 2014 SCS. For the 2018 SCS, AMBAG updated the model base year from 2010 to 2015, with the revised population, employment, and housing data discussed above. According to AMBAG, detailed transportation and transit networks in the region have been included for the current 2018 SCS. Specifically, AMBAG completed the traffic analysis zone (TAZ) data layer updates and incorporated this change into all modeling years (2015, 2020, 2035 and 2040).

Off-Model Adjustments

AMBAG relied on several off-model adjustments for various strategies to demonstrate their regional SB 375 targets. The adjustment methods for most strategies (e.g., vanpool, telecommute, bike lane, complete street, and TSM) were consistent with the methods used in their 2014 SCS, but need to be improved in subsequent SCS updates. AMBAG included one new off-model strategy in their 2018 SCS current plan for Electric Vehicle (EV) Incentives.

The included EV Incentives strategy attempts to quantify the GHG emissions benefits from the Monterey Bay Air Resources District (MBARD) EV and EV Infrastructure Funding Activity program. This program receives funding from AB 2766 / AB 923 local Department of Motor Vehicles (DMV) fees and has invested over \$3 million for EV promotion over the past 3 years (i.e., 2015-2017). The investment includes funding multiple DC fast charge and Level 2 charging station installation projects in the region and giving EV vouchers to public agencies and residents in the region. According to AMBAG's 2018 SCS and the provided project list, a total of \$21 million in funding will go to EV-related projects over the next 20 years through MBARD, and the total EV-related investment in the region will be over \$56 million by 2040.

Based on the total amount of investment, individual vehicle rebate amount, current EV promotion progress and individual EV activity patterns (i.e., all-electric VMT), AMBAG conducted an off-model analysis to estimate VMT and GHG emissions reductions from this local EV incentive program compared to the baseline. AMBAG assumes that there will be about 5000 EVs on-road by 2040 due to MBARD investment, which can reduce on-road GHG emissions by 1 percent. CARB staff reviewed the analysis and found that the calculation method oversimplifies many factors and needs to be improved in future analysis. For instance, AMBAG's current method did not distinguish the residential eVMT benefits attributed to local policies versus State policies/programs. AMBAG's current method did not quantitatively demonstrate how EV infrastructure in the region

can support the increasing amount of EVs. Some recommendations from CARB staff are:

- 1) Future analysis should exclude GHG emissions benefits from State programs from this calculation.
- 2) Future analysis should consider the different activity patterns of different types of EVs. Specifically, EVs used by public agencies and EVs used by residents should have different eVMT assumptions. For data on vehicle activity patterns, analysts can refer to the California Household Travel Survey (CHTS) and NHTS.
- 3) Future analysis should separate the calculations for EV incentive programs (e.g., voucher and rebate programs) and EV infrastructure programs (e.g., charging stations), as they have distinct GHG emissions reduction mechanisms and methodologies.

CARB's forthcoming SCS evaluation guidelines, to be published in fall 2018, will be a useful resource for AMBAG to improve EV-related off-model analysis in future plan cycles.

Adjustment to EMFAC Outputs

AMBAG used different versions of CARB's EMFAC model in quantifying the GHG emissions for its 2014 and 2018 SCSs. To allow an "apple to apples" comparison of the first and second round of SCSs, CARB developed a methodology to calculate a CO₂ adjustment to EMFAC outputs for SB 375 target demonstrations to allow MPOs to adjust the calculation of percent reduction in per capita CO₂ emissions used to meet the established targets when using a different version of EMFAC for the second SCS. This adjustment factor neutralizes the changes in fleet average emission rates between the version of EMFAC used for the 2014 SCS (EMFAC 2011) and the version used for the 2018 SCS (EMFAC 2014). The goal of the methodology is to hold each MPO to the same level of stringency in achieving their targets, regardless of the version of EMFAC used for its second SCS. AMBAG followed the methodology and their CO₂ per capita reduction results were adjusted accordingly.

APPENDIX B: TRAVEL DEMAND MODEL SENSITIVITY ANALYSES

The Association of Monterey Bay Area Governments (AMBAG) submitted a sensitivity analysis document to the California Air Resources Board (CARB) summarizing tests conducted by AMBAG and its consultant for:

1. Added Roadway Capacity
2. Modified Land Use
3. Added New Transit Service

In summary, AMBAG's modeled results do not represent the impact of Sustainable Communities Strategy (SCS) strategies on vehicle miles traveled (VMT) very well and rely heavily on off-model calculation methods to demonstrate the SB 375 regional target. CARB staff is aware that AMBAG is developing a new activity-based model for future SCSs. As AMBAG works to make this transition, CARB staff recommends that AMBAG improve the model's sensitivity to the region's core SCS strategies. CARB's forthcoming SCS evaluation guidelines, to be published in fall 2018, can be a useful resource for this purpose. As part of this effort, CARB recommends that AMBAG's model update include sensitivity testing of the model for transportation and land use strategies that AMBAG's preferred scenario will implement. AMBAG should also include scenarios showing model sensitivity to negative changes of selected parameters in the future.

ROAD CAPACITY EXPANSION

For this sensitivity analysis, AMBAG expanded the road capacity in the regional travel demand model by increasing the number of lanes modeled for a portion of CA-1 from 4 to 6 lanes. AMBAG compared the resulting volumes and VMT changes and concluded that the model is appropriately sensitive to this change. AMBAG provided two figures as the sensitivity analysis results (Figure 2 and Figure 3), but no additional quantification methods/data were provided.

According to the limited information provided by AMBAG, CARB staff conclude that the direction and area of influence due to the widening is qualitatively reasonable. But CARB staff cannot quantitatively estimate the elasticity between VMT and road capacity in the model. Given the importance of this strategy to AMBAG's SCS, CARB staff recommend that AMBAG continue to test their model sensitivity to road capacity expansion as they work to update to an activity-based model for use in developing their next SCS.

Figure 2. Area of CA-1 Widened for Sensitivity Test

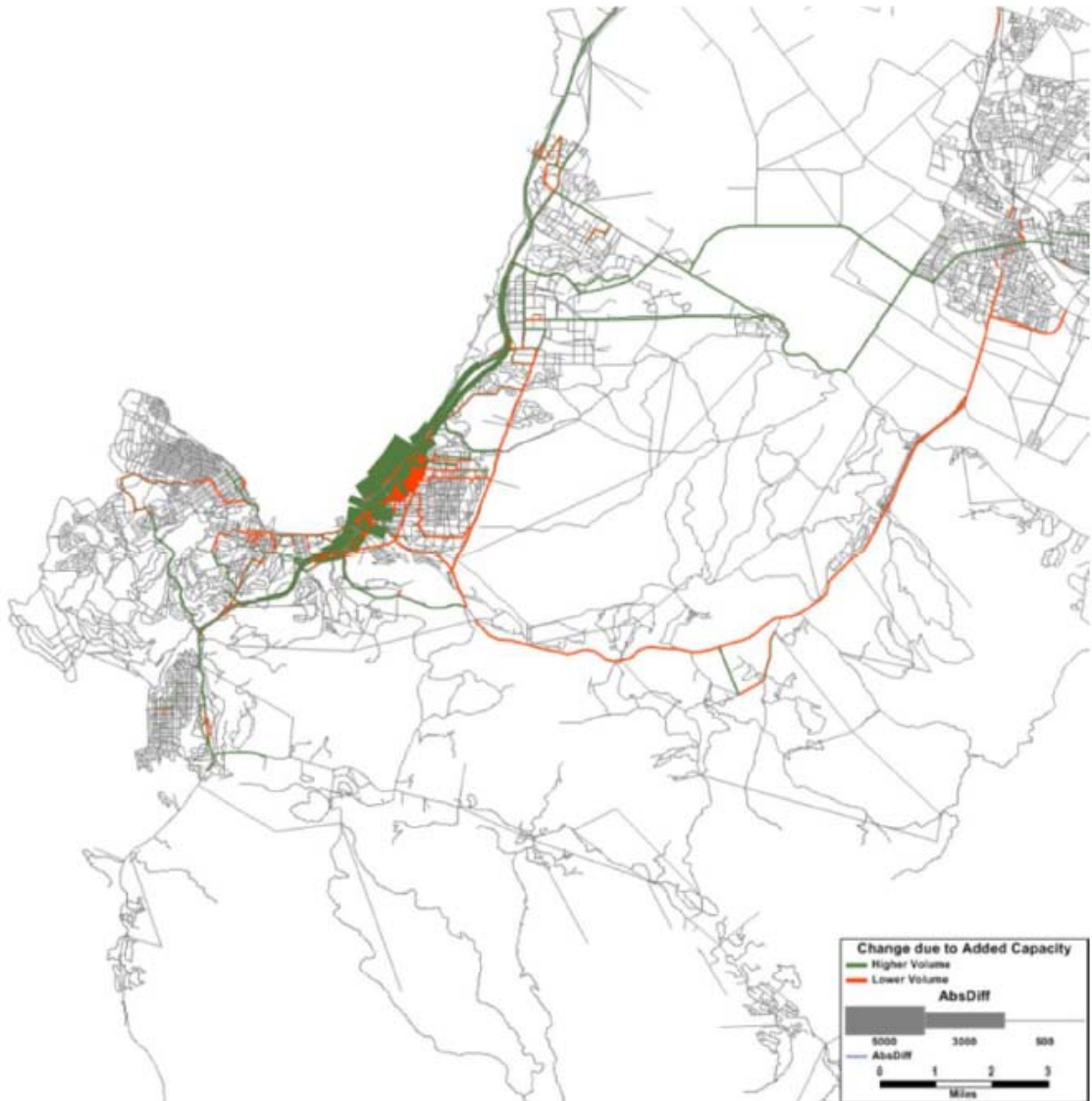
CA 1 Widening: 4 to 6 lanes



Source: Figure copied from AMBAG submittal. Area widened is highlighted in green.

Figure 3. Geographic Area Affected by the Road Capacity Sensitivity Test

Area of Influence



Source: Figure copied from AMBAG submittal. Green means volume increase and red means volume reduction.

JOB-HOUSING BALANCE

For this sensitivity analysis, AMBAG tested the impact on model outputs of land use changes on regional VMT by adding an infill development project into the Salinas area of their region. AMBAG compared the modeled VMT changes in the Salinas area and the whole AMBAG region. According to AMBAG, with the Salinas infill changes, the VMT in the influence area is reduced by just over 1 percent, but regional VMT increases by 0.04 percent (Table 5).

Table 5. Model Sensitivity Analysis Result for Job-Housing Balance

Region	VMT Without Infill	VMT With Infill	Percent Change
Salinas Infill Influence Area	203,640 -1.19%	201,220	-1.19%
Entire AMBAG Area	4,703,250	4,705,170 +0.04%	+0.04%

According to the information provided by AMBAG, CARB staff conclude that the model is partially sensitive to the job-housing ratio change inside the influence area. However, at the regional level, CARB staff is concerned about the sensitivity of the model due to the small magnitude of change and directionality (i.e., overall increase in VMT due to infill). Given the importance of this strategy to AMBAG's SCS, CARB staff recommend that AMBAG continue to test their model sensitivity to job-housing balance as they work to update to an activity-based model for use in developing their next SCS.

TRANSIT NETWORK

AMBAG conducted a sensitivity analysis for its transit network and concluded that the model was not sensitive enough to capture the VMT changes from transit network change. Therefore, AMBAG prepared off-model adjustment methods for their transit network. Given the importance of this strategy to AMBAG's SCS, CARB staff recommend that AMBAG continue to test their model sensitivity to transit as they work to update to an activity-based model for use in developing their next SCS.

APPENDIX C: DATA TABLE

Modeling Parameters ^[1]	2005 (if available)	20150 (base year)	2020		2035		2040		Data Source(s)
			With Project ^[2]	Without Project ^[3]	With Project	Without Project	With Project	Without Project	
DEMOGRAPHICS									
Total population	N/A	762,676	791,600	791,600	862,200	862,200	883,300	883,300	2040 MTP/SCS Appendix A : Regional Growth Forecast
Group quarters population	N/A	33,889	36,715	36,715	45,563	45,563	47,914	47,914	Subregional-4. SummaryNEW2_1 21916.xlsx
Total employment (employees)	N/A	337,600	351,800	351,800	384,800	384,800	395,000	395,000	Subregional-4. SummaryNEW2_1 21916.xlsx
Average unemployment rate (%)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Total number of households	N/A	240,278	250,757	250,757	272,686	272,686	279,499	279,499	Subregional-4. SummaryNEW2_1 21916.xlsx
Persons per household	N/A	3.17	3.16	3.16	3.16	3.16	3.16	3.16	2040 MTP/SCS Appendix A : Regional Growth Forecast. Applied persons per HH by county average.
Auto ownership per household	N/A	1.976	1.976	1.976	1.976	1.976	1.976	1.976	2010 Census
Median household income	N/A	67,105.90	67,105.90	67,105.90	67,105.90	67,105.90	67,105.90	67,105.90	2010 Census
LAND USE ^[4]									
Total acres within MPO	3,295,936	3,295,936	3,295,936	3,295,936	3,295,936	3,295,936	3,295,936	3,295,936	County land totals: 2040 MTP/SCS Chapter 4. GIS file: Counties_RGNL_A MBAG.
Total resource area acres (CA GC Section 65080.01)	N/A	292,088	292,088	292,088	292,088	292,088	290,283	N/A	2040 MTP/SCS FEIR Section 4-2

Modeling Parameters ^[1]	2005 (if available)	20150 (base year)	2020		2035		2040		Data Source(s)
			With Project ^[2]	Without Project ^[3]	With Project	Without Project	With Project	Without Project	
Total consumed/converted farmland acres (CA GC Section 65080.01)	N/A	N/A	3,061	3,061	4,076	4,076	5,123	N/A	FMMP-P,U,S. FMMP 2014. AMBAG Performance Measures.
Total developed acres (Commercial/Residential/Mixed Use/Industrial/INS/Other)	N/A	75,009	N/A	N/A	N/A	N/A	77,352	N/A	2040 MTP/SCS Appendix I :SCS Maps. Excludes Agriculture NU-1 , undeveloped, and OSR.
Total commercial developed acres	N/A	5,705	N/A	N/A	N/A	N/A	6,073	N/A	2040 MTP/SCS Appendix I :SCS Maps. Includes (U-3, S-3, S-4, S-5, T-3, NU-2)
Total residential developed acres	N/A	48,192	N/A	N/A	N/A	N/A	49,548	N/A	2040 MTP/SCS Appendix I :SCS Maps. Includes (U-1, U-2, S-1, S-2, T-1, T-2, NU-3, NU-4)
Total mixed use developed acres	N/A	1,725	N/A	N/A	N/A	N/A	1,969	N/A	2040 MTP/SCS Appendix I :SCS Maps. Includes (U-4, S-6, T-4)
Total housing units	N/A	262,660	273,606	273,606	297,851	297,851	305,293	305,293	2040 MTP/SCS Appendix A - Regional Growth Forecast
Housing vacancy rate (%)	N/A	8.5	8.4	8.4	8.4	8.4	8.4	8.4	2040 MTP/SCS Appendix A - Regional Growth Forecast
Total single-family detached housing units	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Total small-lot single family detached housing units	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Modeling Parameters ^[1]	2005 (if available)	20150 (base year)	2020		2035		2040		Data Source(s)
			With Project ^[2]	Without Project ^[3]	With Project	Without Project	With Project	Without Project	
(x,xxx sq. ft. lots and smaller)									
Total conventional-lot single family detached units (between x,xxx and x,xxx sq. ft. lots)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Total large-lot single family detached units (x,xxx sq ft. lots and larger)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Total single-family attached housing units	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Total multi-family housing units	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Total mobile home units & other	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Total infill housing units	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Total mixed use buildings	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Total HH within 1/2 mile of transit stations and stops	N/A	182,320	189,252	189,163	200,859	200,764	207,987	203,802	RTDM Model Files TAZ and Transit Routes/Stops
Total employment within 1/2 mile of transit stations and stops	N/A	264,735	274,513	274,342	299,299	299,116	308,478	306,388	RTDM Model Files TAZ and Transit Routes/Stops
TRANSPORTATION SYSTEM									
Freeway general purpose lanes – mixed flow lane miles									

Modeling Parameters ^[1]	2005 (if available)	20150 (base year)	2020		2035		2040		Data Source(s)
			With Project ^[2]	Without Project ^[3]	With Project	Without Project	With Project	Without Project	
Highway (lane miles)	N/A	230	231	230	266	230	268	230	RTDM FC 2 Model Network layer
Expressway (lane miles)	N/A	0	0	0	0	0	0	0	RTDM Model Network layer
HOV (lane miles)	N/A	0	0	0	0	0	0	0	RTDM Model Network layer
Arterial (lane miles)	N/A	2,231	2,238	2,235	2,315	2,235	2,390	2,235	RTDM FC 3 ,4 Model Network layer
Collector (lane miles)	N/A	1,773	1,786	1,773	1,813	1,773	1,831	1,773	RTDM FC 5,6 Model Network layer
Local (lane miles)	N/A	5,731	5,730	5,730	5,760	5,730	5,773	5,730	RTDM FC 7 Model Network layer
Freeway/Interstate (lane miles)	N/A	0	0	0	0	0	0	0	RTDM FC 1 Model Network layer
Local, express bus, and neighborhood shuttle operation miles	N/A	8,941	9,324	8,947	9,636	8,947	13,317	8,947	RTDM Transit Company Report
Bus rapid transit bus operation miles	N/A	423	920	423	1,033	423	1,062	423	RTDM Transit Route Report
Passenger rail operation miles	N/A	71	99	71	99	71	108	71	2040 MTP/SCS Appendix C: Project Lists
Transit total daily vehicle service hours	N/A	160	312	163	331	165	278	166	RTDM Transit Company Report
Bicycle and pedestrian trail/lane miles	N/A	892	N/A	892	N/A	892	1,377	892	2040 MTP/SCS Appendix C: Project Lists
Vanpool (total riders per weekday)	N/A	902	1,535	1,535	2,800	2,800	3,113	3,113	Vanpool Growth Projections for AMBAG
TRIP DATA ^[5]									
Number of trips by trip purpose									
Home-based work	N/A	307,427	320,729	353,954	348,026	348,026	357,929	357,545	Trip Generation - Balanced P and A

Modeling Parameters ^[1]	2005 (if available)	20150 (base year)	2020		2035		2040		Data Source(s)
			With Project ^[2]	Without Project ^[3]	With Project	Without Project	With Project	Without Project	
									(Peak and Off-Peak)
Home-based shop	N/A	201,674	210,456	232,258	229,301	229,301	235,421	235,300	Trip Generation - Balanced P and A (Peak and Off-Peak)
Home-based other	N/A	876,874	915,445	1,010,277	996,109	996,109	1,027,313	1,021,210	Trip Generation - Balanced P and A (Peak and Off-Peak)
Home-based school	N/A	102,535	104,410	104,410	116,260	116,260	119,165	119,165	Trip Generation - Balanced P and A (Peak and Off-Peak)
Home-based university	N/A	26,269	27,830	27,830	30,328	30,328	30,328	30,328	Trip Generation - Balanced P and A (Peak and Off-Peak)
Non-home-based work	N/A	198,479	204,145	204,145	224,327	224,327	230,422	230,422	Trip Generation - Balanced P and A (Peak and Off-Peak)
Non-home-based other	N/A	597,036	614,493	614,493	666,517	666,517	681,880	681,880	Trip Generation - Balanced P and A (Peak and Off-Peak)
Average peak weekday trip length by trip purpose (miles)									
Home-based work	N/A	9.93	9.92	9.83	9.75	9.74	9.69	9.67	Trip Distribution - Trip Length Table
Home-based shop	N/A	4.92	4.90	4.85	4.84	4.83	4.79	4.81	Trip Distribution - Trip Length Table
Home-based other	N/A	5.57	5.56	5.50	5.44	5.44	5.38	5.40	Trip Distribution - Trip Length Table
Home-based school	N/A	6.41	6.28	6.23	5.99	6.02	5.91	5.90	Trip Distribution - Trip Length Table
Home-based university	N/A	12.13	12.44	12.42	12.75	12.72	12.54	12.75	Trip Distribution - Trip Length Table

Modeling Parameters ^[1]	2005 (if available)	20150 (base year)	2020		2035		2040		Data Source(s)
			With Project ^[2]	Without Project ^[3]	With Project	Without Project	With Project	Without Project	
Non-home-based work	N/A	6.80	6.80	6.73	6.60	6.62	6.60	6.55	Trip Distribution - Trip Length Table
Non-home-based other	N/A	5.29	5.30	5.25	5.19	5.19	5.20	5.15	Trip Distribution - Trip Length Table
Average peak weekday travel time by trip purpose (minutes)									
Home-based work	N/A	15.56	15.52	15.53	15.63	15.61	15.49	15.65	Trip Distribution - Trip Length Table
Home-based shop	N/A	8.49	8.44	8.45	8.51	8.49	8.39	8.51	Trip Distribution - Trip Length Table
Home-based other	N/A	9.45	9.41	9.40	9.42	9.40	9.26	9.40	Trip Distribution - Trip Length Table
Home-based school	N/A	10.44	10.26	10.26	10.08	10.10	9.81	10.01	Trip Distribution - Trip Length Table
Home-based university	N/A	20.23	20.42	20.59	21.16	21.29	20.75	21.54	Trip Distribution - Trip Length Table
Non-home-based work	N/A	10.92	10.89	10.88	10.84	10.89	10.84	10.88	Trip Distribution - Trip Length Table
Non-home-based other	N/A	8.72	8.74	8.74	8.72	8.73	8.73	8.74	Trip Distribution - Trip Length Table
MODE SHARE									
Vehicle Mode Share (Peak Periods)									
SOV (% of trips)	N/A	39.48%	39.50%	39.71%	39.52%	39.54%	39.42%	39.58%	Peak Mode and Off Peak Choice Summary - Mode Choice
HOV (% of trips)	N/A	43.68%	43.63%	43.48%	43.73%	43.74%	43.56%	43.75%	Peak Mode and Off Peak Choice Summary - Mode Choice
Transit (% of trips)	N/A	1.37%	1.41%	1.34%	1.40%	1.36%	1.39%	1.35%	Peak Mode and Off Peak Choice Summary - Mode Choice
Non-motorized (% of trips)	N/A	15.47%	15.46%	15.47%	15.35%	15.36%	15.63%	15.32%	Peak Mode and Off Peak Choice

Modeling Parameters ^[1]	2005 (if available)	20150 (base year)	2020		2035		2040		Data Source(s)
			With Project ^[2]	Without Project ^[3]	With Project	Without Project	With Project	Without Project	
									Summary - Mode Choice
Vehicle Mode Share (Whole Day)									
SOV (% of trips)	N/A	38.59%	38.61%	38.79%	38.64%	38.65%	38.54%	38.68%	Peak Mode and Off Peak Choice Summary - Mode Choice
HOV (% of trips)	N/A	44.24%	44.19%	44.08%	44.26%	44.26%	44.09%	44.26%	Peak Mode and Off Peak Choice Summary - Mode Choice
Transit (% of trips)	N/A	1.25%	1.28%	1.22%	1.27%	1.24%	1.26%	1.23%	Peak Mode and Off Peak Choice Summary - Mode Choice
Non-motorized (% of trips)	N/A	15.92%	15.92%	15.92%	15.83%	15.86%	16.11%	15.83%	Peak Mode and Off Peak Choice Summary - Mode Choice
Average weekday trip length (miles)									
SOV	N/A	7.52	7.50	7.46	7.37	7.37	7.33	7.32	Trip Distribution - Trip Length Table
HOV	N/A	7.18	7.15	7.08	7.07	7.07	7.06	7.04	Trip Distribution - Trip Length Table
Transit	N/A	5.01	5.24	5.21	5.52	4.96	5.39	4.91	Trip Distribution - Trip Length Table
Walk	N/A	1.24	1.24	1.24	1.25	1.25	1.25	1.25	Trip Distribution - Trip Length Table
Bike	N/A	4.11	4.11	4.11	4.10	4.08	4.07	4.08	Trip Distribution - Trip Length Table
Average weekday travel time (minutes)									
SOV	N/A	16.22	16.18	16.20	16.27	16.27	16.15	16.31	Trip Distribution - Trip Length Table
HOV	N/A	16.22	16.18	16.20	16.27	16.27	16.15	16.31	Trip Distribution - Trip Length Table

Modeling Parameters ^[1]	2005 (if available)	20150 (base year)	2020		2035		2040		Data Source(s)
			With Project ^[2]	Without Project ^[3]	With Project	Without Project	With Project	Without Project	
Transit	N/A	15.67	16.08	16.07	16.73	15.54	16.52	15.53	Trip Distribution - Trip Length Table
Walk	N/A	30.90	30.73	30.72	31.19	31.17	30.96	31.25	Trip Distribution - Trip Length Table
Bike	N/A	35.98	35.86	35.70	35.53	35.43	35.52	35.38	Trip Distribution - Trip Length Table
TRAVEL MEASURES									
Total VMT per weekday for passenger vehicles (ARB vehicle classes of LDA, LDT1, LDT2 and MDV) (miles)	N/A	14,451,056	15,259,259	15,807,458	17,287,854	17,292,479	17,871,429	17,925,593	RTDM Outputs
Total II (Internal) VMT per weekday for passenger vehicles (miles)	N/A	9,574,166	9,879,756	10,410,657	10,456,090	10,458,973	10,555,324	10,623,576	RTDM Outputs
Total IX/XI VMT per weekday for passenger vehicles (miles)	N/A	4,533,346	4,997,052	5,012,595	6,329,410	6,332,355	6,774,817	6,761,141	RTDM Outputs
Total XX VMT per weekday for passenger vehicles (miles)	N/A	343,544	382,451	384,206	502,354	501,151	541,287	540,876	RTDM Outputs
Congested Peak Period (AM+PM) VMT on freeways FC 2 (V/C ratios >0.86)	N/A	231,421	322,533	322,465	347,078	390,226	374,772	447,940	RTDM Outputs
Congested Peak Period (AM+PM) VMT on all other roadways FC 3-7 (V/C ratios >0.90)	N/A	267,643	318,839	319,431	621,248	679,156	743,752	811,252	RTDM Outputs

Modeling Parameters ^[1]	2005 (if available)	20150 (base year)	2020		2035		2040		Data Source(s)
			With Project ^[2]	Without Project ^[3]	With Project	Without Project	With Project	Without Project	
CO₂ Emissions [6]									
Total CO ₂ emissions per weekday for passenger vehicles (ARB vehicle classes LDA, LDT1, LDT2, and MDV) (tons)	N/A	6,718	6,980	7,245	7,820	7,796	8,076	8,092	RTDM Outputs
Total II (Internal) CO ₂ emissions per weekday for passenger vehicles (tons)	N/A	4,451	4,519	4,771	4,730	4,715	4,770	4,796	RTDM Outputs
Total IX / XI trip CO ₂ emissions per weekday for passenger vehicles (tons)	N/A	2,107	2,286	2,297	2,863	2,855	3,061	3,052	RTDM Outputs
Total XX trip CO ₂ emissions per weekday for passenger vehicles (tons)	N/A	159.7	174.9	176.1	227.2	225.9	244.6	244.2	RTDM Outputs
INVESTMENT (Billions)									
Total RTP Expenditure (In 2018 Year, \$1000)	N/A	N/A	N/A	N/A	N/A	N/A	\$9,940,177	N/A	MTP Financial Plan, Chapter 3, Table 3-2. Updated 6/4/18.
Highway , O&M and Capacity expansion (\$1000)	N/A	N/A	N/A	N/A	N/A	N/A	\$3,049,331	N/A	MTP Financial Plan, Chapter 3, Table 3-2. Updated 6/4/18.
Other road capacity expansion (\$1000)	N/A	N/A	N/A	N/A	N/A	N/A	\$385,139	N/A	MTP Financial Plan, Chapter 3, Table 3-2. Updated 6/4/18.

Modeling Parameters ^[1]	2005 (if available)	20150 (base year)	2020		2035		2040		Data Source(s)	
			With Project ^[2]	Without Project ^[3]	With Project	Without Project	With Project	Without Project		
Roadway maintenance (\$1000)	N/A	N/A	N/A	N/A	N/A	N/A	\$2,305,736	N/A	MTP Financial Plan, Chapter 3, Table 3-2. Updated 6/4/18.	
BRT projects (\$1000)	N/A	N/A	N/A	N/A	N/A	N/A	-	N/A	MTP Financial Plan, Chapter 3, Table 3-2. Updated 6/4/18.	
Transit capacity expansion (\$1000)	N/A	N/A	N/A	N/A	N/A	N/A	\$425,271	N/A	MTP Financial Plan, Chapter 3, Table 3-2. Updated 6/4/18.	
Transit operations (\$1000)	N/A	N/A	N/A	N/A	N/A	N/A	\$2,630,284	N/A	MTP Financial Plan, Chapter 3, Table 3-2. Updated 6/4/18.	
Bike and pedestrian projects (\$1000)	N/A	N/A	N/A	N/A	N/A	N/A	\$708,240	N/A	MTP Financial Plan, Chapter 3, Table 3-2. Updated 6/4/18.	
TRANSPORTATION USER COSTS										
Vehicle operating costs (Year XXXX \$ per mile)	N/A	Light = .14, Medium = .23, Heavy = .26	Light = .14, Medium = .23, Heavy = .26	Light = .14, Medium = .23, Heavy = .26	Light = .14, Medium = .23, Heavy = .26	Light = .14, Medium = .23, Heavy = .26	Light = .14, Medium = .23, Heavy = .26	Light = .14, Medium = .23, Heavy = .26	Light = .14, Medium = .23, Heavy = .26	AMBAG Truck Model, 2010
Gasoline price (Year XXXX \$ per gallon)	N/A	Light = 3.13, Medium = 3.15, Heavy = 3.15	Light = 3.13, Medium = 3.15, Heavy = 3.15	Light = 3.13, Medium = 3.15, Heavy = 3.15	Light = 3.13, Medium = 3.15, Heavy = 3.15	Light = 3.13, Medium = 3.15, Heavy = 3.15	Light = 3.13, Medium = 3.15, Heavy = 3.15	Light = 3.13, Medium = 3.15, Heavy = 3.15	Light = 3.13, Medium = 3.15, Heavy = 3.15	AMBAG Truck Model, 2010
Average transit fare (Year XXXX \$)	N/A	\$2.00 to \$12.00 by mode (2010)	\$2.00 to \$12.00 by mode (2010)	\$2.00 to \$12.00 by mode (2010)	\$2.00 to \$12.00 by mode (2010)	\$2.00 to \$12.00 by mode (2010)	\$2.00 to \$12.00 by mode (2010)	\$2.00 to \$12.00 by mode (2010)	\$2.00 to \$12.00 by mode (2010)	AMBAG Truck Model, 2010
Parking cost (Year XXXX \$)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Modeling Parameters ^[1]	2005 (if available)	20150 (base year)	2020		2035		2040		Data Source(s)
			With Project ^[2]	Without Project ^[3]	With Project	Without Project	With Project	Without Project	
EMFAC ADJUSTMENT [7]									
% change in per capita GHG due to EMFAC 2011 to EMFAC2014 adjustment (%)	N/A	N/A	-2.80%	-2.80%	-5.50%	-5.50%	N/A	N/A	2018MTP_Off Model GHG Computations

[1] When reporting \$ units, indicate whether they are current dollars, YOE (year of exchange), or other.

[2] This scenario includes modeling of all planned and programmed projects in RTP/SCS for respective calendar year.

[3] This scenario should reflect the MPO's Business as Usual scenario, which for most is what would happen under the MPO's previously adopted RTP for the respective calendar year.

[4] In cases where "TOTAL" land use data is reflective of "GROWTH ONLY", please indicate those instances within the table.

[5] Please include any other trip type that may be applicable to your region.

[6] Please provide ARB staff with the EMFAC Input and Output files associated with these outputs.

[7] Please provide the corresponding documentation for conducting EMFAC adjustment.

APPENDIX D: PERFORMANCE INDICATORS

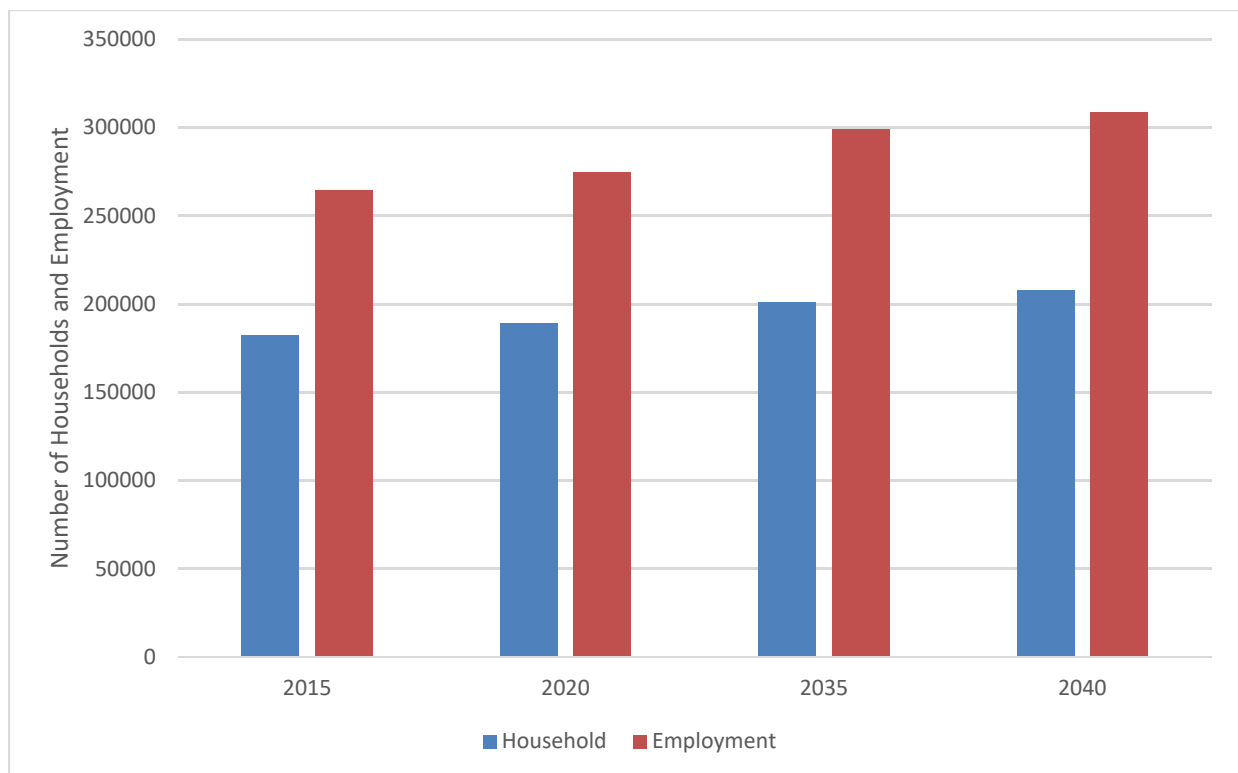
LAND USE INDICATORS

Land use influences the travel behavior of residents including both mode choice and trip length. The evaluation focused on two land use-related performance indicators to determine whether they support Association of Monterey Bay Area Governments' (AMBAG) land use strategies and forecasted greenhouse gas (GHG) emissions forecast: total households and employment near transit, and mixed-use developed acreage.

Housing and Employment near Transit

As shown in Figure 4, AMBAG estimates that the number of households near transit (i.e., within ½ miles of transit stations and stops) will increase by 18,539 dwelling units, or 10 percent, from 2015 to 2035. AMBAG also estimates that employment near transit (i.e., within ½ miles of transit stations and stops) will increase by 34,564 jobs, or 13 percent, from 2015 to 2035. Both households and employment will continue to increase to 2040. The metric supports AMBAG's 2018 Sustainable Communities Strategy (SCS) strategy and its GHG emissions reduction targets.

Figure 4. Total Households and Employment within 1/2 Mile of Transit Stations and Stops



Total Mixed-Use Developed Acres

Table 6 shows that the total acreage of mixed use land in AMBAG will increase by over 14 percent from 2005 to 2040. Mixed-use developed acreage can help reduce individuals' trip length and vehicle miles traveled (VMT). Therefore, the increased acreage of mixed-use land in AMBAG is directionally supportive to AMBAG's GHG emissions reduction targets.

Table 6. Mixed-Use Developed Acres in AMBAG

Calendar Year	Mixed Use Developed Acres	Percent Change from 2015
2015	1725	-
2040	1969	14.1

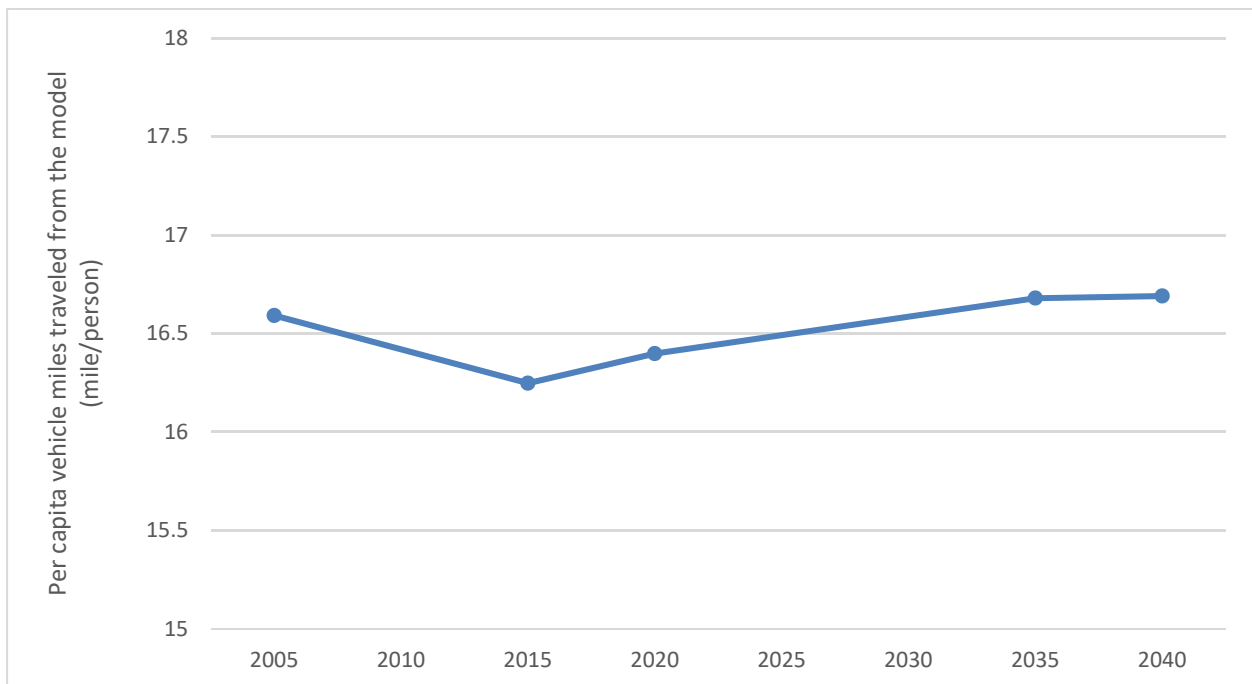
TRANSPORTATION INDICATORS

CARB staff evaluated three transportation-related performance indicators to determine whether the trends support AMBAG's transit strategies and the reported GHG emissions reductions, including per capita VMT, transit operation miles, and transit service hours.

Per Capita VMT

The 2018 SCS shows a decline in per capita passenger vehicle VMT between 2005 and 2015, and an increase afterwards. As shown in Figure 5, per capita VMT is modeled to decrease by 1.2 percent between 2005 and 2020, and increase by 0.5 percent between 2005 and 2035. Whereas the modeled VMT will increase in 2020 and 2035, AMBAG's 2018 SCS also includes off-model strategies that are expected to reduce VMT per capita that are not reflected in these results. AMBAG's off-model estimation uses these transportation model results (i.e., VMT increases) as inputs to their calculation. CARB staff therefore found that the indicator here is neither consistent nor inconsistent with AMBAG's claimed GHG emissions reductions.

Figure 5. Per Capita Passenger VMT



Transit Operation Miles

Figure 6 shows AMBAG's anticipated bus rapid transit operation miles. Compared to the 2005 base year, the operation miles increase by 140 percent in 2020, and by 150 percent in 2035. The operation miles continue to increase in 2040.

Figure 6. Bus Rapid Transit Operation Miles

