

**TECHNICAL EVALUATION OF THE
GREENHOUSE GAS EMISSIONS REDUCTION QUANTIFICATION FOR
TAHOE METROPOLITAN PLANNING ORGANIZATION/TAHOE REGIONAL
PLANNING AGENCY'S
SB 375 2017 SUSTAINABLE COMMUNITIES STRATEGY**

October 2018



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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 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 May 4, 2018, Tahoe Regional Planning Agency (TRPA), which also serves as the Metropolitan Planning Organization (MPO) for the Lake Tahoe region, completed submittal of its 2017 SCS and necessary supporting documentation for CARB to review with estimates of 8 percent and 5 percent decrease in GHG per capita emissions reductions by 2020 and 2035 compared to 2005, respectively. The region's per capita GHG emissions reduction targets are 7 percent in 2020 and 5 percent in 2035, compared to 2005 levels. This report reflects CARB's technical evaluation of TRPA's 2017 SCS GHG quantification.

CARB DETERMINATION

ACCEPT

Based on a review of all available evidence, including model inputs, outputs, the SCS strategies, performance indicators, and implementation efforts so far, CARB accepts TRPA's determination that its 2017 SCS would, if implemented, meet the targets of a 7 percent reduction in 2020 and a 5 percent reduction in 2035.

TRPA's 2017 SCS contains nearly the same strategies as the first SCS, which CARB reviewed and accepted as meeting the targets in April 2013. For the 2017 SCS, TRPA incorporated modeling improvements and updated inputs and assumptions for housing, employment, and visitor travel that show an increase in quantified GHG emissions reductions for the same set of strategies. These improved modeling assumptions coupled with newly added off-model adjustments for electric vehicle infrastructure contributed to changes in the quantification of GHG emissions reductions.

SCOPE AND METHODOLOGY

CARB examined TRPA'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 TRPA's 2017 SCS is an update to its adopted 2012 SCS, CARB also performed an additional qualitative review of TRPA's implementation actions over the past four years. CARB looked for evidence that TRPA 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 2012 and 2017 plans.

CHANGES FROM THE REGION'S PREVIOUS SCS GHG QUANTIFICATION

CARB focused its review on identifying and evaluating changes TRPA made between the current 2017 SCS and the previous 2012 SCS² with the potential to affect land use and the SCS GHG emissions quantification. This included review of changes made to the transportation strategies included within the SCS, updates to the model and off-model methods used to calculate passenger travel-related GHG emissions, as well as any changes in 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 TRPA's model and off-model GHG emissions calculations.

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

² CARB's acceptance and technical evaluation of TRPA's first SCS was completed in April 2013, and contains detailed information about the methods TRPA 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/tmpo_scs_tech_eval.pdf.

LAND USE AND TRANSPORTATION STRATEGIES

TRPA’s 2017 SCS maintains the same set of land use and transportation strategies adopted in their previous 2012 SCS, carrying over the same land use scenario and assumptions adopted in the 2017 SCS with newly added off-model adjustments for electric vehicle infrastructure. The adopted land use scenario, “low development, highly incentivized redevelopment”, concentrates the region’s limited remaining growth in the form of infill development in existing communities near transit and trails.

The 2017 SCS incorporates minor updates to the region’s forecasted population, employment, and housing growth. Table 1 summarizes these changes, and where appropriate, CARB’s assessment and findings based on consistency with best available information and practice.

Table 1. Summary of Demographic, Employment, and Housing Changes in TRPA’s 2017 SCS Compared to the 2012 SCS

Action	CARB Assessment	Finding
Revised Population	Reasonable	The 2017 SCS shows less than 2 percent decrease in population compared to the 2012 SCS. This change is consistent with the region’s constrained growth potential. See Appendix A for further detail.
Revised Number of Jobs	Reasonable	The 2017 SCS shows less than 3 percent increase in number of jobs compared to the 2012 SCS. This is due to use of data obtained from the latest census and surveys. See Appendix A for further detail.
Revised Housing Units	Reasonable	The 2017 SCS shows less than 7 percent decrease in housing units compared to the 2012 SCS. This change is consistent with the region’s constrained growth potential. See Appendix A for further detail.

MODEL AND OFF-MODEL CALCULATIONS

TRPA used the same modeling tools to evaluate its 2017 SCS and 2012 SCS, however, they made key changes to model inputs and assumptions that affect the GHG emissions quantification. Table 2 summarizes these changes along with CARB’s assessment and findings based on consistency with best available information and modeling practice.

Table 2. Key Changes in Modeling Processes of TRPA’s 2017 SCS Compared to the 2012 SCS

Modeling Component	CARB Assessment	Finding
Revised Population, Employment, and Housing Growth Forecast	Reasonable	The model was updated with business, employment, and hotel-motel information from InfoGroup and incorporated, tract-level 2010 census demographics, internal and external validations of single-family residences, and school enrollment. See Appendix A for further detail.
Revised Assumptions Related to Visitor Travel	Reasonable	The model was calibrated and validated with the latest observed traffic count, and cordon station license plate survey data. The model has also been independently reviewed by Kittelson & Associates, Inc. See Appendix A for further detail.
Adjustment to EMFAC Outputs	Reasonable	TRPA followed the procedure demonstrated in CARB’s memo titled “ <i>Methodology to Calculate CO2 Adjustment to EMFAC Output for SB 375 Target Demonstrations.</i> ” See Appendix A for further detail.
Off Model Adjustments for Electric Vehicle Infrastructure	Reasonable	TRPA adapted the Bay Area region’s PEV GHG reduction methodology and assumed 40 percent electric vehicle miles traveled (eVMT) for the baseline and 80 percent eVMT for the SCS scenario. The estimated GHG reduction is 1.7 percent for 2035. See Appendix A for further detail.
Trip Reduction Impact Analysis (TRIA) Tool	Reasonable	TRPA updated their TRIA tool to reflect current transit services and new transportation facilities.

REGIONAL LAND USE AND TRANSPORTATION PERFORMANCE INDICATORS

CARB reanalyzed several land use and transportation modeled indicators against relationships expressed in the empirical literature between each metric, and vehicle miles traveled (VMT) and/or GHG emissions to understand whether changes were consistent with forecasted GHG emission reduction trends. Table 3 shows a summary of TRPA’s 2017 SCS performance indicators. Data shown in this analysis came from TRPA’s modeling data table, see Appendix B. Supporting data and charts for performance indicators are provided in Appendix C.

Table 3. Performance Indicators

Performance Indicator	CARB Assessment	Finding
Land Use Indicators		
Residential Density	Consistent with reducing VMT/GHG	TRPA’s 2017 SCS shows an 8 percent increase in average residential density from 2005 to 2035. Residential density is 7.64 housing units/developed acre for 2035, compared to 7.08 in 2005.
Housing Types Mix	Consistent with reducing VMT/GHG	Housing type mix shows an increasing multi-family housing share, while single-family housing share decreases. Multi-family housing share increases from 18 percent to 25 percent, while single-family housing share decreases from 82 percent to 75 percent.
Transportation Indicators		
Mode Share	Consistent with reducing VMT/GHG	By 2035, modeled auto mode share decreases 2 percent from 2005 to 2035, and shifts to transit and non-motorized mode share.
Daily Transit Service Hours	Consistent with reducing VMT/GHG	Total daily transit service hours increase by about 50 percent from 2014 to 2020, and double from 2020 to 2035.

IMPLEMENTATION OF TRPA'S FIRST SCS

TRPA's actions over the past four years demonstrate the region's commitment to implementing their first SCS, and establishing a foundation for continued implementation of policies and programs that are reflected in both the 2012 and 2017 SCSs.

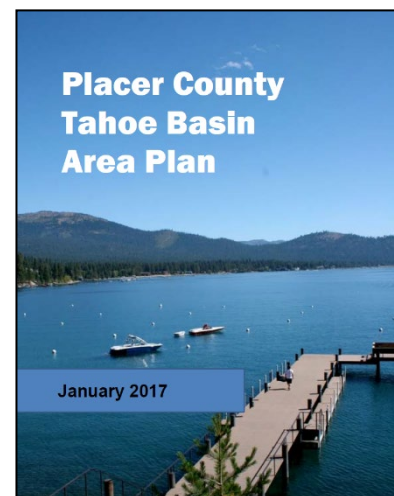
The focus of both the 2012 and 2017 SCSs is transportation improvements within town centers to create walkable, bikeable communities. Since adoption of the 2012 SCS, TRPA and its member jurisdictions are implementing projects that help demonstrate mixed-use, walk, bicycle, and transit-friendly development that will support the stated SCS strategy. In addition, the region is developing a number of local community transportation and transit plans that will enhance their capacity to implement more local sustainability projects.

Focused Growth and Growth Management

Since publication of the first SCS in 2012, multiple regional and local community plans have been updated and adopted:

- The *Placer County Tahoe Basin Area Plan*
- The *South Shore Area Plan*
- The *Tahoe Douglas Area Plan*
- The *Tahoe Valley Area Plan/Specific Plan*
- The *Tourist Core Area Plan*
- The *Meyers Area Plan*

In addition to the update and adoption of regional and local community plans, an element of TRPA's *Regional Plan*, is an update to the region's existing Transfer of Development Rights (TDR) program. The TDR program helps to shift existing development on sensitive land or outside communities toward more compact development within existing small town centers around the lake through incentives that include bonus units and enhanced transfer ratios. The goals of the TDR program are to concentrate development near transit and trails; encourage mode shift from private automobiles to walking, bicycling, and transit; and restore sensitive lands that improve habitat and lake health. An online portal, TDR Marketplace (<http://www.trpa.org/permitting/transfer-development-rights/tdr-marketplace/>) was developed to help make transfers easier to find and implement.



The Placer County Tahoe Basin Area Plan

Photo Source: TRPA's EIP Air Quality & Transportation Project Tracker website: <https://eip.laketahoeinfo.org/>

Enhancing Transportation Options

TRPA has delivered, or is nearing completion, on a number of transportation projects to implement their 2012 SCS. Projects include pedestrian and bicycle facilities and safety improvements, as well as enhancements to their transit system. Some projects that highlight implementation successes of the SCS include:

- More than 25 miles of pedestrian/bicycle routes have been constructed in the region, with an additional 6 miles planned in the near term. TRPA's 2017 SCS establishes annual regional targets for pedestrian/bicycle facility construction, with a Level 1 target of 4.5 miles of pedestrian/bicycle facilities constructed per year between 2012 and 2015 and a Level 2 target of 9 miles constructed per year between 2016 and 2020. TRPA's 2017 SCS indicates these targets have been met, as 4.6 miles of facilities were constructed each year between 2012 and 2015, while 9.2 miles were constructed in 2015, the last year information is available in TRPA's 2017 SCS. Planned and recently completed pedestrian and bicycle projects include:

- Phase 1a of the South Tahoe Greenway Shared Use Trail
- The Nevada Stateline to Stateline Bikeway Laura Drive to Round Hill Pines Beach
- The Homewood West Shore Bike Trail Extension and the Dollar Creek Shared-Use Trail
- The El Dorado Beach to Ski Run Boulevard Bike Trail
- The Lake Tahoe Boulevard Bike Trail Project



Example of Pedestrian & Bicycle Improvement Program

Photo Source: TRPA's EIP Air Quality & Transportation Project Tracker website: <https://eip.laketahoeinfo.org/>

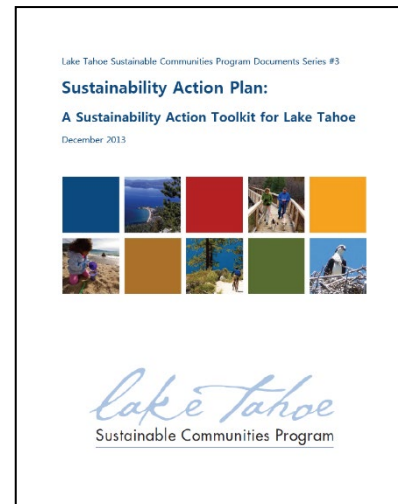
- Tahoe Transportation District (TTD) and Tahoe Truckee Area Regional Transit (TART) have rebranded and upgraded their fleets, expanded services and frequency, added real-time transit information, and built transit shelters and a new Transit Center just outside of Tahoe City.
- TART and TTD have deployed automatic vehicle location systems allowing passengers to find the exact location of their vehicles, and planned features include real-time bus arrival information.

- TTD has increased the number of “Spare the Air Days” on which transit service is provided free of charge to passengers, reducing costs for regular users and encouraging new users to try and commit to using the system.
- The Kings Beach Commercial Core Project incorporates “complete streets” design elements, including a reduction of travel lanes, the addition of sidewalks and landscaping, and roundabout intersection improvements, along a 1.1 mile stretch of State Route 28 in Kings Beach to increase bicycle and pedestrian safety and access, and motivate resident and visitors to walk, bicycle, or use transit.
- The SR 89/Fanny Bridge Community Revitalization Project enhances the Tahoe City and west shore community with improved access to federal lands; enhanced pedestrian/bicycle facilities; complete streets improvements; and economic development and community revitalization.
- The U.S. 50/South Shore Community Revitalization Project includes a single two-way transit lane, and expanded pedestrian/bicycle facilities.

Policy Guidance and Strategic Planning Documents

TRPA and its member jurisdictions have also prepared several transportation- and transit-related regional and local planning documents that support implementation of the 2012 SCS. The following efforts were completed or have been ongoing since 2012:

- The *Sustainability Action Plan: A Sustainability Action Toolkit for Lake Tahoe*
- The 2016 *Tahoe City Mobility Plan*
- Annual Bicycle and Pedestrian Monitoring Reports based on the *Lake Tahoe Region Bicycle and Pedestrian Monitoring Protocol*
- TRPA’s *Intelligent Transportation Systems Strategic Plan*
- TRPA’s *Linking Tahoe: Active Transportation Plan*
- Lake Tahoe Unified School District’s *South Tahoe Middle School Area Connectivity Plan*



The Lake Tahoe Sustainable Communities Program Action Plan.

Source: http://laketahoesustainablecommunitiesprogram.org/wp-content/uploads/2014/01/Final-Sustainability-Action-Plan_12.31.13-1.pdf

- TART's *Systems Plan Update for the Tahoe Truckee Area Regional Transit in Eastern Placer County*
- TTD's 2017 *Linking Tahoe: Tahoe Transit Master Plan*
- TTD's 2017 *Short Range Transit Plan*
- The 2017 *Truckee Long-Range Transit Plan*
- TMPO's 2014 *Coordinated Human Services Transportation Plan*
- TRPA and the Truckee-Donner Public Utility District's *Tahoe-Truckee Plug-in Electric Vehicle Readiness Plan: A Road Map to Charging Infrastructure and Zero Tailpipe Emissions*

OTHER FINDINGS AND RECOMMENDATIONS

VMT Split by Internal-Internal (II), Internal-External/External-Internal (IX/XI), and External-External (XX)

TRPA was not able to provide VMT projections split by II, IX/XI, and XX trips. In addition, TRPA did not clearly document how California and Nevada portions of VMT are split. As VMT is a key performance indicator for SCS evaluation, TRPA will need to distinguish VMT by origin and destination in their next RTP/SCS submittal.

Transit Ridership

Based on a transit survey that TRPA and Tahoe Transit District (TTD) conducted, only 1.4 percent of the region's internal person trips in 2014 were transit trips. While increasing transit ridership and mode share is a key strategy in TRPA's SCS and will take time, the data suggests that significant efforts will be needed in order to achieve the assumed daily ridership and mode share goals in TRPA's SCS (Tahoe Regional Planning Agency, 2017). TRPA should continue to work in partnership with TTD to monitor progress on efforts to enhance transit ridership in the region, continue to report progress on mode share shifts to active and transit modes using best available data, and based on this information assess whether assumptions continue to be reasonable as part of the update to their next SCS.

REFERENCES

Tahoe Regional Planning Agency. (2018, July 18). *Sustainability Framework Components*. Retrieved from Sustainability Action Plan:
<http://laketahoesustainablecommunitiesprogram.org/sustainability-framework/>

Tahoe Regional Plan Agency and Truckee Donner Public Utility District. (2017). *Tahoe-Truckee Plug-in Electric Vehicle Readiness Plan-A Road Map to Charging Infrastructure and Zero Tailpipe Emissions*. ICF.

Tahoe Regional Planning Agency. (2017). *Linking Tahoe: Lake Tahoe Basin Transit Master Plan*. Stantec.

APPENDIX A: FURTHER DISCUSSION OF 2017 SCS CHANGES

Revised Population, Employment, and Housing Growth Forecast

For the 2017 SCS, TRPA incorporated the recently released 2012 U.S. Census data at the census tract level. These data include resident second home ownership, persons per household, and income distribution. The number of housing units are revised using updated counts of parcels with completed building permits and certificates of occupancy. The employment data is updated based on hotel-motel information obtained from InfoGroup.

Table 4 below compares the estimates of population, housing, and employment used in the 2012 and 2017 SCS.

Table 4. Comparison of Population, Housing and Employment Estimates in the TRPA 2012 and 2017 SCS

	2012 SCS			2017 SCS		
	2005	2020	2035	2005	2020	2035
Population	41,213	43,934	45,468	41,377	43,341	45,166
Employment	12,715	12,034	12,854	12,715	16,688	17,125
Housing	33,897	37,809	38,921	35,245	36,750	38,100

Source: TRPA 2012 and 2017 data tables

Revised Modeling Assumptions Related to Visitor Travel

Visitor travel in TRPA’s travel demand model is sensitive to the hotel/motel occupancies, seasonal and vacation use, day-use visitation and additional external trips. In the 2017 RTP development, TRPA updated their hotel/motel occupancy assumptions by considering the population forecasts, the 2014 “Bay to Tahoe Basin Recreation and Tourism Rural Roadway Impact Study” by El Dorado County, and inputs from local lodging representatives and visitor authorities. The model assumed a total growth of 6 to 19 percent from 2015 to 2035. The TRPA model assumed 44 percent occupancy for the seasonal or vacation homes from 2014 base year to 2035. TRPA performed a series of sensitivity analyses to capture the additional traffic growth for day-use visitation and compared traffic counts and external trips that are close to TRPA boundaries. For the 2017 RTP development cycle, TRPA’s model was calibrated against 20 traffic count stations that are continuously maintained by Caltrans and NDOT. To better characterize the travel behavior of visitors, TRPA and Tahoe Transportation District partnered on anonymized mobile device data collection by using the AirSage data product. From the mobile device data, visitor hot-spots, and high traffic

destinations were identified. Other issues such as insufficient parking space, and low transit ridership were also identified.

Adjustment to EMFAC Outputs

TRPA used different versions of CARB's EMFAC model in quantifying the GHG emissions for its 2012 and 2017 SCS. 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 2012 SCS (EMFAC 2011) and the version used for the 2017 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. TRPA followed the methodology and their CO₂ per capita reductions results were adjusted accordingly.

Off Model Adjustments for Electric Vehicle Infrastructure

TRPA conducted a Vehicle Ownership Survey for residents and visitors regarding the current regional vehicle ownership trends in Tahoe-Truckee. The survey shows a potential of growth in regional plug-in electric vehicle (PEV) ownership and usage (Tahoe Regional Plan Agency and Truckee Donner Public Utility District, 2017). TRPA considered PEV GHG Reductions for the Tahoe-Truckee region using an adopted methodology from the Metropolitan Transportation Commission (San Francisco Bay Area MPO). The methodology estimates the GHG emissions reductions attributable to increasing eVMT. The assumption is that increased charging infrastructure allows for more frequent charging for PEVs and generates more electric miles. To better quantify the GHG reductions that are attributable to TRPA's planning intervention, the reductions were split by resident and visitor travel. The resident portion of the reduction was estimated using CARB's EMFAC model and assumes 15 percent of total VMT after 2025 to be eVMT. The visitor module estimates the number and the geographical origin of vehicle trips by visitors and estimates the percentage of eVMT for those trips. The GHG emissions reductions were then estimated for baseline and SCS scenarios. TRPA assumes that their efforts to increase electric vehicle infrastructure by about 200 stations in 2035 will increase the portion of the region's PEV VMT that is electric. TRPA assumes their infrastructure efforts will increase eVMT from 40 to 80 percent for PEVs. The estimated impact to GHG emissions per capita for off-model adjustment is a 1.7 percent reduction by 2035.

APPENDIX B: DATA TABLE

Modeling Parameters	2005	2014	2020	2020	2035	2035	Data Source(s)
			w/ projects	w/o projects	w/ projects	w/o projects	
DEMOGRAPHIC							
Total Population	41,377	42,371	43,341	N/A	45,166	N/A	model
Residents	41,377	42,371	43,341	N/A	45,166	N/A	model
Visitors	N/A	N/A	N/A	N/A	N/A	N/A	model
Group Quarters Population	N/A	N/A	N/A	N/A	N/A	N/A	model
Total Number of Households	16,432	17,074	17,456	N/A	18,135	N/A	model
Persons Per Household	2.52	2.48	2.48	N/A	2.49	N/A	model
Auto Ownership Per Household	1.9	1.9	1.9	N/A	1.9	N/A	2005 Tahoe Regional Household Travel Survey, p. i.
Total Number of Jobs	26,800	26,367	26,877	N/A	27,418	N/A	model
Average Unemployment Rate (%)	N/A	8.2%	N/A	N/A	N/A	N/A	2016 ACS five year estimate
Average Household Income (YEAR\$)	N/A	\$58,754	N/A	N/A	N/A	N/A	2010 Census
LAND USE							
Total Developed Acres	6,222	6,229	6,235	N/A	6,250	N/A	Internal development rights accounting system
Commercial Developed Acres/Commercial Floor Area	6,338,000	6,417,970	6,627,125	N/A	6,987,472	N/A	RTP 2017: Appendix D
Residential developed acres	4,978	4,984	4,985	N/A	4,990	N/A	Internal development rights accounting system
Total Acreage Developed (new)	N/A	N/A	N/A	N/A	N/A	N/A	
Housing Vacancy Rate	N/A	N/A	N/A	N/A	N/A	N/A	
Total Housing Units	35,245	35,360	36,750	N/A	38,100	N/A	Internal development rights accounting system
Total Single-Family Detached Housing Units	28,901	28,288	28,665	N/A	28,575	N/A	Internal development rights accounting system
<i>Total Large-Lot Single Family Detached Housing Units (XX sqft and smaller)</i>	N/A	N/A	N/A	N/A	N/A	N/A	
<i>Total Conventional-Lot Single Family Detached Housing Units (XX sqft and smaller)</i>	N/A	N/A	N/A	N/A	N/A	N/A	
<i>Total Small-Lot Single Family Detached Housing Units (XX sqft and smaller)</i>	N/A	N/A	N/A	N/A	N/A	N/A	

Modeling Parameters	2005	2014	2020	2020	2035	2035	Data Source(s)
			w/ projects	w/o projects	w/ projects	w/o projects	
Total Single-Family Attached Housing Units	N/A	N/A	N/A	N/A	N/A	N/A	
Total Multi-Family Housing Units	6,344	7,072	8,085	N/A	9,525	N/A	Internal development rights accounting system
Total infill Housing Units	N/A	N/A	N/A	N/A	N/A	N/A	
Tourist Accommodation Units (e.g. Hotel Rooms, Vacation Homes, Shared Vacation Homes, etc.)	11,583	11,947	12,127	N/A	12,289	N/A	RTP Appendix D
Average Density (dwelling units/acre)	N/A	N/A	N/A	N/A	N/A	N/A	
PROXIMITY TO TRANSIT							
Total housing within 1/4 mile of transit stations and stops	16,326	16,322	N/A	N/A	N/A	N/A	Internal development rights accounting system, spatial analysis
Total housing within 1/2 mile of transit stations and stops	24,177	24,207	N/A	N/A	N/A	N/A	Internal development rights accounting system, spatial analysis
Total employment within 1/4 mile of transit stations and stops	N/A	N/A	N/A	N/A	N/A	N/A	
Total employment within 1/2 mile of transit stations and stops	N/A	N/A	N/A	N/A	N/A	N/A	
Average Headway (minutes)	N/A	N/A	N/A	N/A	N/A	N/A	
TRANSPORTATION SYSTEM							
Freeway and General Purpose Lanes -Mixed Flow, auxiliary, etc. (lane miles)	N/A	N/A	N/A	N/A	N/A	N/A	
Freeway Managed Lanes (e.g. HOV, HOT, Tolloed) (Lane Miles)	N/A	N/A	N/A	N/A	N/A	N/A	
Arterial/Expressway (lane miles)	134	134	134	N/A	134	N/A	model
Collector and Local (lane miles)	578.94	578.94	578.94	N/A	578.94	N/A	model
Regular Transit Bus Operation Miles	N/A	3,998	5,080	N/A	7,224	N/A	provided by TART & TTD
Bus Rapid Transit Bus Operation Miles	0	0	0	N/A	0	N/A	
Transit Rail Operation Miles	0	0	0	N/A	0	N/A	
Transit Total Daily Vehicle Service Hours	N/A	234	356	N/A	651	N/A	provided by TART & TTD
<i>Bike and Pedestrian Lane (class I & II) Miles⁴</i>	N/A	119.86	240.46	N/A	240.46	N/A	2040: Tahoe Active Transportation Plan

Modeling Parameters	2005	2014	2020	2020	2035	2035	Data Source(s)
			w/ projects	w/o projects	w/ projects	w/o projects	
							Appendix H (assumes full build out of proposed projects). 2014:
ACTIVITY, TOUR and TRIP DATA							
Tour Data-Residents							
<i>Total Number of Tours per Day</i>	70,654	74,525	75,918	N/A	78,337	N/A	model
<i>Tours by Tour Purpose (please use space below to identify)</i>							
<i>Mandatory</i>	29,917	31,537	31,898	N/A	32,855	N/A	model
<i>Non-mandatory</i>	36,707	38,687	39,744	N/A	40,953	N/A	model
<i>Joint</i>	N/A	N/A	N/A	N/A	N/A	N/A	model
<i>At-Work</i>	4,030	4,301	4,276	N/A	4,529	N/A	model
<i>Tours by Tour Mode (please use space below to identify)</i>							
<i>SOV</i>	43,550	46,248	46,981	N/A	48,434	N/A	model
<i>HOV</i>	19,624	20,940	21,544	N/A	22,306	N/A	model
<i>Walk_Transit</i>	976	826	813	N/A	811	N/A	model
<i>Drive_Transit</i>	33	31	38	N/A	36	N/A	model
<i>Non-Motorized</i>	5,550	5,579	5,673	N/A	5,800	N/A	model
<i>School Bus</i>	1,011	985	952	N/A	1,041	N/A	model
Trip Data-Residents							
<i>Trips by Tour Purpose</i>							
<i>Work</i>	56,698	60,870	61,833	N/A	63,522	N/A	model
<i>School</i>	16,062	15,786	15,767	N/A	16,441	N/A	model
<i>At-Work</i>	9,571	10,182	10,085	N/A	10,681	N/A	model
<i>Shop</i>	25,923	28,157	28,783	N/A	29,912	N/A	model
<i>Escort</i>	6,392	7,022	7,268	N/A	7,199	N/A	model
<i>Eat</i>	5,056	5,377	5,498	N/A	5,541	N/A	model
<i>Other</i>	53,933	55,253	57,058	N/A	58,839	N/A	model
<i>Travel Distance</i>							
<i>Average Auto Trip Length (miles)</i>	12.2	12.1	12.1	N/A	12.4	N/A	model
<i>Average Non-Motorized Trip Length (miles)</i>	1.1	1.1	1.1	N/A	1.1	N/A	model
<i>Average Other Trip Length (miles)</i>	9.4	8.9	9	N/A	8.8	N/A	model
<i>Average Transit Trip Length (miles)</i>	3.4	3.4	3.6	N/A	3.6	N/A	model
Tour Data-Tourists				N/A		N/A	

Modeling Parameters	2005	2014	2020	2020	2035	2035	Data Source(s)
			w/ projects	w/o projects	w/ projects	w/o projects	
<i>Total Number of Tours per Day</i>	59,039	58,343	61,130	N/A	72,596	N/A	model
Tours by Tour Purpose (please use space below to identify)							
Non-mandatory	N/A	N/A	N/A	N/A	N/A	N/A	
Joint	N/A	N/A	N/A	N/A	N/A	N/A	
Trip Data-Tourists							
<i>Trips by Tour Purpose</i>							
<i>Gaming</i>	26,231	26,476	27,997	N/A	31,960	N/A	model
<i>Other</i>	32,954	32,720	33,966	N/A	40,843	N/A	model
<i>Recreation</i>	60,442	59,066	62,109	N/A	74,331	N/A	model
<i>Shopping</i>	18,372	18,070	18,547	N/A	22,392	N/A	model
<i>Thru</i>	1,695	1,696	1,758	N/A	2,042	N/A	model
<i>Travel Distance</i>							
<i>Average Auto Trip Length (miles)</i>	12.2	12.1	12.1	N/A	12.4	N/A	model
<i>Average Non-Motorized Trip Length (miles)</i>	1.1	1.1	1.1	N/A	1.1	N/A	model
<i>Average Other Trip Length (miles)</i>	9.4	8.9	9	N/A	8.8	N/A	model
<i>Average Transit Trip Length (miles)</i>	3.4	3.4	3.6	N/A	3.6	N/A	model
PERCENT PASSENGER TRAVEL MODE SHARE							
<i>Whole Day</i>							
drive alone	44.31%	44.93%	44.25%	N/A	42.32%	N/A	model
drive transit	1.31%	1.22%	1.44%	N/A	1.49%	N/A	model
non-motorized	15.22%	15.20%	15.05%	N/A	16.20%	N/A	model
shared auto	34.01%	33.55%	34.01%	N/A	34.51%	N/A	model
school bus	1.00%	1.08%	0.99%	N/A	1.00%	N/A	model
visitor shuttle	2.19%	2.11%	2.26%	N/A	2.51%	N/A	model
walk transit	1.96%	1.91%	2.01%	N/A	1.97%	N/A	model
<i>Peak Period</i>							
drive alone	40.81%	41.48%	40.02%	N/A	37.75%	N/A	model
drive transit	1.65%	1.53%	1.80%	N/A	1.90%	N/A	model
non-motorized	15.98%	16.20%	16.14%	N/A	17.76%	N/A	model
shared auto	36.40%	35.76%	36.90%	N/A	36.90%	N/A	model
school bus	0.83%	0.90%	0.81%	N/A	0.80%	N/A	model
visitor shuttle	2.44%	2.39%	2.45%	N/A	2.91%	N/A	model
walk transit	1.90%	1.75%	1.89%	N/A	1.98%	N/A	model
Transit Boardings							
Bus	N/A	1,141,033	N/A	N/A	N/A	N/A	reported by TART & TTD

Modeling Parameters	2005	2014	2020	2020	2035	2035	Data Source(s)
			w/ projects	w/o projects	w/ projects	w/o projects	
Rail	N/A	N/A	N/A	N/A	N/A	N/A	
Other (please specify)	N/A	N/A	N/A	N/A	N/A	N/A	
VEHICLE MILES TRAVELED							
Total VMT per weekday (all vehicle class) (miles)	1,041,890	N/A	1,038,998	N/A	1,149,601	N/A	
Residents	N/A	N/A	N/A	N/A	N/A	N/A	
Tourists	N/A	N/A	N/A	N/A	N/A	N/A	
Total VMT per weekday for passenger vehicles (ARB vehicle classes LDA, LDT1, LDT2, and MDV)	901,102	N/A	919,513	N/A	1,052,719	N/A	2017 RTP
Total II VMT per weekday for passenger vehicles (miles)	N/A	N/A	N/A	N/A	N/A	N/A	
Total IX/XI VMT per weekday for passenger vehicles (miles)	N/A	N/A	N/A	N/A	N/A	N/A	
Total XX VMT per weekday for passenger vehicles (miles)	N/A	N/A	N/A	N/A	N/A	N/A	
CONGESTED TRAVEL MEASURES							
Congested weekday VMT on freeways (miles, V/C ratios > 0.75)	N/A	N/A	N/A	N/A	N/A	N/A	
Congested weekday VMT on all other roadways (miles, V/C ratios > 0.75)	N/A	N/A	N/A	N/A	N/A	N/A	
CO2 EMISSIONS							
Total CO2 emissions per weekday (all vehicle class) (tons)	N/A	N/A	N/A	N/A	N/A	N/A	
Total SB375 CO2 emissions per weekday for passenger vehicles (ARB vehicle classes LDA, LDT1, LDT2, and MDV) (tons)	445	N/A	428	N/A	461	N/A	2017 RTP
Total II CO2 emissions per weekday for passenger vehicles (tons)	N/A	N/A	N/A	N/A	N/A	N/A	
Total IX/XI CO2 emissions per weekday for passenger vehicles (tons)	N/A	N/A	N/A	N/A	N/A	N/A	
Total XX CO2 emissions per weekday for passenger vehicles (tons)	N/A	N/A	N/A	N/A	N/A	N/A	
Total SB 375 CO2 (with EMFAC adjustment)	N/A	N/A	N/A	N/A	N/A	N/A	
INVESTMENT (millions) (YEAR of Expenditure in \$)							

Modeling Parameters	2005	2014	2020	2020	2035	2035	Data Source(s)
			w/ projects	w/o projects	w/ projects	w/o projects	
Total Plan Period Investment	N/A	N/A	\$ 328,018,855	N/A	\$ 255,530,376	N/A	RTP 2017: Appendix B
Highway Capacity Expansion	N/A	N/A	\$123,308,644	N/A	\$ 110,761,548	N/A	RTP 2017: Appendix B
Other Road Capacity Expansion	N/A	N/A	\$123,671,428	N/A	\$1,000,000	N/A	RTP 2017: Appendix B
Transit Capacity Expansion	N/A	N/A	\$ 39,572,487	N/A	\$ 72,935,891	N/A	RTP 2017: Appendix B
BusTransit Capacity Expansion	N/A	N/A	N/A	N/A	N/A	N/A	RTP 2017: Appendix B
Transit - Maintain and Sustain Existing Infrastructure	N/A	N/A	\$ -	N/A	\$ -	N/A	RTP 2017: Appendix B
Rail Transit - Maintain and Sustain Existing Infrastructure	N/A	N/A	N/A	N/A	N/A	N/A	RTP 2017: Appendix B
Bike and Pedestrian Projects	N/A	N/A	\$40,716,296	N/A	\$65,458,778	N/A	RTP 2017: Appendix B
Other (please specify)	N/A	N/A	\$750,000	N/A	\$5,374,159	N/A	RTP 2017: Appendix B
TRANSPORTATION USER COSTS AND PRICING (YEAR of Expenditure in \$)							
Vehicle Operating Costs (cents per mile)	N/A	N/A	N/A	N/A	N/A	N/A	
Gasoline Price (dollar per gallon)	N/A	N/A	N/A	N/A	N/A	N/A	
Parking Price (dollar per day)	N/A	N/A	N/A	N/A	N/A	N/A	
Toll Price (dollar per trip)	N/A	N/A	N/A	N/A	N/A	N/A	
Congestion Price (dollar per mile)	N/A	N/A	N/A	N/A	N/A	N/A	
Average Transit Fare per Passenger Mile (dollar per mile)	N/A	N/A	N/A	N/A	N/A	N/A	

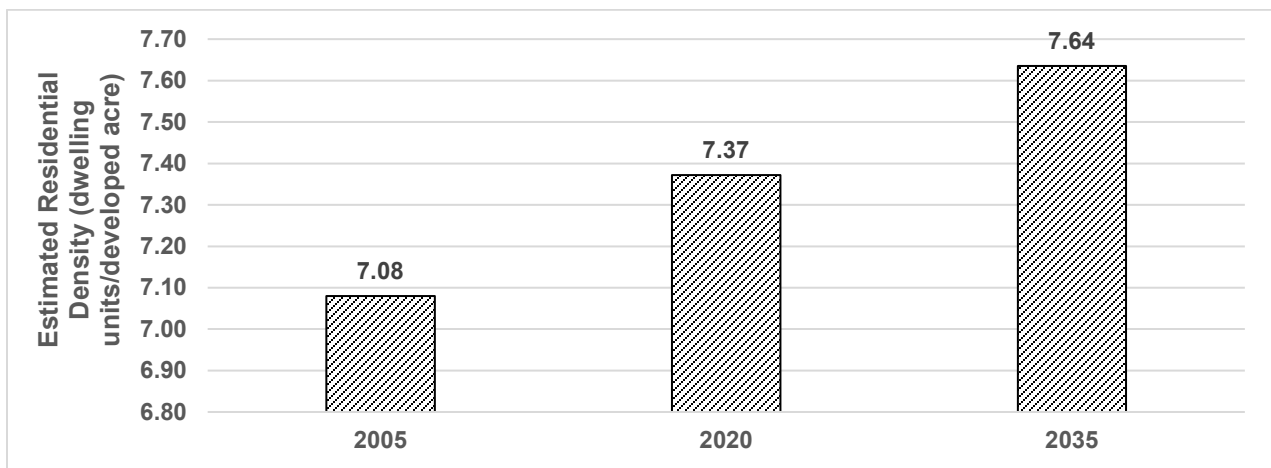
APPENDIX C: PERFORMANCE INDICATORS

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 TRPA's forecasted GHG emissions forecast: residential density, and housing type mix.

Residential Density

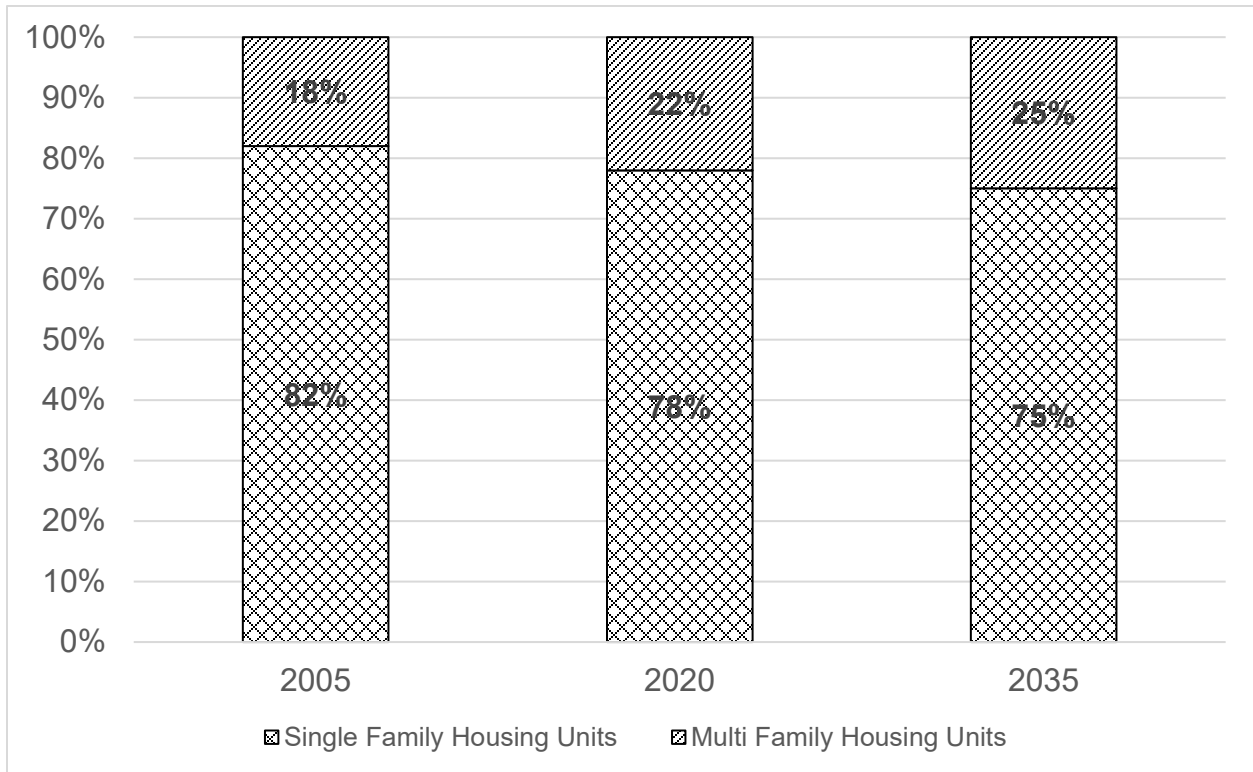
Figure 1. Regional Residential Density



TRPA estimates that the residential density within the region will increase by about 8 percent in between 2005 to 2035. Based on the land use data provided by TRPA, the overall residential density will increase from 7.08 to 7.64 dwelling units per acre between 2005 and 2035 as shown in Figure 1.

Housing Type Mix

Figure 2. Share of Single-Family and Multi-Family Housing Units



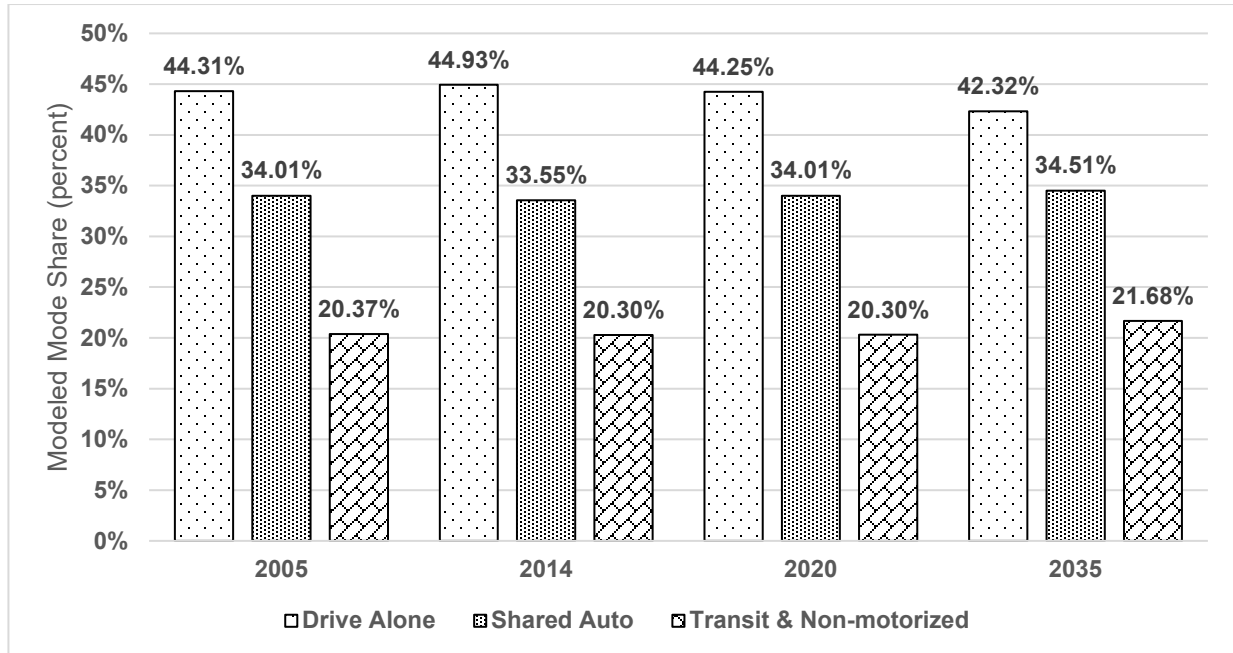
TRPA forecast of multi-family housing units shows an increase relative to the total number of housing units in the region, while single-family housing unit share decreases. The multi-family housing units make up 18 percent in 2005 and increase up to 25 percent in 2035. The share of single-family housing units reduces from 82 percent in 2005 to 75 percent in 2035 (Figure 2).

TRANSPORTATION INDICATORS

CARB staff evaluated two transportation-related performance indicators to determine whether the trends support the TRPA reported GHG emissions reductions, including mode share, and transit ridership.

Mode Share

Figure 3. Modeled Mode Share (percent)



TRPA's modeled results indicate that the plan will change mode share for drive alone, shared auto, and transit and non-motorized modes from 2005 to 2035. TRPA's modeling forecasts that as a result of the plan, drive alone share will slightly decrease from 44.31 percent to 42.32 percent, the transit and non-motorized share increase from 20.37 to 21.68 percent between 2005 and 2035 (Figure 3).

Total Transit Service Hours

Figure 4. Modeled Total Daily Transit Service Hours

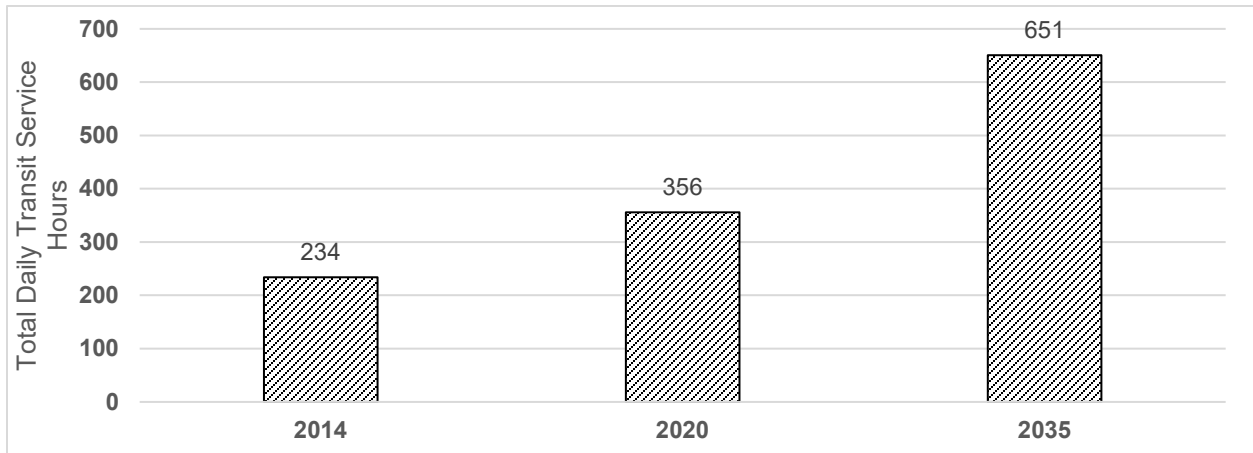


Figure 4 shows TRPA's modeled daily transit service hours. The transit service hours in the 2014 base year of 234 increase by 53 percent in 2020. In 2035, the modeled daily transit service hours is 651, double the 2014 level.