

APPENDIX D: METHODOLOGY FOR ESTIMATING VEHICLE MILES TRAVELED AND GREENHOUSE GAS REDUCTIONS IN THE 2017 REGIONAL TRANSPORTATION PLAN




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Overview

This appendix describes the methodology developed by the Tahoe Regional Planning Agency (TRPA) for estimating daily regional vehicle miles traveled (VMT) and greenhouse gas (GHG) emissions reductions for use in the 2017 Regional Transportation Plan. These two indicators are estimated utilizing the Lake Tahoe Transportation Model, a state-of-the-art activity-based model that estimates travel behavior and use of the transportation system.

Because the modeling process is extremely lengthy, TRPA began development of the Regional Transportation Plan model inputs in the summer of 2015. Since land use regulations and information regarding existing and available development rights is constantly being updated, running the model necessitates selecting a cutoff date and loading the model with the best available data as of that date. To provide adequate time to perform quality assurance reviews of the model inputs and outputs, December 31, 2014 was selected as the cutoff date. Therefore, the modeled land-use scenario included all regulations in place as of December 31, 2014, and all data on existing and planned development in place up to December 31, 2014. All available documentation on August 2015 was used for this purpose. This appendix has three parts:

-  **Part 1:** Information Used for Modelling the 2017 RTP
-  **Part 2:** Estimation of Daily Regional VMT
-  **Part 3:** Calculation of the share of vehicle miles traveled (VMT) attributable to the California portion of the Lake Tahoe Region

Background

TRPA monitors daily regional VMT for several reasons. For planning purposes, daily regional VMT is the performance measure used to better understand use of, and activity on, the Region's roadways. Daily regional VMT is also monitored for regulatory purposes. TRPA maintains a VMT threshold standard requiring attainment of a daily regional VMT reduction target of "10% Reduction from 1981 VMT Base Year Values". Additionally, in its role as a Metropolitan Planning Organization (MPO), California state legislation (SB 375) requires TRPA to incorporate a Sustainable Communities Strategy (SCS) for reducing passenger vehicle-related GHG emissions in the Regional Transportation Plan and must also show compliance with GHG reduction targets set by the California Air Resources Board (CARB). GHG emissions are estimated, in part, using the VMT estimates produced by TRPA's Lake Tahoe Transportation Model. The integrated land use policies from the Regional Plan and the transportation policies from the Regional Transportation Plan must demonstrate achievement of these thresholds and standards.

Part 1: Information Used for Modelling the 2017 RTP

Lake Tahoe Transportation Model and Assumptions

Model Description

The Lake Tahoe Transportation Model is one of the Region's most powerful analytic tools for understanding travel behavior and congestion into and around the Region. The state-of-the-art activity-based travel demand model was developed using the TransCAD platform. It is an enhancement over the more common four-step trip-based models because it considers non-home-based travel and linked characteristics of a household's travel patterns in addition to planned future land uses and transportation system investment. Several distinct groups are modeled including year-round residents, seasonal residents, external workers (commuters), day-use visitors, and overnight visitors. Separate algorithms are included within the model to simulate each group's population, demographics, socioeconomic characteristics, and travel preferences. The model aggregates the travel behavior of each travel group (known as "tour types"), estimates the expected travel mode distribution (auto, transit, walk, bike), and produces traffic projections for intersections and roadways on a peak summer day and for peak periods during that day. Since these estimates are based on regional data, they are useful for understanding region-wide impacts. This section briefly summarizes the key assumptions used for development of this Regional Transportation Plan, however, for additional information concerning the Lake Tahoe Transportation Model, please refer to the *Lake Tahoe Resident and Visitor Model; Model Description and Final Results, August 2007* available on the TRPA transportation website, Library page:

<http://www.trpa.org/transportation/library/>.

Since development of the previous RTP, the 2012 RTP, the Lake Tahoe Transportation Model and its inputs have been updated to include the most up-to-date information available. Model updates that have occurred since the development of the 2012 RTP include:

- 📌 **Land Use Updates:** Updated business and employee information and updated hotel-motel information, including the number of rooms and employees was acquired from InfoGroup and incorporated.
- 📌 **Single-Family Residence Updates:** TRPA conducted internal and external validations of the number and locations of single family dwellings built since 2012. TRPA contacted local jurisdictions to identify the parcels where a completed building permits and certificates of occupancy were issued.
- 📌 **Cordon Station License Plate Survey:** TRPA conducted a video surveillance license plate survey and follow-up post card survey at the Region's seven basin-entry points to re-calibrate the travel characteristics of residents and visitors entering the basin.
- 📌 **2010 U.S. Census Data Updates:** Census tract-level updates to demographic variables including: resident-second home ownership, persons per household, and income distribution were completed using the recently released 2012 U.S. Census data.
- 📌 **School Enrollment Updates:** TRPA acquired updated school enrollment data from Lake Tahoe Unified School District, Tahoe Truckee Unified School District, Washoe County and Douglas County School Districts which was used to validate the model.
- 📌 **Traffic Counts Updates:** The traffic counts used for development of the 2012 RTP (latest available were 2010 counts) were updated to include traffic counts from 2011-2014 (latest available at the time the model was run for the 2017 RTP).
- 📌 **Independent Model Review:** TRPA contracted with Kittleson and Associates pursuant to the Travel Forecasting Guidelines (California Department Transportation and Nevada Department of Transportation (NDOT) Traffic Forecasting Guidelines) to conduct an independent review and assessment of the TRPA model.

For the 2017 Regional Transportation Plan, there are two model base years, 2005 and 2014, and three forecast model years, 2020, 2035, and 2040. Staff selected the 2005, 2020 and 2035 model years based on requirements by the California Air Resources Board (ARB) to show reductions in greenhouse gas (GHG) emissions for the forecast years 2020 and 2035 as compared to 2005. Staff selected 2014 as an additional base year to make comparisons between future estimates and current known on-the-ground conditions. 2040 is the forecast year of the 2017 Regional Transportation Plan, so it is also considered, although for modeling purposes 2035 and 2040 are very similar.

The potential impact of the RTP is influenced by the amount and distribution of new development (i.e. residential units, commercial floor area (CFA), and tourist accommodation units (TAUs)), and the rate of utilization of visitor accommodations such as hotels, motels, and vacation rentals. Because the modeling process is extremely lengthy, TRPA began development of the Regional Transportation Plan model inputs in the summer of 2015. Since land use regulations and information regarding existing and available development rights is constantly being updated, running the model necessitates selecting a cutoff date and loading the model with the best available data as of that date. TRPA selected December 31, 2014 as the cutoff date. Therefore, the modeled land-use scenario included all regulations and in place as of December 31, 2014, and all data on existing and planned development in place up to December 31, 2014, with the documentation available by August 2015.

Staff updated the TransCAD model to include the total residential, commercial, and tourist development that was constructed (for base years) and that is allowable (for forecast years). It is not possible to know the exact distribution of future development, thus the process necessitated a series of assumptions related to the distribution of residential allocations, residential bonus units, commercial floor area, and tourist accommodation units. A description of each of these types of development rights (sometimes called “commodities”) is below, as well as a description of the transfer of development rights program that was instituted with approval of the 2012 Regional Plan. This description is followed by detailed modeling assumptions for each type of development right.

Land Use Policies Overview

In 2012, TRPA approved an update to the Regional Plan. This update affirmed major components of the Region’s existing land use policies, such as requirements to obtain development rights before constructing new residential, commercial floor area, or tourist units projects, and also included important changes to the development rights program, including a new transfer of development program. These programs are captured in the transportation model because they help shape the rate and location of development. The following description of the three different commodity types has been adapted from the Lake Tahoe Sustainable Communities Program Documents Series #7, “Development Commodities Transfer Policies Analysis,” December 2013.

Residential Development Rights

To develop a residential parcel a property owner must have a residential development right, a residential development allocation, and the necessary amount of land coverage for the project. As an alternative, a property owner may acquire and remove an existing residential unit of use from a property, or, in the case where a residence does not yet exist, remove a development right and transfer it to a different property, per the transfer of development regulations outlined below.

Residential development rights are the right to develop a vacant, privately-owned, residential parcel. The upper limit on residential development rights has been established by prohibiting any new land subdivisions. The upper limit on residential development rights in the Basin is approximately 51,000.

The annual level of residential allocations has been set by the Regional Plan. The 1987 Regional Plan allowed up to 300 allocations per year for 20 years (i.e., 6,000). The 2012 Regional Plan revised the allocation system to a significantly reduced level, allowing for a maximum of 130 allocations per year (i.e.,

2,600). These allocations are distributed to jurisdictions annually based on a number of criteria, including compliance with code requirements and implementation of water quality improvement projects.

Commercial Development Rights

Commercial floor area is generally defined as the square footage of the floor area on all levels of a commercial building. To develop a commercial project both commercial floor area and coverage are required. The 1987 Regional Plan allowed coverage to be transferred on a sliding scale up to a “two-to-one” basis (i.e. two square feet of coverage removed for each new square foot placed). The 2012 Regional Plan changed the coverage transfer basis to “one-to-one” when coverage is transferred off of sensitive lands to provide an incentive to remove coverage from where it is most environmentally impactful (pursuant TRPA Code Section 30.4.3).

The 1987 Regional Plan also allowed commercial floor area to be transferred on a “one-to-one” basis. To create an incentive to move commercial floor area from more sensitive lands to targeted mixed-use redevelopment areas, the 2012 Regional Plan changed the commercial floor area transfer ratio to a sliding scale as described below.

At the time of model development, staff estimated that there were approximately 6.4 million square feet of commercial floor area in the Lake Tahoe Basin. The 1987 Regional Plan allocated 800,000 square feet for commercial development. When the 2012 Regional Plan was prepared, slightly less than 400,000 square feet were remaining and available for use. Hence, the 2012 Regional Plan did not allocate additional commercial floor area to the jurisdictions, but a pool of 200,000 square feet of CFA was established with the limitation that it could only be distributed once the remaining CFA from the 1987 plan has been utilized. However, as mentioned above, the 2012 Regional Plan did change the transfer ratio for commercial development, allowing transfers on a sliding scale ranging from “one-to-one” to “one-to-three”, depending on the sensitivity of land from which it is being transferred (i.e. three square feet of commercial floor area can be placed for each square foot removed from the most sensitive lands).

Tourist Accommodation Unit Development Rights

A tourist accommodation unit, or TAU, is generally defined as a hotel, motel or other rental lodging unit with one or more bedrooms primarily designed to be rented temporarily by the day or week. To develop a tourist accommodation project both TAUs and coverage are required. As also described above, the 2012 Regional Plan changed the coverage transfer ratio to “one-to-one” when coverage is transferred from sensitive lands to provide an incentive to remove coverage from where it is most impactful. The 2012 Regional Plan also changed the TAU transfer ratio so TAUs can be transferred on a sliding scale ranging from “one-to-one” to “one-to-three”, depending on the sensitivity of land from which it is being transferred (i.e. three TAUs can be placed for each TAU removed from the most sensitive lands). At the time of model development, staff estimated that there were 11,947¹ TAUs in the Lake Tahoe Basin. Because there are TAUs from the 1987 Regional Plan that have remained unused, the 2012 Regional Plan does not include any additional TAUs. However, as mentioned above, the 2012 Regional Plan did change the transfer ratio for TAUs.

Transfer of Development Rights (TDR) Program²

Transfer of development rights, otherwise known as TDR, is a TRPA regulatory strategy used to manage growth within the Lake Tahoe Basin. Voluntary and incentive-based, TDR capitalizes on market forces to direct development away from sensitive lands into more desirable areas such as town centers. TDR is based on the designation of standard sending and receiving areas, as well as the distinction between land ownership and the rights necessary to develop a parcel.

¹ Regional Plan Update Final EIS, Response to Comments, Volume 1, Chapter 3, p. 3-46, Table 3-8.

² The description of the TDR program is adapted from the TRPA webpage, “Transferring Development Rights,” <http://www.trpa.org/permitting/transfer-development-rights/>. It also encompasses transfer of existing development.

Sending areas are typically lands that have been identified for preservation or deemed environmentally sensitive and therefore not suitable for development. Receiving lands are areas in which additional growth is desirable and beneficial. Development rights serve to quantify development and act as the building blocks for growth management. By transferring the rights from a sending to a receiving parcel, TDR works to implement programs designed to increase affordable housing as well as other desirable development, restore sensitive lands, and achieve the following:

- 📌 Help direct growth away from sensitive areas, facilitating achievement of environmental goals;
- 📌 Contribute to more compact development patterns thus making downtown areas more walkable, reducing the need for vehicle trips and reducing greenhouse gas emissions (GHG);
- 📌 Allow property owners to realize value through sales of rights from their parcels.

In Tahoe, transferable development rights are those that can be banked and/or verified as legally existing by TRPA. These rights include:

- 📌 land coverage (existing and potential) (not captured in the Transportation model)
- 📌 commercial floor area (CFA)
- 📌 existing residential units of use (ERU)
- 📌 tourist accommodation units (TAU)
- 📌 residential development rights (RDR)
- 📌 residential allocations
- 📌 restoration credits (not captured in the Transportation model)

Table D.1 shows the amount of estimated development that was known to be on the ground in the two base years at the time of the model development. The amount of known, existing development in 2012 is also shown for comparison purposes. These amounts represent the basic land use assumptions for the base year modeling. TRPA designated Centers are shown for the North and South shores in Figure D.1 and Figure D.2.

Table D.1: Existing Development in 2005, 2012 and 2014

TYPE	2005 Existing ¹	2012 Existing ²	2014 Existing ³
Residential Units	46,359	46,962	47,092
CFA	6,338,000	6,403,893	6,417,970
TAUs	11,583	11,947	11,947
Notes: 1 - "Existing" refers to estimated constructed units in 2005. Source: TRPA Transportation Model, 2000 Census. 2 - Included for comparison purposes only. Source: Regional Plan Update Final EIS, Response to Comments, Volume 1, Chapter 3, p. 3-46, Table 3-8. 3 - The estimated development as of 2014 was modeled using best available information at the time of the model run. TRPA has since published an updated accounting of development rights in the 2015 Threshold Evaluation Report (see TRPA 2015 Threshold Evaluation Report, Implementation Chapter, http://www.trpa.org/wp-content/uploads/18_Ch12_Implementation_FINAL_9_30_2016.pdf).			

Table D.2 shows the amount of development potential remaining in 2012 (as reported in the Regional Plan Update Final EIS) compared with the amount known to be used in 2013 and 2014, with the amount of total development potential known to be remaining as of December 31, 2014.

Table D.2: Development rights used or constructed in 2013 and 2014 compared to remaining development potential

TYPE	Remaining from 1987 plan in 2012 ¹	Authorized in the 2012 RPU ¹	Total Potential Development Remaining in 2012	2013 and 2014 Construction ²	Total Potential Development Remaining December 31, 2014 ³
Residential Allocations	114	2,600	2,714	130	2,584
Residential Bonus Units	874	600	1,474	0	1,474
CFA	383,579	200,000	583,579	14,077	569,502
TAUs	342	-	342	0	342
Notes: 1 - Source: Regional Plan Update Final EIS, Response to Comments, Volume 1, Chapter 3, p. 3-46, Table 3-8; excludes banked units. 2 - Source: TRPA Permit Data and Research and Analysis Division tracking, August 17, 2015. Additional units that have been allocated but not built are shown in Table D.4. 3- The potential remaining development as of 2014 was compiled using best available information at the time of the model run. TRPA has since published an updated accounting of development rights in the 2015 Threshold Evaluation Report (see TRPA 2015 Threshold Evaluation Report, Implementation Chapter, http://www.trpa.org/wp-content/uploads/18_Ch12_Implementation_FINAL_9_30_2016.pdf).					

Remaining Development Potential Modeling Assumptions

To forecast development patterns in the two forecast years, 2020 and 2035 (2040 land use assumptions are the same as 2035, since development rights are forecast to be used up by 2035), remaining development potential was allocated in the model to the different planning jurisdictions, as well as across time. Table D.3 provides a summary of how all remaining development potential was allocated. The individual sections below provide additional detail.

Table D.3: Modeling Forecast Assumptions Summary

		Model Timeframe		
Commodity Type		2020	2035 ¹	Totals ²
Residential Allocations	Already assigned	232		2,584
	Distributed per methodology	792	1,560	
Residential Bonus Units (RBUs)	Already assigned	36	349	1,474
	Distributed per methodology	363	726	
Commercial Floor Area (CFA)	Already assigned	209,155		569,502
	Distributed per methodology		360,347	
Tourist Accommodation Units (TAUs)	Already assigned	180		342
	Distributed per methodology		162	
Notes: 1 - The 2,600 new allocations authorized by the 2012 Regional Plan are modeled to be exhausted after 2032, at the current pace of 130 units released per year. For 2033-2035, no new residential allocations are modeled. 2- The potential remaining development as of 2014 was compiled using best available information at the time of the model run. TRPA has since published an updated accounting of development rights in the 2015 Threshold Evaluation Report (see TRPA 2015 Threshold Evaluation Report, Implementation Chapter, http://www.trpa.org/wp-content/uploads/18_Ch12_Implementation_FINAL_9_30_2016.pdf). Source: Regional Plan Update FEIS; TRPA Code of Ordinances February 9, 2013; Research and Analysis 2015				

Residential Allocations: Remaining residential development potential includes residential allocations remaining from the 1987 Plan, and new allocations authorized in the 2012 Regional Plan Update. The text and tables below describe the modeling assumptions for geographic distribution of these allocations, and their distribution over time. Table D.4 provides a summary of how these allocations were distributed, and Table D.5 and Table D.6 provide more detail.

The 1987 Regional Plan authorized 6,000 residential allocations. At the time of the model development, best available data showed that by the end of 2012, all but 114 of these allocations had been used. The remaining 114 allocations had been distributed to local jurisdictions, but not yet used. The model assumes that all of these remaining allocations will result in residential development by the year 2020, and that they will remain in the jurisdiction to which they were allocated. See Table D.5, below, for the distribution of these units by jurisdiction.³

Since the Regional Plan was adopted in December 2012, 248 Residential Allocations were released in 2013 and 2014⁴. In 2013 and 2014, 130 allocations were used to construct residential development projects, including 38 allocations from the 2009/2011 releases (1987 Plan) and 92 allocations from the 2013/2014 releases⁵. Consequently, 232 Residential Allocations remain unused (248+114, minus 130). The model assumes these remaining 232 Residential Allocations are available to local jurisdictions as allocated, and that these will result in constructed residential units by 2020.

Finally, 2,352 Residential Allocations remaining from the 2,600 authorized in the 2012 Regional Plan Update were considered to be available for future releases between 2015 and 2032⁶. For the model, these 2,352 allocations remaining to be released were assumed to be released to the local jurisdictions at a rate of 130 per year, and distributed proportionately between the counties based on the percent of vacant developable parcels within each county. Table D.6 shows the approximate number and percent of vacant developable parcels within each county. Once the proportional distribution of allocations between each county was determined, individual allocations were randomly assigned to developable parcels within each county.

³ The number of remaining allocations per the 2012 FEIS used best available information at the time. TRPA has since published an updated accounting of development rights in the 2015 Threshold Evaluation Report (see TRPA 2015 Threshold Evaluation Report, Implementation Chapter, http://www.trpa.org/wp-content/uploads/18_Ch12_Implementation_FINAL_9_30_2016.pdf), which updated the number of remaining allocations from the 1987 plan to 149 units.

⁴ Ten allocations were also put into the TRPA Pool during this period, for a total of 258 allocations.

⁵ Source: TRPA LakeTahoeInfo.org/Parcel Tracker and TRPA permit tracking in Accela. The allocation release is pursuant Ordinance 2014-07 and TRPA Code of Ordinance Section 50.5.1.

⁶ Although the timeframe for modeling is 2035, allocations are released up until 2032. Between 2032 and 2035, it is assumed that no new residential allocations will be released.

Table D.4: Summary of Residential Allocation Distribution over the 2020 and 2035 Model Years

Residential Allocation Type	Model Timeframe		
	2015 – 2020 (6 years)	2021 – 2032 (12 years) ⁷	Totals
Remaining from 1987 Plan	114	0	114
Allocated in 2013/2014(non-TRPA Pool)	248		248
Units constructed in 2013/2014	-130		-130
Subtotal	232		
New units authorized in 2012, remaining after 2013/2014 release	780 (130 units x 6 years)	10 units allocated to the TRPA Pool in 2013/2014	1,560 (130 x 12)
Subtotal	790	1,560	2,350
Total	1,022	1,560	2,582

Table D.5: Remaining Residential Allocations as of December 2014 within Each Jurisdiction

Jurisdiction	Estimated Remaining Residential Allocations as of December 2012 ¹	2013/2014 New Residential Allocations ²	Allocations Redeemed (built) in 2013/2014	Total Estimated Remaining Residential Allocations as of December 2014, assumed to be constructed by 2020
City of South Lake Tahoe	3	38	-23	18
Douglas County	10	17	-16	11
El Dorado County	40	92	-68	64
Placer County	32	57	-18	71
Washoe County	29	44	-5	68
TOTAL	114	248	-130	232

Notes:

1- The estimated development as of 2014 was modeled using best available information at the time of the model run. TRPA has since published an updated accounting of development rights in the 2015 Threshold Evaluation Report (see TRPA 2015 Threshold Evaluation Report, Implementation Chapter, http://www.trpa.org/wp-content/uploads/18_Ch12_Implementation_FINAL_9_30_2016.pdf).

2- In 2013/2014 258 Residential Allocations were issued; however 10 units were allocated to the TRPA Pool.

Source: TRPA LakeTahoeInfo.org/Parcel Tracker and TRPA permit tracking in Accela. The allocation release is pursuant Ordinance 2014-07 and TRPA Code of Ordinance Section 50.5.1.

⁷ Although the timeframe for modeling is 2035, allocations are released up until 2032. Between 2032 and 2035, it is assumed that no new residential allocations will be released.

Table D.6: The estimated number and percent of total developable parcels with a development right within each county, for determining the Residential Allocation potential¹

County	Approximate developable parcels with Development Rights	Percent of Total Developable Parcels
Douglas County, NV	197	4%
El Dorado County, CA (including the CSLT)	3,015	60%
Placer County, CA	1,169	23%
Washoe County, NV	670	13%
TOTAL	5,051	100%
Notes: 1-The determination of the number of vacant developable parcels outside of Centers required the selection of parcels (local Property Assessors) outside of a TRPA-designated Center with an IPES score greater than 0 (TRPA), within either Residential, Mixed Use, and Tourist Regional Land Use Areas (TRPA), not including building footprints (pursuant the Impervious Surface GIS dataset, produced by Spatial Informatics in 2010). This necessitated Geographic Information System (GIS) analysis and estimations.		

Residential Bonus Units (RBU): Based on what is remaining from the 1987 Plan and authorized in the 2012 Regional Plan, the model assumed a total of 1,474 Residential Bonus Units will be available between the years 2015 and 2035. For modeling purposes, all of these RBUs were assumed to be distributed to TRPA-designated Centers (also referred to as Receiving Areas) because of the requirements associated with their use. These requirements are:

- 📌 The 600 RBUs authorized through the 2012 Regional Plan Update can only be allocated as transfer bonus units in TRPA-designated Centers.
- 📌 Among the total RBUs, 385 RBUs are already allocated to specific Community Plan Areas or Community Enhancement Projects in the different jurisdictions; consequently, the model assigned them to these jurisdictions. See Table D.7.
- 📌 Finally, 489 bonus units carried over from the 1987 Plan can be used for transfers or the construction of deed-restricted affordable housing, and the majority of areas zoned for multi-family housing are in Centers.

Table D.7 below gives an overview of the available Residential Bonus Units and how they were modeled. Those units that are assigned to CEP Projects were assumed to be used by 2020, and those to Community Plan Areas by 2035 (shown as 2032 in the table below for consistency with the Regional plan timeframe). See Table D.8 and the “Residential and Commercial Transfer Assumptions” section for an accounting of how the remaining Residential Bonus Units were accounted for in the model.

Table D.7: Residential Bonus Units (RBUs) Remaining from the 1987 Plan Accounting Summary⁸

Community Plan Area or Community Enhancement Program (CEP) Project	CEP Project RBUs ⁹	Community Plan RBUs remaining from 1987 Plan ¹⁰	Total
Tahoe City, Placer County		20	20
Tahoe Vista, Placer County		20	20
California North Stateline, Placer County		13	13
Nevada North Stateline, Washoe County		37	37
Incline Commercial, Washoe County		14	14
Incline Tourist, Washoe County		19	19
Ponderosa Ranch, Washoe County		50	50
South Shore Area Plan, Douglas County (formerly referred to as the Kingsbury Community Plan)		67	67
Tourist Core Area Plan, City of South Lake Tahoe (formerly referred to as the Stateline/Ski Run Community Plan)		89	89
Bijou/Al Tahoe, City of South Lake Tahoe		20	20
Homewood CEP	12		12
Boulder Bay CEP	24		24
<i>Subtotal</i>	<i>36</i>	<i>349</i>	<i>385</i>
TRPA Residential Bonus Pool	0	489	489
Total	36	838	874
Grand Total		874	

Table D.8: Residential Bonus Units distribution in the Transportation Model

Residential Bonus Unit Type	Modeled in 2015 – 2020 (6 years)	Modeled in 2021 – 2032 (12 years) ¹¹	Total
Residential Bonus Units remaining from the 1987 Plan, assigned to Community Plan Areas and CEP Projects	36	349	385
TRPA Residential Bonus Pool, remaining from 1987 (489 RBUS) + Bonus Units allowed from 2012 Regional Plan (600 RBUs) (1,089 total)	Approximately 10% are assumed to be used for affordable housing, metered out at a rate of approximately 6 per year (36)	Approximately 10% are assumed to be used for affordable housing, metered out at a rate of approximately 6 per year (72)	108
	Remaining amount are used for transfer match and metered out at a rate of approximately 55 per year (327)	Remaining amount are used for transfer match and are metered out at a rate of approximately 43 per year (654)	981
Total	399	1,075	1,474

⁸ Source: Regional Plan Update Draft EIS, Page 3.2-9, Table 3.2-3. Per conversation with Paul Nielsen, Current Planning Division Manager, August 25, RBUs for all CEP Projects except for Homewood and Boulder Bay were returned to the TRPA Pool.

⁹ Assumed to be used by 2020

¹⁰ Assumed to be used by 2035

¹¹ This is the 2035 model year.

Commercial Floor Area (CFA): The model assumed a total of 569,502 square feet (sq. ft.) of unused CFA. This included 209,155 sq. ft. of CFA remaining from the 1987 plan assigned to jurisdictions or CEP Projects (i.e. Homewood), 160,347 sq. ft. of bonus CFA remaining from the 1987 Regional Plan for Special Projects and Community Enhancement; and the 200,000 sq. ft. of bonus CFA that was authorized by the 2012 Regional Plan that may be released once the remaining 1987 plan supply is depleted. The model assumed that the remaining CFA assigned to jurisdictions (209,155) will be constructed within those jurisdictions by 2020. The remaining 360,347 sq. ft. of CFA is assumed to be used by 2035, see Table D.9. An explanation of how the CFA available for transfers was distributed is in the Residential and Commercial Transfer Assumptions section.

Table D.9: Commercial Floor Area (CFA) Accounting¹²

Jurisdiction	Remaining from 1987 Plan and 2012 Plan	CFA Constructed in 2013 and 2014	Accounting as of End of 2014 ¹³	CFA Remaining from the 1987 Plan, Accounting as of end of 2014 ¹⁴
CSLT (various eligible areas)	52,986	8,847	44,139	
Douglas County (South Shore Area Plan is the eligible area)	36,250	2,730	33,520	
El Dorado County (Meyers CP is the eligible area)	36,150	2,500	33,650	
Placer County (eligible areas include Carnelian Bay CP, Kings Beach CP, Kings Beach Industrial CP, North Stateline CP, Placer non CP, and Tahoe City CP)	72,609	0	72,609	
Washoe County (eligible area is non CP areas)	2,000	0	2,000	
Homewood CEP			23,237	
TRPA pool for transfer match from sensitive lands (referred to as TRPA Special Project, CEP Pool)	0	0	0	160,347
TRPA pool for transfer match from sensitive lands (2012 Regional Plan update, available after 1987 Plan is exhausted)				200,000
Totals	199,995	14,077	209,155	360,347
Source: TRPA Code of Ordinances, effective February 9, 2013, Section 50.4, Allocation of Commodities and Development Rights Accounting, Table 50.4.1-1; and Research and Analysis Division, August 2015.				

Tourist Accommodation Units (TAUs): The model assumed 342 TAUs were remaining from the 1987 plan as of December 31, 2014. Of these remaining TAUs, a total of 180 were already assigned to individual Community Plans or CEP projects, and these TAUs were distributed in the model as assigned, and assumed to be used by 2020. Based on supply and demand and market considerations, all of the remaining 162 TAUs were assigned as a bonus unit match for the hypothetical transfer of a South Lake Tahoe motel

¹² The estimated development as of 2014 was modeled using best available information at the time of the model run. TRPA has since published an updated accounting of development rights in the 2015 Threshold Evaluation Report (see TRPA 2015 Threshold Evaluation Report, Implementation Chapter, http://www.trpa.org/wp-content/uploads/18_Ch12_Implementation_FINAL_9_30_2016.pdf).

¹³ Assumed to be constructed by 2020

¹⁴ Assumed to be constructed by 2035

located in a Stream Environment Zone outside of a Center. A parcel in Tahoe City (within the Center) in Placer County is modeled as the receiving area for this transfer. See Table D.10.

Table D.10: Tourist Accommodation Unit Distribution Summary¹⁵

Jurisdiction	Remaining TAUs from 1987 Plan, assumed to be used by 2020	Remaining TAUs (assumed to be used by 2035)	Total
<i>City of South Lake Tahoe</i>	25		25
<i>Douglas</i>	25		25
<i>El Dorado</i>	10		10
<i>Placer</i>	25		25
<i>Homewood¹⁶</i>	50		50
<i>Washoe</i>	45		45
TRPA Pool		162	162
Total	180	162	342

Residential and Commercial Transfer Assumptions

Residential Bonus Units: As noted in the Residential Bonus Unit description above, a total of 1,474 RBUs are available for adopted programs including the Special Projects or Community Enhancement Programs (CEP) which allocate bonus units for projects that result in substantial or threshold-related environmental gain and/or rehabilitation of substandard development (see Code Chapters 50-53); and as an incentive to property owners who transfer existing residential development or development rights from areas less suitable for development to within Town Centers, the Regional Center, or the High Density Tourist District (collectively referred to as Centers or Receiving Areas). For transfers, different numbers of RBUs are offered depending on whether existing development is torn down and the parcel restored or whether a development right is transferred off an undeveloped parcel and the parcel is then protected from future development. More RBUs are offered for transfers of development from land that is more sensitive than for transfers from land that is less sensitive. More RBUs are also offered for transfers that are from parcels further from major transportation routes. Any one parcel may combine RBUs offered based on the sensitivity of the sending parcel with RBUs offered based on the distance from transportation routes or receiving areas. This results in a total of 30 different possible transfer ratios based on the land capability of the sending site, its distance from primary transit routes, and whether existing development is present. Based on these factors, each eligible parcel could earn a total of between 0 and 5 RBUs. Table D.11 shows the RBU transfer ratios for different categories of sending parcels.

¹⁵ Note: This table shows modeled numbers. Current accounting differs slightly from the modeled numbers.

¹⁶ These were taken from the TRPA Pool.

To evaluate the potential effects of the residential transfer incentives shown in Table D.11, TRPA modeled likely transfers of residential uses. Since it is impossible to know exactly how many and which parcels would utilize the residential transfer incentives, it was necessary to make a series of reasonable assumptions based on the best available information. These assumptions are described in more detail below, and relate to the following: 1) the total number and rate of RBU utilization, 2) the proportion of units assigned to existing development transfers and development rights transfers; 3) the number of transfers from each combination of land capability and distance categories; and 4) the proportion of development transferred to each receiving area. Once these assumptions were made, the resulting changes in the distribution and number of residential units were incorporated into the transportation model.

Table D.11: Residential Bonus Unit Incentives for Transfers of Development to Centers

1) Land Capability Classification		
	Transfer Existing Development (ERU, CFA, TAU) to Town Centers, Regional Centers and/or the High-Density Tourist District and restore and retire parcel	Transfer Development Right to Town Centers, Regional Centers and/or the High-Density Tourist District and retire parcel
Stream Environment Zone (SEZ)	1:3	1:1.5
Sensitive Lands (1a, 1c, 2 and 3) other than a SEZ	1:2	1:1.25
Non-Sensitive lands (4, 5, 6 and 7)	1:1	1:1
2) Distance from Primary Transit Routes (additional transfer ratio only available for transfers of residential development and development rights into Centers)		
Less than ¼ Mile or on the Lake-ward side of primary transit routes	1:1	
¼ Mile to ½ Mile	1:1.25	
½ Mile to 1 Mile	1:1.5	
1 Mile to 1½ Mile	1:1.75	
Greater than 1½ Mile	1:2	

Source: TRPA Code of Ordinances Sections 51.3 and 51.5.

Total Number and Rate of RBU Utilization: A total of 1,089 RBUs were modeled as available and unassigned (i.e. not already allocated to a pending development project). This included an estimated 489 RBUs carried over and available from the RBUs authorized in the 1987 Regional Plan, as well as 600 new RBUs. Under the existing Regional Plan, these RBUs can only be assigned in the following ways: for projects that construct deed-restricted, affordable housing, RBUs can be earned through completion of mitigation above and beyond that required for project approval (pursuant Code section 52.3.3); or they can be assigned as incentives for transfer of existing development or development rights into Centers.¹⁷

¹⁷ In addition to RBU transfer incentives; there are other programs to incentivize transfer of development into Centers. These include: increasing the maximum coverage allowed for a redevelopment project in a receiving area (pursuant to Section 30.4.2.B in the TRPA Code), allowing

The existing sensitive lot retirement program has demonstrated that demand exists for incentives that encourage property owners to retire sensitive lots. The sensitive lot retirement program provides an allocation to property owners who retire a sensitive lot. Since the sensitive lot retirement program went into effect in 1999, 233 lots have been retired in exchange for an allocation. The allocation offered under this program is substantially less of an incentive than the bonus units (i.e. the one allocation earned under the sensitive lot program still needs to be paired with a development right, whereas the 2012 Regional Plan allows up to 5 bonus units to be earned for transferring one unit, and these bonus units do not require a development right). In addition, several 2012 TRPA Regional Plan policies encourage the reservation of RBUs for transfers since they support the restoration of Sensitive Lands and incentivize the transfer of development from Sensitive Lands and outlying residential areas to Centers (LU-3.5, LU-3.6, LU-3.7, and LU-3.8). It is reasonable to assume that the majority of available RBUs would be used for the transfer of residential development given the large number of properties that would be eligible for the residential transfer incentives, the additional incentives, the Regional Plan goals, and the high amount of demand demonstrated by participation in a more limited program that offered fewer incentives. Of the total supply of Residential Bonus Unit supply available in the TRPA pools, 10% were set aside for affordable housing projects, leaving a total of 981 Residential Bonus Units available for residential transfers. Therefore, the model assumes that approximately 80% of the available RBUs (785 out of a total of 981) would be used to facilitate the transfer of residential development right transfers, and 20% (196 out of a total of 981) would be used to facilitate the transfer of existing residential development. This results in utilization of 196 Residential Bonus Units for Existing Residential Development and 785 for Development Right transfers and a total of 981 Residential Bonus Units used for all the modeled transfers (Tables Table D.13 and Table D.14).

Proportion of Units Assigned to Existing Development Transfers and Development Rights Transfers: It is necessary to make an assumption about the proportion of transfers that would occur from developed and from undeveloped parcels. Two different sets of residential transfer incentives are available including the transfer of residential development rights to Centers which requires sending development rights from vacant eligible parcels (TRPA Code Section 51.3) and the transfer of existing residential development to Centers which requires transferring existing residential development from eligible built parcels (TRPA Code Section 51.5). Undeveloped parcels are less expensive to purchase than developed parcels and therefore more likely to be acquired by a project proponent acquiring development rights for a transfer. In addition, the transfer of existing development requires investment involved with the demolition of development and restoration of land. Many undeveloped parcels eligible for RBUs are in Sensitive Lands. These Sensitive parcels are subject to greater development restrictions and, therefore, they are very unlikely to be developed. The most likely use for these parcels is a transfer of development rights. While there are more eligible developed parcels than undeveloped parcels and a higher number of RBUs are offered for transfers of existing development, the lower cost and limited uses of undeveloped sensitive parcels would make it likely that significantly more development rights would be transferred than existing development. Therefore, the model assumed that approximately 80% (or 785 Residential Bonus Units and 1,109 development rights) of transfers would be sent from undeveloped parcels and approximately 20% (or 196 Residential Bonus Units and 143 existing units) would be sent from developed parcels.

Number of Transfers from Each Combination of Land Capability and Distance Categories: Fourteen possible combinations of land capability categories and distance categories provide bonus unit incentives for transfers of existing residential development, and an additional fourteen categories provide bonus unit incentives for transfers of development rights (although fifteen combinations are shown in the tables below, one of them has a transfer ratio of 1:1, and is therefore not considered to provide an incentive). Once the proportion of transfers of existing development and transfers of development rights was

transfers of non-conforming coverage from sensitive land (pursuant to Section 30.4.2.C in the TRPA Code), and increasing allowable multi-family residential density (pursuant to Section 31.3 and 31.4 in the TRPA Code and with the adoption of an Area Plan, Centers can receive up to 25 units per acre of Multi-Family Development), among other incentives. In combination with the residential bonus units, these measures serve to incentivize transfers of residential units for redevelopment projects in receiving areas.

established, it was necessary to make assumptions about the number of units moved within each category. Table D.13 and Table D.14 show each possible combination of land capability and distance categories for both developed and undeveloped parcels, list the transfer ratio for each combination, and show the number of bonus units received for modeled transfers. The tables show the number of units transferred and bonus units provided by the years 2020 and 2035, and the percent of all eligible parcels utilizing the transfer incentive program within each category.

As described above, fewer transfers are expected from existing residentially developed parcels. The transfers from existing residentially developed parcels are anticipated to follow a similar pattern as the transfers from undeveloped lands. More transfers are assumed to come from sensitive land because they receive more transfer incentives, and redevelopment and expansion of those parcels is constrained by coverage limitations and other restrictions. A total of 34 eligible developed SEZ parcels (out of a total of 3,387 eligible parcels) and 22 sensitive parcels (out of a total of 2,163 eligible parcels) are assumed to participate in the transfer program. A lower proportion of developed parcels on high capability land are assumed to transfer due to the lower incentives offered for those parcels and the lack of constraints to redevelopment. A total of 87 eligible high capability developed parcels (out of a total of 12,794 parcels eligible for transfer bonus incentives) are assumed to participate (Table D.13 and Table D.14).

Proportion of Development Transferred to Each Receiving Area: Once the assumptions described above were made regarding sending parcels, an assumption was necessary about the distribution of the transferred development rights and RBUs within the various receiving areas. The proportion of transferred development rights and RBUs assigned to each receiving area was determined based on the level of redevelopment that has already occurred within each receiving area and the size of receiving areas. TRPA and local jurisdiction staff familiar with development trends in the receiving areas were consulted to determine the level of development or redevelopment likely to occur within each receiving area. Receiving areas that have experienced more redevelopment recently were expected to provide fewer opportunities for future redevelopment and receive fewer transferred development rights and RBUs. Smaller receiving areas were presumed to offer fewer opportunities for receiving transferred development rights and RBUs than larger receiving areas. The assumed percent of development transferred to each TRPA designated Center (or receiving area) is provided in Table D.12. TRPA designated Centers are shown for the North and South shores in Figure D.1 and D.2

Table D.12: Proportion of development transferred to each receiving area

Jurisdiction	Center	Percent
City of South Lake Tahoe	Regional Center	20%
	South "Y"	20%
Placer County	Kings Beach	15%
	Tahoe City	5%
	North Stateline	2.5%
Washoe County	Incline Village	5%
	North Stateline	2.5%
Douglas County	High Density Tourist District	20%
	Kingsbury	5%
El Dorado County	Meyers	5%
Total		100%

Figure D.1: North Lake Tahoe Traffic Analysis Zones and Centers

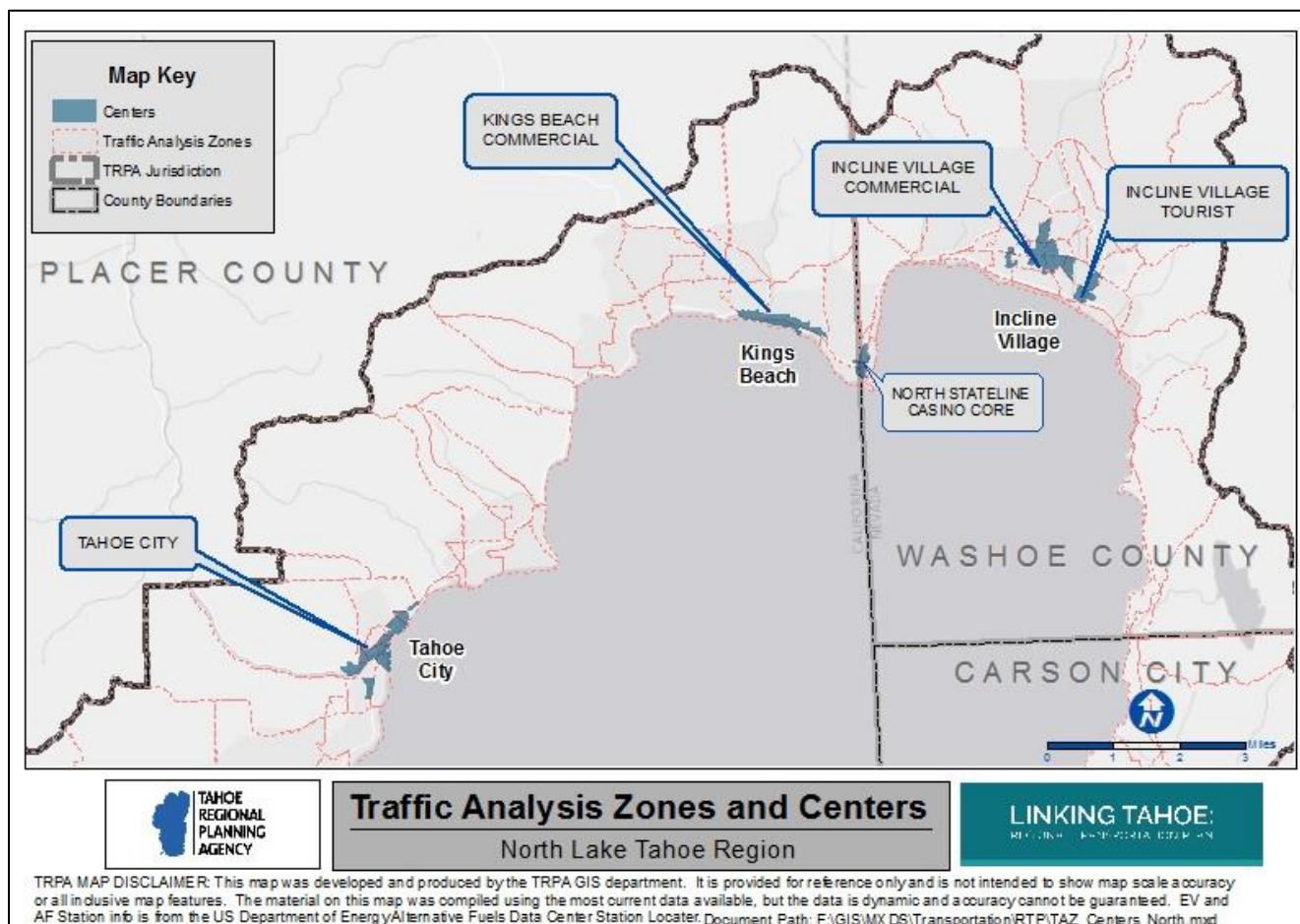
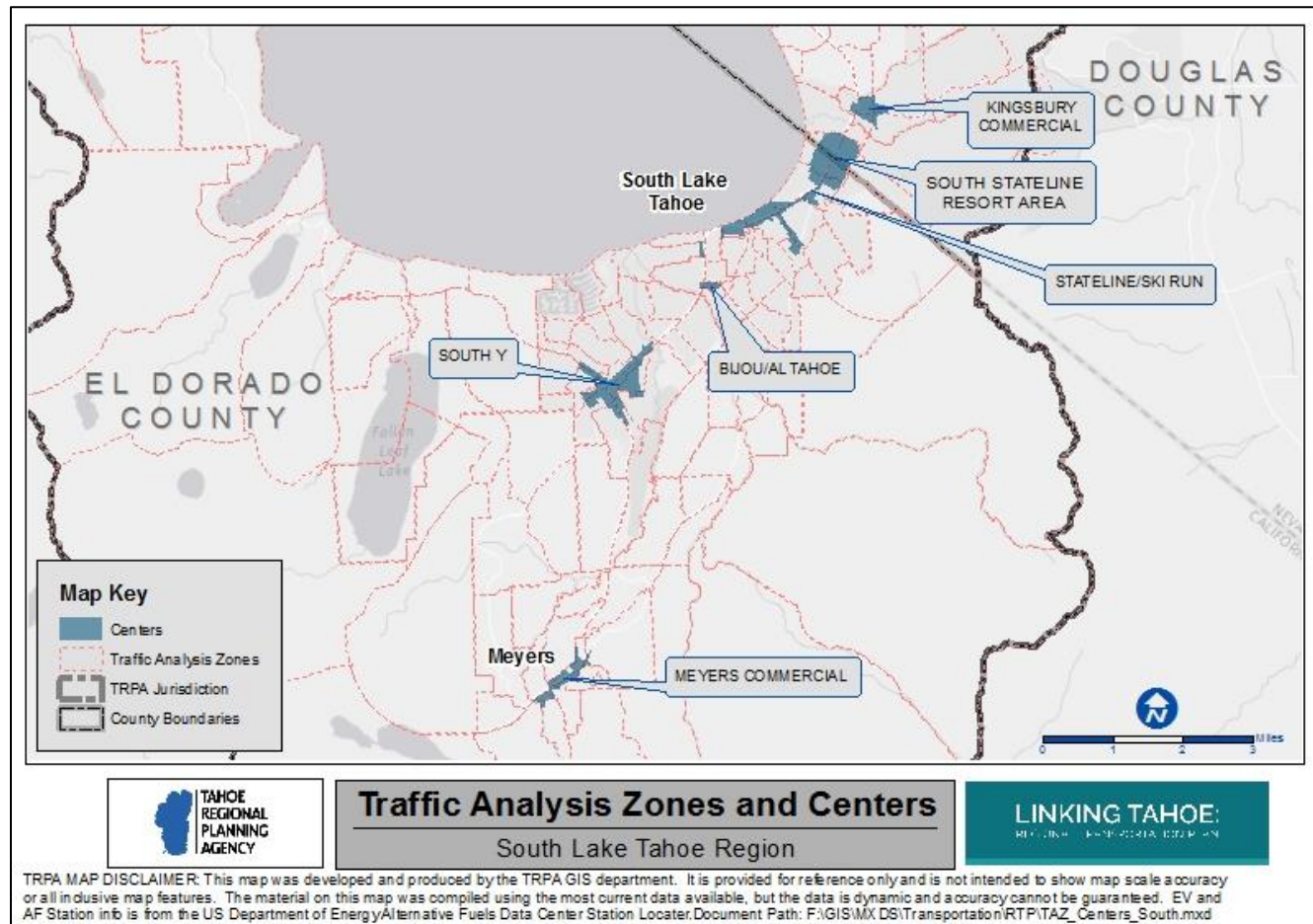


Figure D.2: South Lake Tahoe Traffic Analysis Zones and Centers



Residential Bonus Unit Modeling Approach

To input the residential transfer assumptions into the transportation model, TRPA used the best available GIS data to perform the following steps (described generally):

Existing Residential Development Transfers:

1. Identify eligible Sending parcels in the Region by selecting parcels outside of TRPA designated Centers, not owned by public agencies. Then, pursuant to the respective property assessor descriptions, select only the parcels described as having existing residential development (such as Single Family dwelling) and as a safeguard, retain only the parcels with building footprint(s) as indicated by the 2010 impervious dataset (Spatial Informatics, Inc.).
2. Identified the land capability category (e.g. 1b), pursuant to the Bailey-Sinclair land capability classifications and transfer ratio data, and the distance category (e.g. >1.5 miles) measured as "a crow flies" for each of the selected parcels in the Region. Then randomly select the appropriate number of existing residential parcels within each combination of land capability, distance, and development categories based on the assumptions shown in Table D.13.

3. Removed those existing residential development sending parcels from the sending Traffic Analysis Zone (TAZ). TAZs are a modeling unit in the transportation model. Then assigned those residential units to receiving area TAZs as shown in above
4. Table D.12 (these parcels were evenly distributed to all the TAZs within each respective Center).
5. Calculated total number of units leaving each TAZ and total number to be received by each TAZ and incorporated into the transportation model.

Residential Development Rights Transfers:

1. Identify eligible Sending parcels in the Region by selecting parcels outside of TRPA designated Centers, not owned by public agencies. Next, pursuant the respective property assessor descriptions select only the parcels described as having vacant (private) existing land uses and as a safeguard, retain only the parcels without building footprint(s) as indicated by the 2010 impervious dataset (Spatial Informatics, Inc.).
2. Identified the land capability category (e.g. 1b), pursuant to the Bailey-Sinclair land capability classifications and transfer ratio data, and the distance category (e.g. > 1.5 miles) measured as “a crow flies” for each of the selected parcels in the Region. Then randomly select the appropriate number of existing residential parcels within each combination of land capability, distance, and development categories based on the assumptions shown in Table D.14.
3. Removed those residential development rights sending parcels from the sending Traffic Analysis Zone (TAZ), and assigned those residential units to receiving areas at the proportions shown in above
4. Table D.12 (these parcels were distributed evenly across all TAZs within each respective Center). For each transfer of development right, one new Residential Allocation was used (these Residential Allocations were evenly deducted from each model year) in conjunction with the transferred development right and the resulting residential unit was assigned to the receiving area.
5. Calculated total number of units leaving each TAZ and total number to be received by each TAZ and incorporated into the transportation mode

Table D.13: The transfer ratios and number of bonus units earned for transfers of existing residential development, the percent of eligible parcels, the modeled number of units moved from each sending category, and the number of bonus units provided

Existing Residential Development (See Section 51.5.3, Transfer of Existing Development to Centers)		Transfer (Sending: Receiving)	Ratio	Bonus Units Per Transfer (TRPA Match)	Total Eligible Parcels (GIS Analysis Based Estimate ¹)	Percent of Total Eligible Parcels from Each Category (Eligible units/total)	**Adjusted Existing Units Transferred 2015-2020 (Sending Parcels)	**Adjusted Existing Units Transferred 2021-2035 (Sending Parcels)	Total Bonus Units Available for 2015-2020 (Rounded down***)	Bonus Units Available for 2021-2035 (Rounded down***)	Total Bonus Units Available for both model years (Rounded down***)
Less than 1/4 mile from primary transit routes	SEZ	1:3		2	2,292	12%	3	6	6	12	18
	Sensitive	1:2		1	1,197	7%	2	3	2	3	5
	High Capability	1:1		0							
1/4 to 1/2 mile from primary transit routes	SEZ	1:3.75		2.75	287	2%	2	4	5	11	16
	Sensitive	1:2.5		1.5	337	2%	1	2	1	3	4
	High Capability	1:1.25		0.25	5,291	29%	12	20	3	5	8
1/2 mile to 1 mile from primary transit routes	SEZ	1:4.5		3.5	409	2%	3	5	10	17	27
	Sensitive	1:3		2	493	3%	2	6	4	12	16
	High Capability	1:1.5		0.5	3,885	21%	12	20	6	10	16
1 mile to 1.5 mile from primary transit routes	SEZ	1:5.25		4.25	109	1%	2	3	8	12	20
	Sensitive	1:3.5		2.5	59	0%	1	2	2	5	7
	High Capability	1:1.75		0.75	1,998	11%	3	8	2	6	8
Greater than 1.5 mile from primary transit routes	SEZ	1:6		5	290	2%	2	4	10	20	30
	Sensitive	1:4		3	77	0%	1	2	3	6	9
	High Capability	1:2		1	1,620	9%	3	9	3	9	12
					18,344	100%	49	94	65	131	196
Notes: *Distance measured 'as a crow flies'. Total bonus units, rounded down correspond with above Table D.8.											
***After calculating the Bonus Units gained per transfer ratios, these numbers are rounded down (pursuant policy/procedures, Current Planning). GIS analysis was used to determine the number of eligible parcels (property assessor information, TRPA Regional Land Uses, TRPA IPES data, and the Impervious Surface data produced in 2010 by Spatial Informatics).											

Table D.14: The transfer ratios and number of bonus units earned for transfers of residential development rights, the modeled number of units moved from each sending category, the number of bonus units provided, and the percent of eligible parcels

Residential Development Rights (See Section 51.3. and Table 51.3.6-1, Transfer of Development Rights to Centers)		Transfer Ratio (Sending: Receiving)	Bonus Units Per Transfer (TRPA Match)	Total Eligible Parcels (GIS Analysis Based Estimate ²)	Percent of Total Eligible Parcels from Each Category (Eligible units/total)	**Adjusted Existing Units Transferred 2015-2020 (Sending Parcels)	**Adjusted Existing Units Transferred 2021-2035 (Sending Parcels)	Total Bonus Units Available for 2015-2020 (Rounded down***)	Bonus Units Available for 2021-2035 (Rounded down***)	Total Bonus Units Available for both model years (Rounded down***)
Less than 1/4 mile from primary transit routes	SEZ	1:1.5	0.5	158	5%	16	40	8	20	28
	Sensitive	1:1.25	0.25	207	6%	12	40	3	10	13
	High Capability	1:1	0							
1/4 to 1/2 mile from primary transit routes	SEZ	1:1.875	0.875	33	1%	2	6	1	5	6
	Sensitive	1:1.5625	0.5625	51	1%	3	8	1	4	5
	High Capability	1:1.25	0.25	751	22%	80	160	20	40	60
1/2 mile to 1 mile from primary transit routes	SEZ	1:2.25	1.25	82	2%	20	51	25	63	88
	Sensitive	1:1.875	0.875	77	2%	12	30	10	26	36
	High Capability	1:1.5	0.5	879	25%	80	160	40	80	120
1 mile to 1.5 mile from primary transit routes	SEZ	1:2.625	1.625	18	1%	4	6	6	9	15
	Sensitive	1:2.1875	1.1875	16	0%	2	4	2	4	6
	High Capability	1:1.75	0.75	572	17%	36	60	27	45	72
Greater than 1.5 mile from primary transit routes	SEZ	1:3	2	67	2%	18	38	36	76	112
	Sensitive	1:2.5	1.5	22	1%	2	4	3	6	9
	High Capability	1:2	1	526	15%	80	135	80	135	215
				3,459	100%	367	742	262	523	785
Notes: 1) Distance is measured as a crow flies from a primary transit route. 2) GIS analysis was used to determine the number of eligible parcels (property assessor information, TRPA Regional Land Uses, TRPA IPES data, and the Impervious Surface data produced in 2010 by Spatial Informatics).										

Commercial Transfer Assumptions Overview: The model assumed 160,347 sq. ft. of Commercial Floor Area (CFA) remaining from the 1987 Regional Plan and 200,000 sq. ft. of CFA allocated in the 2012 Regional Plan would be available for transfers. Both of these supplies are in the TRPA pool and are assigned to incentivize transfers from environmentally sensitive land, anywhere in the Lake Tahoe Region. The model assumed that all 360,347 of this CFA would be distributed in the 2020-2035 model timeframe, while the 209,155 sq. ft. of CFA that has already been assigned to jurisdictions, but not yet constructed, was assumed to be used in the 2015 – 2020 timeframe. An overall total of 360,347 sq. ft. of CFA was included in the modeling of commercial related transfers. This CFA is available as an incentive to property owners who transfer existing eligible commercial development from environmentally sensitive areas, deemed less suitable for development, into Town Centers, the Regional Center, or the High-Density Tourist District. The following assumptions were made about the portion of development transferred from Sending Areas and to Receiving Areas.

Proportion of Commercial Development Transferred from Sending Areas: For transfers, more CFA sq. ft. is offered for transfers of existing development from more sensitive lands than for transfers from less sensitive lands. Specifically, the transfer ratio from Stream Environment Zones with a land capability classification of 1b (SEZs) is 1:3; meaning that for every square foot of CFA transferred from an SEZ into a Center, two square feet of CFA bonus units are available (see Table D.15 for more information). Additionally, the transfer ratio is 1:2 for transfers out of environmentally sensitive lands other than SEZs with a land capability classification of 1a, 1c, 2, or 3 into a Center. The model assumed that equal transfers would occur from SEZs and other environmentally sensitive lands since the incentives are comparable and higher than a transfer from non-environmentally sensitive lands. The model does not include transfers from non-environmentally sensitive, high capability lands since there would not be any transfer incentives for these types of transfers.

Proportion of Development Transferred to Each Receiving Area: Under the existing Regional Plan, various policies act as incentives to promote transfers into Centers (receiving areas). These include: increasing the maximum coverage allowed for a redevelopment project in a receiving area (pursuant to Section 30.4.2.B in the TRPA Code), allowing transfers from sensitive land to transfer non-conforming coverage (pursuant to Section 30.4.2.C in the TRPA Code), among other incentives. In combination with the bonus units, these measures serve to incentivize transfers of commercial establishments for redevelopment projects into receiving areas.

Similar to the Residential Bonus Unit transfer program, the proportion of transferred CFA assigned to each receiving area was determined based on the level of redevelopment that has already occurred within each Center and the size of receiving areas. These proportions were the same as those used for the Residential Bonus Unit transfers, and are shown in Table D.15. The assumed percent of development transferred to each receiving area and the associated percent and amount of transferred CFA and bonus CFA from SEZs and other environmentally sensitive areas is provided below in Table D.16, for the 2021-2035 model timeframe.

Table D.15: Existing Development Transfer Ratios (TRPA Code Section 51.5.3)

Existing Commercial Development	Transfer Ratio (Sending: Receiving)	Bonus Units Per Transfer (TRPA Match)	% of Eligible CFA Allocations Transferred from Each Category (Eligible units/total)
SEZs	1:3	2	50.0%
Other Sensitive Lands	1:2	1	50.0%

Table D.16: The proportion of development transferred to each Receiving Area based on the supply, the transfer ratios, and number of units and bonus units earned for CFA transfers for the 2021-2035 modeled timeframe.

Center Name (Receiving Areas for Transfers)	Jurisdiction	Percent to be Transferred	Total Existing Business Sq. Ft. of CFA Transferred from SEZ to Center	Total Bonus CFA Match for SEZ Transfers (Transfer Ratio of 1:3 or double of existing CFA)	Total Existing Business Sq. Ft. of CFA Transferred from Other Sensitive Lands to Center	Total Bonus CFA for Other Sensitive Land Transfers (Transfer Ratio of 1:2)	Total Bonus CFA (SEZ & Other Transfers)
High density tourist district	Douglas	20%	24,023	48,046	24,023	24,023	72,069
Kingsbury	Douglas	5%	6,006	12,012	6,006	6,006	18,017
Regional center	CSLT	20%	24,023	48,046	24,023	24,023	72,069
South "Y"	CSLT	20%	24,023	48,046	24,023	24,023	72,069
Meyers	El Dorado	5%	6,006	12,012	6,006	6,006	18,017
Incline Village	Washoe	5%	6,006	12,012	6,006	6,006	18,017
North Stateline, Washoe	Washoe	4%	4,420	8,841	4,420	4,420	13,261
North Stateline, Placer	Placer	1%	1,586	3,171	1,586	1,586	4,757
Tahoe City	Placer	5%	6,006	12,012	6,006	6,006	18,017
Kings Beach	Placer	15%	18,017	36,035	18,017	18,017	54,052
Total	0	100%	120,116	240,231	120,116	120,116	360,347

Source: TRPA, 2016.

Commercial Transfer Assumptions Model Approach

To run the commercial transfer model and produce an output to be used in the transportation model, TRPA used the best available GIS data to perform the following steps:

- 1) Identified the commercial establishments using the InfoGroup Business dataset (2014) in the SEZ and Environmentally Sensitive lands other than SEZs based on the land capability category pursuant to the Bailey-Sinclair land capability designations. Included only the business establishments eligible for transfers (for example certain types were excluded, such as Automated Teller Machines - ATMs, Accessory CFA, tourist accommodation facilities, home businesses, and government/educated related establishments). Excluded those businesses located inside Centers. Accessory CFA is accessory commercial uses designed to serve the primary commercial uses and that meet all the criteria specified in Code Chapter 21. Examples include: employee facilities, restricted gaming (Nevada only), ski rental shops in ski areas, gift shops in airports, tackle shops used by patrons of marinas, restaurants in a hotel, pro shops at golf courses, and cafeterias in hospitals. See Code Chapters 21, 50, and 90 for additional detail. Derived ground floor CFA for the above identified parcels with businesses eligible for CFA based on the building footprint areas provided in the 2010 Impervious Surface GIS dataset.
- 2) Assigned the appropriate transfer ratio to each eligible parcel based on land capability category.
- 3) Randomly selected the appropriate number of business establishments to meet the target CFA to be transferred to Centers. Businesses were selected in the corresponding jurisdiction where the Centers were located.

- 4) Removed the CFA from the sending Traffic Analysis Zone (TAZ) and assigned the CFA to receiving areas at the proportions shown in the above tables (and distributed evenly across all TAZs within the receiving area).
- 5) Calculated total number of units leaving each TAZ and total number to be received by each TAZ and incorporated into the transportation model.

Tourist Lodging Transfer Assumptions Model Approach

- 1) Identified the tourist lodging establishments using the InfoGroup Business dataset (2014) in the SEZ and Environmentally Sensitive lands other than SEZs based on the land capability category pursuant to the Bailey-Sinclair land capability designations. Excluded tourist lodging located inside Centers.
- 2) Assigned the appropriate transfer ratio to the eligible parcel based on land capability category (1:3 for transfer of existing development out of a SEZ to a Center).
- 3) Based on supply and demand and market considerations, all of the remaining 162 TAUs were assigned as a bonus unit match for the transfer of a South Lake Tahoe motel located in a Stream Environment Zone outside of a Center. A parcel in Tahoe City (within the Center) in Placer County is modeled as the receiving area for this transfer.
- 4) Removed the TAUs from the sending Traffic Analysis Zone (TAZ) and assigned the TAUs to receiving areas at the proportions shown in the above tables (and distributed evenly across all TAZs within the receiving area).
- 5) Calculated total number of units leaving each TAZ and total number to be received by each TAZ and incorporated into the transportation model inputs for TAU by TAZ.

Visitor Assumptions

In addition to assumptions about the distribution of development, another factor that influences transportation model outputs is the amount of visitation to the Region. There are two inputs to the model that most directly impact the model's estimation of visitation to the Region, and those are hotel and motel occupancies, and the percent of housing that is owned as a second home and operated as a seasonal residence or a vacation rental. The assumptions used in the 2020, 2035 and 2040 forecast years for the 2017 RTP are described below, as well as assumptions for day visitors.

Hotel/Motel Occupancies: A key factor in estimating future traffic volumes and vehicle miles traveled are assumptions related to the number of overnight visitors coming to the Region. It is very difficult to predict future levels of visitation to the Region because visitation can be influenced by a number of external factors such as population growth in nearby counties, the overall state of the economy, gas prices, and the weather, to name a few. With the exception of population growth in nearby counties, there is very little in the way of statewide or nation-wide forecasts to assist with predictions.

In light of the available data, to develop reasonable assumptions about overnight visitor growth, TRPA considered a variety of sources: 1) population forecasts; 2) the recent "Bay to Tahoe Basin Recreation and Tourism Rural Roadway Impact Study" completed by El Dorado County in October 2014; and 3) input from local lodging representatives and visitor authorities, and the Strategic Marketing Group, a marketing consulting firm that provides marketing and strategic planning services for the tourism, recreation, and hospitality industries. The assumptions made in the model err on the side of high visitor growth, in order to maintain a conservative analysis of the potential increase in VMT over the next 20 years.

- 1) Population Forecasts. The state demographer's office for California and Nevada maintain population forecasts by county by decade. These were analyzed for the counties housing major population centers and that are a high source of tourists for the Lake Tahoe Region. On the California side these counties included Alameda, Contra Costa, El Dorado, Sacramento, San Francisco, Santa Clara, and Yolo counties which house the major population centers of the San Francisco Bay Area, San Jose, and Sacramento. Between 2010 and 2020, 2030, and 2040, population in these areas was projected to grow approximately 1% per year (California Department of Finance, Report P-1, State and County Population Projections by Major Age Groups, December 15, 2014). Growth in the working age population group, ages 25-64 years, was projected to grow even less in these counties, only slightly more than a half a percent per year. On the Nevada side, Washoe County projects 1-2% growth per year between 2013 and 2033, with an overall average annual growth rate of 1.2%. This estimate incorporates the addition of the Tesla factory (Nevada State Demographer's Office, Nevada October 2014 Population Projections).
- 2) Bay to Tahoe Basin Recreation and Tourism Rural Roadway Impact Study. The purpose of this study was to evaluate the impacts of regional tourism travel on the highway system within the Study Area, evaluate the existing and future tourism market, associated impacts and needs based upon existing conditions, and to provide an evaluation of existing transportation funding sources and programs and likely future funding opportunities. The Study Area for this report was comprised of four California counties: Amador, El Dorado, Placer, and Nevada, plus the Lake Tahoe Basin which included residents who live in the western-most sections of Washoe, Carson City, and Douglas counties, Nevada. The report analyzed visitor spending trends over the past ten to twelve years, as well as future planned developments and attractions that may influence visitor spending and travel. The study predicts that the North Shore of Lake Tahoe will continue recent trends and realize visitor-spending growth in the range of three to five percent, per year. For the South Shore, the study predicts that visitor-spending growth will be relatively flat, due to recent downturns in visitor spending in the gaming economy, with perhaps a slight upward trend representing trends of the past two years. The report notes that if new approved facilities come online, such as the Edgewood Tahoe Lodge, the South Shore could see a modest rate of growth at between one and three percent per year (page 4-13, Bay to Tahoe Basin Recreation and Tourism Rural Roadway Impact Study).
- 3) Consultation with marketing and tourism experts. TRPA staff contacted marketing and tourism experts from both the North and South Shores to test visitor assumptions. These experts noted that a flat or no-growth scenario is not unrealistic, given recent reductions in visitation. They also noted that increases in revpar (revenue per available room--calculated by dividing a hotel's total guestroom revenue by the room count and the number of days in the period being measured) rather than overall occupancy could be expected, but much of that growth would be in increase in room rates, because the quality of hotel rooms is increasing. When demand goes up, hotel prices increase, and occupancies remain static. They noted that there is room for growth in winter and the off-season more so than summer. (Carl Ribaud, Strategic Marketing Group, August 12, 2015; Sandy Evans-Hall, Executive Director, North Tahoe Resort Association, August 13, 2015; Jerry Bindel, Chairman of the South Lake Tahoe Tourism Improvement District, August 20, 2015.)

Based on the above three sources, the model assumed between a ¼% to ¾% increase per year (the same as in the 2012 model), depending on location, for a total of between 6-19% between 2015 and 2035.

Seasonal and Vacation Use: From a modeling perspective, it is important to understand what percentage of homes operate as seasonal homes or vacation rentals, because seasonal visitors and vacationers have different travel patterns than full-time residents. For instance, the average number of trips per day for a full-time residential household is approximately 9.6, while lodging properties geared towards visitors generate approximately 10.6 vehicle trips per day (Institute of Transportation Engineers (ITE) Trip Generation, 8th Edition, trip generation rates for Single-Family Detached Homes versus Recreation and Timeshare Homes).

Fluctuations in the economy have led to changes over time in the levels of residential versus second homeownership. Census data shows that the proportion of total housing units that are in seasonal use or vacant has changed from 51 percent in 1990, to 45 percent in 2000, and back up to 51 percent in 2010 (Lake Tahoe RTP/SCS Final EIR/EIS, Volume 1, page 3-369)¹⁸. These percentages vary between the North Shore and the South Shore, with a greater proportion of housing units used seasonally on the North Shore (U.S. Census 1990, 2000, 2010) (Regional Transportation Plan EIR/EIS, page 3.12-5).

For the 2014 base year, the 2010 census data of occupancy rates by census tract were applied to the appropriate TAZs. Occupancy rates vary, but range from twelve percent to 71 percent Region-wide, indicating the percent of total housing in seasonal use or vacant ranges from 28 percent to 88 percent. In the modeling for 2017 RTP forecast years 2020 and 2035, the percentage of existing housing units in seasonal/occasional use was assumed to remain unchanged from the base year because there are no forecasts available to indicate whether residential occupancy rates or second homeownership will increase or decrease in the future.

Finally, of the homes that are used seasonally or are vacant, 44 percent of these are assumed to be occupied on a peak day in August, the timeframe for the travel model analysis. This percentage is also carried through into the forecast years of 2020 and 2035¹⁹.

Day-Use Visitation, and Addition of External Trips from Development adjacent to TRPA Boundaries: In order to fully recognize the growth potential of recent proposed development adjacent to the TRPA Study Area, TRPA staff canvassed those public transportation agencies responsible for modeling adjacent to the Basin. As shown in Table D.18 below, TRPA staff contacted Caltrans, NDOT, SACOG, and the responsible Regional Transportation Commissions (RTCs) and their modeling staff to discern the relative differences in projected 2035 peak month average daily traffic volumes at the respective entry points. Of particular concern was recent proposed development along California State Route 89 (Squaw Valley) which was estimated to generate an additional 2,804 peak hour vehicle trips into the Lake Tahoe Basin, and along California State Route 267 where additional proposed development (Martis West) was proposed to generate additional traffic volumes of 1,051 peak hour trips into the Lake Tahoe Basin.

In order to account for this additional traffic growth, TRPA staff conducted a series of sensitivity analyses to better characterize the anticipated increase in day-use visitation and increase in projected traffic counts along the two corridors. Within the modeling framework, day-use visitation was originally generated from the 2005 travel survey records and has since been updated with the 2010-2011 License Plate and Postcard Survey. External station cordon counts are then used to calibrate the day-use population size, which is then indexed to the overnight visitor population. Therefore, if the overnight visitor population increases, the day-use visitation component of the model increases accordingly. Another factor that affects the day use population in the model is increases in commercial center and recreational amenities (i.e. beach attractiveness and gaming). Each of these areas is assigned an attraction value, which influences the number of day visitors that are assumed to come to the Basin each day. To reflect the potential growth along the two north entry-corridors, TRPA staff made slight adjustments to the hotel-motel occupancies as well as to beach attractiveness factors to influence greater day-use visitation from the two projects along the SR 89 and SR 267 corridors. The purpose of the analysis was intended to match the forecasted entry volumes forecasted in the Squaw and Martis Valley analyses to be commensurate with the forecasted model values. The comparison of TRPA modeled traffic entry volumes and the modeled entry volumes by adjacent metropolitan planning organizations is shown in Table D.17, below. For additional information concerning how the Lake Tahoe Transportation Model generates day visitation, refer to the Lake Tahoe Resident and Visitor Model; Model Description and Final Results, August 2007.

¹⁸ The American Community Survey (2009-2013) shows a slightly higher percentage of seasonal+vacant (55%), however the numbers from the decennial census were used for consistency with other data used throughout the model.

¹⁹ TRPA, 2013

Table D.17: Comparison of TRPA modeled entry volumes and modeled entry volumes of adjacent MPOs

California Entries	2014 Count	2014 Model	2035 TRPA Model Volumes	2035 Outside Model Volumes		Reference
SR 89 MP 0.00 Alpine-El Dorado	3600	4446	5309	5400		Caltrans PSR (April 2012)
US 50 MP 65.62 Echo Lake Road	15300	13171	16053	17500		SACOG Model - Caltrans PSR
SR 89 MP 13.72 Squaw Valley Rd	15000	21253	25520	22080	2804	Truckee Model (Shaw) Caltrans PSR 2012
SR 267 MP 6.23 Martis Peak Rd	12900	16556	19243	16500	1051	Martis Valley Model (Shaw) Caltrans PSR 2012
	46800	55426	66125	61480		
Nevada Entries						
SR 207 ATR 0531509 - sta 0024	7301	8467	11503	8950		Douglas County (Jeff Foltz-Parsons)
US 50 ATR 252125	15202	19894	21939	15900		Carson City RTC (John Long DKS)
SR 431 sta 770	4949	11053	12317	9000		Washoe RTC (Xuan Wang)
	27452	39414	45759	33850		
Table Date: 3/10/2016						

Part 2: Estimation of Daily Regional VMT

Calibration of Model with Traffic Counts

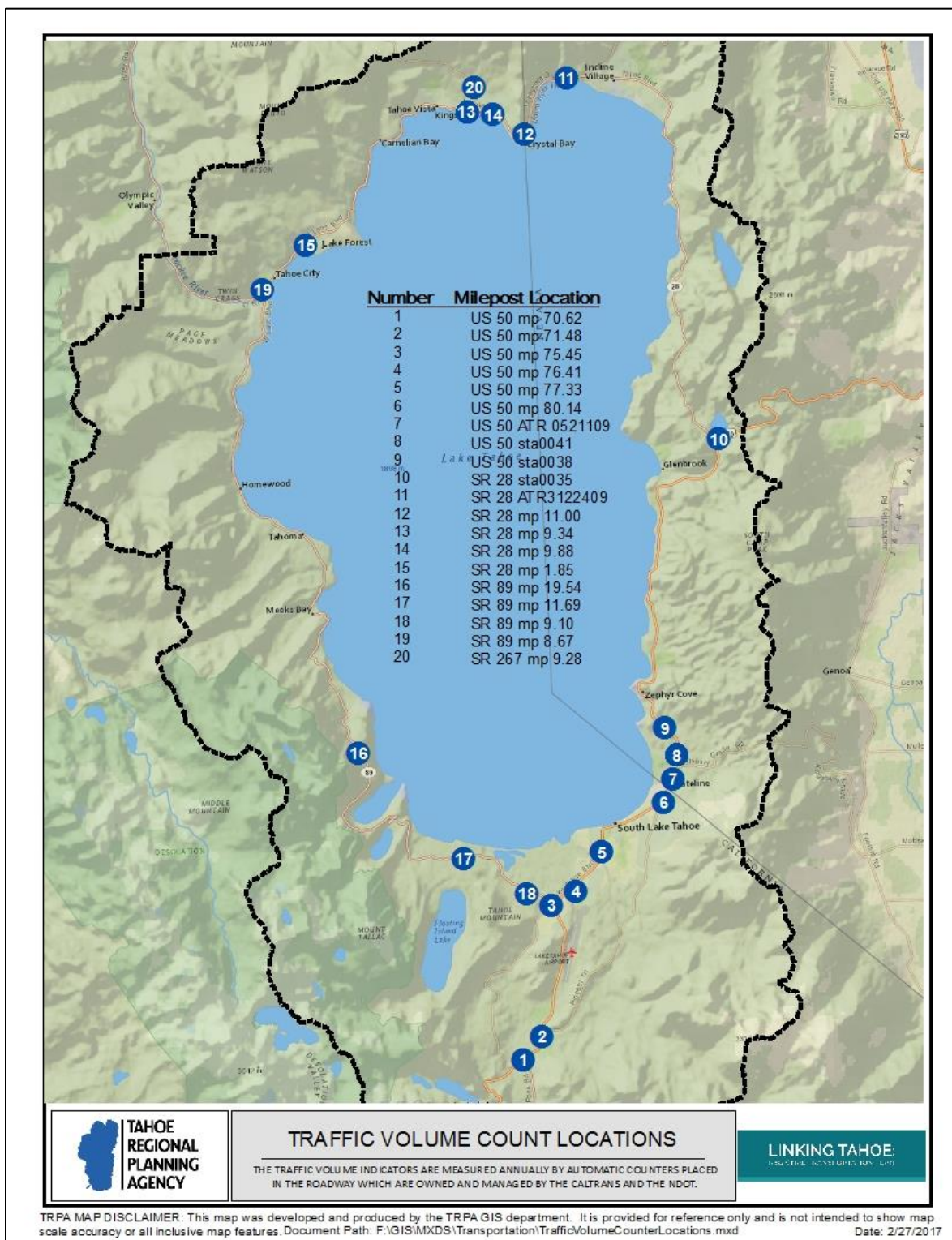
The raw VMT estimates output by the traffic model are compared, or “calibrated”, using 20 traffic count stations continuously maintained by Caltrans and NDOT²⁰. The distribution of the 20 continuously utilized internal count stations were primarily selected to correlate with the population differences between the south shore and north shore (two-thirds – one third, respectively) and to account for those permanent count stations where traffic is counted continuously. Notably, this dataset represents the best indicator of traffic levels available throughout the Tahoe Basin and across the necessary years of analysis. Count Station locations are shown in Figure D.3, and Table D.18 contains the percentage change in August daily traffic volumes as compared with 2015 traffic count data published by Caltrans and NDOT (latest available at the time this RTP was published).

Table D.18: Percentage Change in Peak Month (August) Daily Traffic Volumes

Percentage Change in Peak Month (August) Daily Traffic Volumes						
Count Location			1986 to 2015	2005 to 2015 (10-yr change)	2010 to 2015 (5-yr change)	2012 to 2015 (3-yr change)
1	US 50 mp 70.62	SR 89	-23%	4%	1%	1%
2	US 50 mp 71.48	Pioneer	1%	-3%	1%	1%
3	US 50 mp 75.45	Wye	-14%	0%	0%	0%
4	US 50 mp 76.41	Keys	-25%	5%	5%	5%
5	US 50 mp 77.33	Al Tahoe	-25%	4%	4%	-6%
6	US 50 mp 80.14	Park	-36%	-4%	7%	7%
7	US 50 ATR 0521109	Parkway	-22%	-12%	1%	-1%
8	US 50 sta 0041	Kingsbury	-12%	-3%	17%	21%
9	US 50 sta 0038	Elks Point	-4%	3%	-8%	51%
10	SR 28 sta 0035	Spooner	8%	5%	8%	25%
11	SR 28 ATR 3122409	W. Lakeshore	-14%	-10%	-4%	-1%
12	SR 28 mp 11.00	Stateline	-29%	-6%	4%	8%
13	SR 28 mp 9.34	SR 267	4%	7%	14%	6%
14	SR 28 mp 9.88	Coon St.	2%	15%	32%	35%
15	SR 28 mp 1.85	Lake Forest	-26%	-5%	0%	0%
16	SR 89 mp 19.54	Bliss Park	0%	-5%	-3%	0%
17	SR 89 mp 11.69	Fallen Leaf	12%	38%	47%	47%
18	SR 89 mp 9.10	10th St.	-13%	-9%	0%	0%
19	SR 89 mp 8.67	TC Wye	-6%	-23%	10%	10%
20	SR 267 mp 9.28	North Avenue	16%	8%	-2%	-2%
North Shore Count Locations			-9%	-2%	9%	9%
South Shore Count Locations			-21%	-1%	5%	7%
Total			-16%	-1%	6%	7%

²⁰ Note: From 1981 through 2006, TRPA utilized 27 traffic count stations. Between the 2006 and 2011 Threshold Evaluation Reports, TRPA removed seven cordon station count stations to better discern the increase and/or decrease in traffic volumes and visitation leading into the basin.

Figure D.3: Traffic Volume Count Locations Map








TRIA Methodology

The TRPA developed and maintains a Trip Reduction Impact Analysis (TRIA) spreadsheet tool to evaluate the trip and VMT reduction impacts of various transportation policies and programs under consideration as part of the Sustainable Communities effort. While the TransCAD model is robust, it cannot capture more nuanced strategies that can have a significant effect on travel demand such as parking policies, traveler information systems, new transit operations, or construction of new bike trails and sidewalks. The purpose of the TRIA is to provide planning-level, order-of-magnitude, comparative estimates of the quantitative impacts on auto trips, vehicle miles traveled and greenhouse gas emissions of the continuation of existing policies and programs compared to the impacts of implementing new policies and programs in the areas of transit service expansion, bicycling and walking, and transportation demand management.

As noted above, the TRIA tool provides a way to make comparisons between different policy alternatives and their ultimate effect on greenhouse gas emissions. Using the tool allows TRPA to develop a package of policies tailored to the Tahoe area that will help the Region meet the greenhouse gas emissions reduction targets set by the California Air Resources Board under California's Senate Bill 375.

As far as possible, the TRIA used estimates based on current conditions in the Tahoe Basin, or existing forecasts developed locally, particularly in the case of new transit services and new active transportation facilities such as bike trails and sidewalks. For policies or projects for which there are no local studies the impacts were estimated based on a review of the available literature and studies of places where these policies have already been implemented. Where research shows that a policy might vary in effectiveness the more conservative approach will be chosen, so as not to overstate the trip and VMT reduction potential.

The TRIA is built around the main modes of transportation and analysis of how the land use plan and transportation strategies and policies proposed in the Regional Transportation Plan will impact these modes. The main categories considered in the model are:

-  Bicycling and walking
-  Public transit
-  Intelligent Transportation System (ITS) technologies
-  Transportation Demand Management measures
-  Parking policy changes

The model is structured in such a way as to estimate the potential growth for each mode, for example the potential for new transit riders who were previously vehicle riders, and to take this growth as reductions in vehicle trips. See Table D.19 for an overview of the strategies analyzed and their trip reduction potential in 2020 and 2035.

Analysis by Mode

Bike and Pedestrian Facilities

The reductions for bicycle and pedestrian trips were developed based on the TRPA/TMPO Bicycle Trail User Model (available at <http://www.trpa.org/transportation/monitoring/>) and trip and VMT reduction estimates documented in the memo "Environmental, Economic, and Public Health Impacts of Shared Use Paths in Lake Tahoe"²¹. This model and report estimate trip and VMT reduction from bicycle and pedestrian facilities planned along major travel corridors in the Tahoe Region. The TRIA assumes that the implementation of the bicycle and pedestrian network will happen at a uniform rate across the timeframe of this plan, therefore by 2020 only a

²¹ http://www.tahoemp.org/documents/Impacts_Memorandum_110107.pdf

portion of the network will have been completed, and therefore the VMT reduction is not as great in 2020 as in 2035.

Transit Services and Facilities

The transit portion of the trip and VMT reductions are based on ridership projections from the most recent available data from published and draft short- and long-range transit systems plans. Investments included:

- 🚏 Lake Tahoe Waterborne Transit
- 🚏 Sacramento - South Shore Summer Transit Service
- 🚏 Reno - Truckee - Tahoe Public Bus Service
- 🚏 Minden/Gardnerville Vanpool Service to South Lake Tahoe
- 🚏 Summer All-Day Service on Route 267
- 🚏 Half-Hourly Service on US 50 -- Stateline to Y
- 🚏 TART Evening Service Improvements
- 🚏 Meyers - SLT Limited Transit Service
- 🚏 Half-Hourly Service on All TART Routes
- 🚏 Free Fare Service
- 🚏 Summer Stateline - Zephyr Cove Service
- 🚏 East Shore Transit Service Operational Enhancements
- 🚏 Emerald Bay Parking Restrictions with Existing Trolley service

Transportation Demand Management (TDM) Measures and Intelligent Transportation System (ITS) Technologies

Several strategies to increase the functionality and usability of transit were included in the TRIA. These included:

- 🚏 Improved transit coordination between local and regional providers, through simplified trip planning (e.g. Google Transit).
- 🚏 Improved transit coordination between local and regional providers, through the elimination or shortened wait time of transfers, improvements to ticketing structure and agency cooperation to eliminate "transfer anxiety".
- 🚏 Real-time arrival information at transit stops, online, and/or via web-enabled mobile devices.
- 🚏 Dynamic ridesharing for inter-regional trips. This strategy assumes that the use of transportation networks for sharing trips into the Basin will become more prevalent.

The TRIA also compared the effect of improving the compliance rate of the existing Employer Trip Reduction ordinance through improved enforcement or updating of policies. Compliance rates and trip reduction potential were based on literature review and local mode share survey data.

Parking Management: The TRIA evaluated adjusting parking requirements (reduction or elimination of minimum parking standards; creation of maximum parking standards; shared parking; in-lieu payment to meet parking requirements) in Town Center Areas. The parking calculations used in the trip and VMT reduction estimates were based on observed parking occupancy statistics and estimates of the total parking supply provided by existing studies, compared to the total parking supply estimated to be available after parking management strategies proposed in the RTP go into effect. Where occupancy and turnover data was not available, trip generation rates were based on data from Trip Generation, 9th Edition²².

²² Trip Generation, 9th Edition, Institute of Transportation Engineers (2012)

Cumulative Effect

While the effect of each policy or project type will be analyzed individually, the cumulative effect of these policies will also be estimated. The cumulative effect of the policies cannot simply be the sum of individual effects. The impact of some policies depends on the origin and destination – for example whether they affect trips that start in Tahoe but end outside the region, or if the entire trip takes place within the Tahoe Basin. Other policies may be mutually exclusive – i.e. the measures could not reasonably be implemented at the same time. Where strategies are obviously mutually exclusive, only the project with the highest projected trip reduction was included.

Where there are several reduction measures that are not mutually exclusive, the total cumulative reduction does not equal Measure A + Measure B. Once Measure A has been applied, Measure B will be applied to a base that has already been reduced by Measure A. For example, if two trip reduction measures would each give a 10% trip reduction, the total cumulative reduction is not 20%. Rather, it would be equal to $100\% - (90\% \times 90\%) = 19\%$.

Other Off-Model Reductions – Greenhouse Gas Reduction for Increased Plug-In Electric Vehicle Usage

An additional off-model reduction was applied to overall greenhouse gas emissions, to capture the reduction in greenhouse gas emissions from increased deployment of plug-in electric vehicle charging infrastructure, based on the Region's anticipated completion of the Tahoe-Truckee Plug-In Electric Vehicle Infrastructure and Readiness Plan. Because of the improved access to charging infrastructure anticipated in the plan, TRPA forecasts that PEV owners will be able to travel more miles using electricity.

Table D.19: Trip Reduction Impact Analysis (TRIA) Estimates Draft 2017 Regional Transportation Plan

Vehicle Trip Reduction Strategy	Primary Source of Reduced Vehicle Trips	Vehicle Trip Types Impacted		Percent Reduction in Vehicle Trips for SCS Horizon Year 2020 (Planning-Level Order-of-Magnitude Estimates)		Percent Reduction in Vehicle Trips for SCS Horizon Year 2035 (Planning-Level Order-of-Magnitude Estimates)	
				RP Alternative 3 Constrained	RP Alternative 4 Unconstrained	RP Alternative 3 Constrained	RP Alternative 4 Unconstrained
Parking Management							
Adjust parking requirements (Reduction or elimination of minimum parking standards; Creation of maximum parking standards; Shared parking; In-lieu payment to meet parking requirements) (Town Center Areas) (Not included in Alternative 4 2035 scenario because it is assumed that Intercept lots and associated disincentive captures this.)	Reduced trip generation from new parking spaces.	Mandatory (work)	Existing development				
			New Development	0.24%	0.25%	1.32%	0.00%
		Non Mandatory (discretionary)	Existing development				
			New Development	0.24%	0.25%	1.32%	0.00%
On-street parking management (demand-responsive pricing in commercial areas with residential permits to prevent parking spillover into residential areas) (Town Center Areas)	Reduced trip generation from managed on-street parking spaces and reduced VMT from circling for parking for trips to and from managed areas.	Mandatory (work)	Existing development	On-Street Parking Management will have many localized transportation and economic benefits, including improved parking availability within commercial districts, but given the relatively small number of parking spaces to be managed (351 on-street parking spaces in commercial districts in Tahoe City and South Lake Tahoe, out of a total supply of more than 100,000 parking spaces within the Tahoe Basin), and the widespread availability of public and private off-street parking within these commercial districts, this strategy is not expected to have a significant impact on vehicle trip reduction at the regional-level.			
			New Development				
		Non Mandatory (discretionary)	Existing development				
			New Development				
Transportation Demand Management							
Improve existing employer vehicle trip reduction program (carpool and vanpool matching programs, employee shuttles, on-site secure bicycle storage and shower facilities, flexible work hours, parking and transit use incentives.) (Town Center Areas)	Reduced peak-hour commuter trips.	Mandatory (work)	Existing development	0.89%	0.89%	0.89%	0.89%
			New Development	2.43%	2.43%	2.43%	2.43%
		Non Mandatory (discretionary)	Existing development				
			New Development				
Transit Service and Facilities							
Intra-regional transit capital projects (within Tahoe Basin; currently this only includes ferry service) (Region-wide)	Increased transit mode share, partially drawn from former vehicle trips.	Mandatory (work)	Existing development	0.20%	0.20%	0.19%	0.19%
			New Development	0.20%	0.20%	0.19%	0.19%
		Non Mandatory (discretionary)	Existing development	0.20%	0.20%	0.19%	0.19%
			New Development	0.20%	0.20%	0.19%	0.19%
Transit operational changes (Region-wide)	Increased transit mode share, partially drawn from former vehicle trips.	Mandatory (work)	Existing development	0.37%	0.37%	0.36%	0.36%
			New Development	0.37%	0.37%	0.36%	0.36%
		Non Mandatory (discretionary)	Existing development	0.37%	0.37%	0.36%	0.36%
			New Development	0.37%	0.37%	0.36%	0.36%
Transit operational changes (Non-Town Centers)	Increased transit mode share, partially drawn from former vehicle trips.	Mandatory (work)	Existing development	0.10%	0.10%	0.10%	0.10%
			New Development				

		Non Mandatory (discretionary)	Existing development				
			New Development				
Inter-Regional Transit Service. Applies to Internal-External and External-Internal Trips only (not counted in Alt 4, 2035 because Intercept Locations Strategy is assumed to capture these new trips as well)	Reduced commuter and recreational trips.	Mandatory (work)	Existing development	0.41%	0.41%	0.38%	0.00%
			New Development	0.41%	0.41%	0.38%	0.00%
		Non Mandatory (discretionary)	Existing development	0.41%	0.41%	0.38%	0.00%
			New Development	0.41%	0.41%	0.38%	0.00%
Inter-Regional Transit Service - Intercept Locations with Frequent Shuttles into the Region Applies to Internal-External and External-Internal Trips only	Reduced visitor trips		IX-XI Trips	0.00%	0.00%	0.00%	6.00%
ITS Strategies							
Improved transit coordination between local and regional providers, through simplified trip planning (for example Google Transit). (Town Center areas)	Increased transit mode share for trips in the corridor/district served by the project, partially drawn from former vehicle trips.	Mandatory (work)	Existing development	0.74%	0.74%	0.69%	0.69%
			New Development	0.74%	0.74%	0.69%	0.69%
		Non Mandatory (discretionary)	Existing development	0.74%	0.74%	0.69%	0.69%
			New Development	0.74%	0.74%	0.69%	0.69%
Improved transit coordination between local and regional providers, through the elimination or shortened wait time of transfers, improvements to ticketing structure and agency cooperation to eliminate "transfer anxiety". (Town Centers)	Increased transit mode share for trips in the corridor/district served by the project, partially drawn from former vehicle trips.	Mandatory (work)	Existing development	0.04%	0.04%	0.05%	0.05%
			New Development	0.04%	0.04%	0.05%	0.05%
		Non Mandatory (discretionary)	Existing development	0.04%	0.04%	0.05%	0.05%
			New Development	0.04%	0.04%	0.05%	0.05%
Enhanced transit trip planning (for example Google Transit). (Inter-Regional Trips)	Increased transit mode share for trips in the corridor/district served by the project, partially drawn from former vehicle trips.	Mandatory (work)	Existing development	0.17%	0.17%	0.15%	0.15%
			New Development	0.17%	0.17%	0.15%	0.15%
		Non Mandatory (discretionary)	Existing development	0.17%	0.17%	0.15%	0.15%
			New Development	0.17%	0.17%	0.15%	0.15%
Real-time arrival information at transit stops, online, and/or via web-enabled mobile devices. (Town Center areas)	Increased transit mode share for trips in the corridor/district served by the project, partially drawn from former vehicle trips.	Mandatory (work)	Existing development	0.22%	0.22%	0.21%	0.21%
			New Development	0.22%	0.22%	0.21%	0.21%
		Non Mandatory (discretionary)	Existing development	0.22%	0.22%	0.21%	0.21%
			New Development	0.22%	0.22%	0.21%	0.21%
Regionally implemented dynamic ridesharing (conservative implementation). Applies to Internal-External and External-Internal Trips only.	Reduced commuter and recreational trips.	Mandatory (work)	Existing development	0.00%	0.00%	0.00%	0.00%
			New Development	0.00%	0.00%	0.00%	0.00%
		Non Mandatory (discretionary)	Existing development	1.00%	1.00%	1.00%	1.00%
			New Development	1.00%	1.00%	1.00%	1.00%
Bike and Pedestrian Facilities							
			Existing development	0.30%	0.30%	0.75%	0.75%

Complete regional network of bike and pedestrian facilities (includes expanded bike parking) (Region-wide)	Increased bike and pedestrian mode share for trips in the corridor/district served by the project, partially drawn from former vehicle trips of 3 miles or less.	Mandatory (work)	New Development	0.30%	0.30%	0.75%	0.75%
		Non Mandatory (discretionary)	Existing development	0.45%	0.45%	1.13%	1.13%
			New Development	0.45%	0.45%	1.13%	1.13%
Other Projects							
TOWN CENTERS							
Cumulative Estimate (for all vehicle trip reduction strategies currently under consideration in the TRPA SCS)	n/a	Mandatory (work)	Existing development	2.73%	2.73%	3.11%	3.11%
			New Development	4.47%	4.48%	5.86%	4.61%
		Non Mandatory (discretionary)	Existing development	2.00%	2.00%	2.60%	2.60%
			New Development	2.24%	2.25%	3.89%	2.60%
NON TOWN CENTERS							
Cumulative Estimate (for all vehicle trip reduction strategies currently under consideration in the TRPA SCS)	n/a	Mandatory (work)	Existing development	0.97%	0.97%	1.41%	1.41%
			New Development	0.97%	0.97%	1.41%	1.41%
		Non Mandatory (discretionary)	Existing development	1.12%	1.12%	1.78%	1.78%
			New Development	1.12%	1.12%	1.78%	1.78%
INTERNAL-EXTERNAL TRIPS							
Cumulative Estimate (for all vehicle trip reduction strategies currently under consideration in the TRPA SCS)	n/a	Mandatory (work)	Existing development	0.57%	0.57%	0.53%	6.14%
			New Development	0.57%	0.57%	0.53%	6.14%
		Non Mandatory (discretionary)	Existing development	1.57%	1.57%	1.52%	7.08%
			New Development	1.57%	1.57%	1.52%	7.08%
			TOWN CENTERS	Alt 3	alt 4	Alt 3	alt 4
			Existing	2.16%	2.16%	2.72%	2.72%
			New	2.73%	2.74%	4.32%	3.05%
			Overall	2.18%	2.18%	2.83%	2.74%
			NON TOWN CENTERS				
			Existing	1.08%	1.08%	1.70%	1.70%
			New	1.08%	1.08%	1.70%	1.70%
			Overall	1.08%	1.08%	1.70%	1.70%
			IX & XI Reductions				
			Existing	1.35%	1.35%	1.31%	6.87%
			New	1.35%	1.35%	1.31%	6.87%
			Overall	1.35%	1.35%	1.31%	6.87%
			Notes	Per the TRPA TransCAD model, 22 percent of regional trips are mandatory and 78 percent are non-mandatory.			

Part 3: Calculation of the share of vehicle miles traveled (VMT) attributable to the California portion of the Lake Tahoe Region

Because the Tahoe Transportation Model spans both California and Nevada in its region-wide VMT calculations, it is necessary to develop a methodology for splitting out the VMT attributable to the California portion of the Region for purposes of understanding California GHG estimates and comply with California SB 375. In addition, in accordance with the RTAC protocol for accounting for half of the VMT of all trips with an origin or destination outside the region, and none of the VMT for trips that cross through the region without stopping, additional post-processing of the transportation model results is necessary. This section explains how the TRIA is integrated into the model results, and how total VMT and GHG emissions for the California portion of the Region are calculated.

The TRPA developed an “accounting-based” approach to improve the accuracy of VMT estimates in the Tahoe Basin. As described below, this approach accounts for every vehicle trip in the TRPA model. By doing so, it does not have to rely on any interim assumptions, and produces accurate VMT estimates that can be readily reviewed/confirmed by others.

California VMT Estimation

This section outlines the process the TRPA took to calculate the California-side VMT for the 2005, 2020, and 2035 model years. As noted, VMT is estimated for a peak summer weekday.

Step 1: Obtain Daily Trip Table

The daily trip table is a large matrix displaying the total number of vehicle trips on a daily basis that travel from one particular traffic analysis zone (TAZ) to another. Trip tables also include the number of trips that remain internal to a particular TAZ and trips that have an origin or destination to an external gateway. Below is an illustration of TRPA’s trip table.

Figure D.4: Example Trip Table Model Output

	1	2	3	4	5	6	7	9	10	11	12	13	
1	69.00	23.00	11.00	30.00	24.00	21.00	30.00	1.00	2.00	0.00	0.00	0.00	0.00
2	36.00	60.00	15.00	17.00	36.00	28.00	28.00	16.00	41.00	16.00	14.00	24.00	4.00
3	0.00	8.00	44.00	1.00	4.00	3.00	0.00	13.00	49.00	20.00	9.00	18.00	2.00
4	26.00	23.00	10.00	7.00	28.00	23.00	28.00	1.00	1.00	2.00	0.00	1.00	0.00
5	25.00	19.00	9.00	34.00	10.00	29.00	29.00	0.00	6.00	3.00	1.00	1.00	0.00
6	30.00	29.00	16.00	26.00	14.00	33.00	29.00	0.00	0.00	0.00	0.00	0.00	0.00
7	44.00	27.00	11.00	28.00	24.00	22.00	81.00	0.00	1.00	0.00	0.00	0.00	0.00
9	1.00	9.00	12.00	0.00	1.00	0.00	0.00	4.00	9.00	4.00	2.00	9.00	2.00
10	1.00	8.00	9.00	0.00	1.00	0.00	2.00	6.00	8.00	1.00	7.00	8.00	2.00
11	0.00	5.00	8.00	1.00	0.00	0.00	0.00	5.00	2.00	2.00	2.00	3.00	1.00
12	3.00	19.00	13.00	0.00	0.00	1.00	0.00	12.00	18.00	3.00	20.00	15.00	5.00
13	1.00	12.00	13.00	2.00	2.00	1.00	0.00	7.00	14.00	3.00	9.00	7.00	3.00
14	0.00	8.00	5.00	0.00	2.00	1.00	1.00	3.00	4.00	1.00	6.00	6.00	0.00
15	1.00	3.00	6.00	2.00	1.00	0.00	0.00	1.00	3.00	0.00	3.00	2.00	0.00

Step 2: Apply TRIA Adjustments

The TRIA quantifies the trip reduction benefits of various transportation programs and policies that are part of the SCS. Since the traffic model is not capable of modeling changes in behavior due to these strategies (e.g., employer shuttles, parking management, subsidized transit, etc.), it is necessary to model these behavior changes through ‘post-processing’ of the model results. TRPA will modify the daily trip table shown above by reducing trips in accordance with the percentages displayed in the TRIA in those TAZs where travel behavior would be affected by the SCS strategies.

Step 3: Estimate Distance of Trips

A distance-skim matrix is used to estimate the travel distance between all TAZs within a model. It is a matrix of identical size to a trip table, but whose contents are expressed as miles versus vehicle trips.

Step 4: Calculate Zone-to-Zone VMT

The TransCAD software program allows for matrix multiplication. The adjusted trip table from Step 2 is multiplied by the distance skim in Step 3 to yield a new matrix whose content is VMT (i.e., number of daily trips multiplied by distance) between all zones in the model.

Step 5: Aggregate Zones into California and Nevada Sides

To show achievement of the greenhouse gas targets associated with SB 375, VMT must be calculated for the California side only. The TRPA model contains 289 TAZs, of which 184 represent land uses on the California side of the Tahoe Basin and 105 represent land uses on the Nevada side of the Tahoe Basin and external gateways. The California and Nevada zones are identified so that Step 6 can be conducted.

Step 6: Apply RTAC's VMT Calculation Methodology

The Regional Targets Advisory Committee (RTAC) established under SB 375 recommends the following accounting of various trip types for VMT purposes²³:

- 📌 Include 100% of internal-internal (I-I) trips
- 📌 Exclude external-external (X-X) trips
- 📌 Count 50% of internal-external (I-X) and external-internal (X-I) trips²⁴

Since the SB 375 evaluation is for the California side of the Tahoe Basin, I-I trips are those that begin and end in this area. An example of an I-X trip is a trip from Meyers, CA to Incline Village, NV, or a trip from Sacramento to Tahoe City, CA. An example of an X-X trip is a trip from Echo Summit, CA to Incline Village, NV, or a trip from Placerville, CA to Carson City, NV.

The zone-to-zone VMT matrix from Step 4 was manipulated based on the aggregation of zones in Step 5 and the above VMT calculation methodology.

The results of this six-step process yield the VMT for the California side of the Tahoe Basin using the RTAC-recommended calculation method.

California Greenhouse Gas Emission Estimation

The California Air Resources Board requires MPOs to use the Emissions Factors (EMFAC) model to calculate greenhouse gas emissions associated with the SCS. In 2015 ARB released a memo entitled

²³ Recommendations of the Regional Targets Advisory Committee (RTAC) Pursuant to Senate Bill 375. September, 2009.

<http://www.arb.ca.gov/cc/sb375/rtac/report/092909/finalreport.pdf>

²⁴ TMPO has decided to count 100% of the modeled VMT for I-X and X-I trips with one trip end in the California side of the Basin and the other trip end to a California point outside the Tahoe Basin, as the transportation model provides trip lengths only to the borders of the TMPO Region. For I-X and X-I trips occurring between the California portion of the Tahoe Basin and the Nevada portion of the Tahoe Basin, or external Nevada point, the TMPO will count 50% of the VMT, in recognition that not all of this VMT is attributable to the California side.

"Methodology to Calculate CO2 Adjustment to EMFAC Output for SB 375 Target Demonstrations."
The methodology states:

"In 2010, ARB established regional SB 375 greenhouse gas (GHG) targets in the form of a percent reduction per capita from 2005 for passenger vehicles using the ARB Emission Factor model, EMFAC 2007. EMFAC is a California-specific computer model that calculates weekday emissions of air pollutants from all on-road motor vehicles including passenger cars, trucks, and buses. ARB updates the EMFAC model periodically to reflect the latest planning assumptions (such as vehicle fleet mix) and emissions estimation data and methods. Since the time when targets were set using EMFAC2007, ARB has released two subsequent versions, EMFAC2011 and EMFAC2014."

The memo continues:

"As MPOs estimate GHG emissions reductions from subsequent RTP/SCSs, they will use the latest approved version of EMFAC, but using a different model will influence their estimates and their ability to achieve SB 375 targets. The goal of this methodology is to hold each MPO to the same level of stringency in achieving their SB 375 targets regardless of the version of EMFAC used for its second RTP/SCS."

The methodology describes a process for neutralizing the changes in fleet average emission rates between the version of EMFAC used for the first SCS and the version used for the second SCS. The methodology adjusts for the small benefit or drawback resulting from the use of a different version of EMFAC by applying an adjustment when quantifying the percent reduction in per capita CO2 emissions using the newest version of EMFAC.

After calculating the VMT attributable to the California side of the Tahoe Basin in accordance with RTAC procedures, the TRPA will use this VMT as an input to EMFAC2014 model to estimate GHG emissions. The resulting GHG emissions are then divided by the 2005, 2020, and 2035 residential populations to obtain GHG emissions per capita. Since the TRPA used EMFAC2011 to calculate GHG emissions in its first SCS, the TRPA will apply ARB's methodology for neutralizing the difference between EMFAC models in order to ensure that resultant estimates are comparable to the targets set for the Region.

Finally, as noted above in the discussion in the "Other Off-Model Reductions – Greenhouse Gas Reduction for Increased Plug-In Electric Vehicle Usage" of the TRIA discussion in Component 2, an additional off-model reduction was applied to the final greenhouse gas emission output, to capture the reduction in greenhouse gas emissions from increased deployment of plug-in electric vehicle charging infrastructure, based on the Region's anticipated completion of the Tahoe-Truckee Plug-In Electric Vehicle Infrastructure and Readiness Plan.

Ongoing Development Rights Accounting, Analysis, and Reconciliation

As described in at the beginning of this appendix, the data used to inform the land use assumptions was based on the best available information at the time that the transportation modeling was performed (June 2015 to March 2016). Since that time, TRPA and its partners have conducted ongoing accounting as well as additional analysis and reconciliation of historical development rights usage. As data are updated, TRPA will continue to utilize the best available data at the time that future analyses are conducted.