TAHOE REGIONAL PLANNING AGENCY

ATTACHMENT G

PROJECT IMPACT ANALYSIS UPDATE: PROJECT IMPACT ASSESSMENT AND AIR QUALITY MITIGATION FEE FRAMEWORK

MARCH 16, 2021

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Project Impact Assessment and Fee Framework

The project level transportation impact assessment and mitigation fee updates will provide a streamlined, transparent, and predictable process for projects that modify, change[1], or expand an existing or previous use resulting in additional vehicle miles traveled (VMT) by transparently determining significant impacts and mitigations; providing a streamlined review process for simpler projects; and providing detailed analysis for significance and mitigation determination of more complex projects. The updates measure and mitigate a project's transportation impacts. For those projects subject to environmental analysis for air quality and greenhouse gas, those impacts will be evaluated using VMT as factors in those analyses.

Goals of the modernized program include:

- Incentivizing development in low VMT areas
- Reducing greenhouse gas emissions
- Promoting mobility
- Reducing reliance on the personal automobile

TRPA is developing, in collaboration with Placer County, California, a project level analytical tool. The tool will use data from the TRPA Travel Demand Model to evaluate all projects to determine if they meet defined screening criteria, to further evaluate non-screened residential or tourist accommodation unit projects for impacts to VMT and provide appropriate mitigation strategies as needed, and to calculate the mobility mitigation fee for all projects. Commercial, recreation, and other projects not defined in the framework that are not screened from additional impact assessment will submit a detailed assessment of the project's impact on VMT. An applicant could choose to have a more detailed analysis if they believe it would more accurately reflect the project's effect on VMT or if a pre-approved alternative analysis, e.g., a market study, would provide more information than considered in the tool.

The updated tool and fees will advance implementation of the Regional Transportation Plan (RTP) by empowering applicants with information they need to design better projects and to mitigate project impacts.

The framework proposes changes to key facets of the current project impact assessment and mitigation fee processes that include:

1. Replacing Daily Vehicle Trip Ends (DVTE) with Vehicle Miles Travelled (VMT) in each process
2. Determining if any project types should be exempt from assessment and/or fees
3. Simplifying project evaluation using specific targets for land use equivalents
4. Establishing geographic boundaries (i.e., zones) for project impact assessment
5. Defining unique projects to be assessed on a case-by-case basis
6. Requiring all projects to mitigate their VMT through implementation of VMT mitigations and/or paying a fee
7. Imposing a fee on significant projects that produce unmitigated VMT

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1 Changes in operation include but are not limited to expansion of gross floor area; or change in the applicable land use listed in Subparagraph 65.2.3.A, normally indicated by a substantial change in products or services provided

The outcomes of these updates will be to reduce the approximately 7% of additional VMT from development and redevelopment within the RTP forecast. The proposed framework demonstrates consistency with the updated per capita VMT threshold standard as it will contribute to the overall effort to attain and maintain that per capita VMT reduction standard.

The framework will be reviewed and revised within a year following an adopted update to the Regional Transportation Plan so that the updated TRPA Model data and projections and RTP constrained project list, costs, and anticipated funding, are reflected in the project impact assessment, mitigation strategies, and mobility mitigation fee.

Project Impact Assessment Elements

Consultant Fehr & Peers provided evaluation of the TRPA model (Appendix 1), best practices, and relevant research, and made recommendations for the project impact assessment update. Input received from the Transportation Technical Advisory Committee and individual stakeholder discussions further informed the framework and associated code changes presented here (Figure 1).

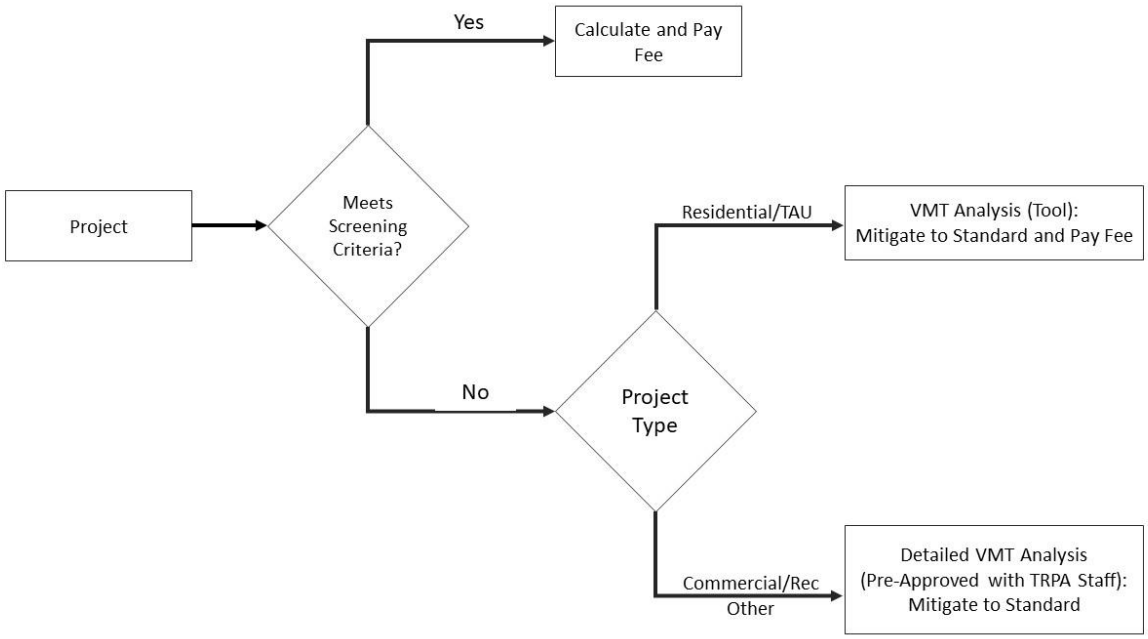

Figure 1: Proposed Project Impact Assessment and Fee Update Framework

The substantive elements of the updates are:

1. Standards of Significance

   Establish minimum expectations for projects, and ensure all development and redevelopment are consistent with the regional goal.

2. Screening Criteria

Screen smaller and less complex projects where fee contribution to regional projects is more appropriate and promote projects in town centers and areas where regional investments in VMT mitigation are focused.

3. Mobility Fee Update

Ensure projects contribute their fair share by updating the fee basis from trips to VMT and incentivize development in targeted areas.

4. Project Tool

Provide a streamlined, transparent, and predictable process that empowers applicants with information they need to design better projects.

The following section summarizes each of the facets of the project impact and mitigation fee updates.

VMT Metric

The VMT Metric is the basic unit of measurement of a project's impact to transportation. An efficiency VMT metric, which measures VMT as a ratio or rate, is most appropriate for project generated VMT, and supports goals to improve the efficiency of vehicle travel by influencing land use and transportation network decisions. Projects whose impact is better understood through its influence on total VMT are best evaluated by an absolute VMT metric.

Table 1 lists the proposed VMT metrics for each project type.

Table 1: VMT Metrics

Project Types	VMT Metric
Commercial	Total VMT
Public Service[2]	VMT per Public Service Use
Recreation[3]	Total VMT
Residential Uses	VMT per resident[4]
Tourist Accommodation Unit	VMT per TAU

2 Public service uses defined Per Table 21.4-A in the Tahoe Code of Ordinances: Religious assembly, Day care centers / pre-schools, Government offices, Hospitals, Local public health and safety facilities, Schools – college, Schools – kindergarten through secondary, Social service organizations, and threshold-related research facilities

3 Recreation uses defined Per Table 21.4-A in the Tahoe Code of Ordinances: Beach recreation, Boat launching facilities, Cross country ski courses, Day use areas, Developed campgrounds, Downhill ski facilities, Golf courses, Group facilities, Marinas, Off-road vehicle courses, Outdoor recreation concessions, Participant sports facilities, Recreation centers, Recreational vehicle parks, Riding and hiking trails, Rural sports, Snowmobile courses, Sport assembly, Undeveloped campgrounds, and Visitor information centers

4 Resident is defined here per the US Census definition: all persons who are "usually resident" in a specified geographic area, and VMT generated from those residents which is calculated at the transportation analysis zone (TAZ) level

Project Types	VMT Metric
Transportation Projects	Total VMT

Screening Criteria

The main goal of screening is to streamline VMT impact assessment by removing projects that are 1) expected to have a minor impact to transportation by producing less VMT than the adopted standard of significance or by providing a beneficial outcome (e.g., affordable housing); or 2) are simple enough that their impacts can be determined without undergoing a complex analysis.

Projects that are screened most effectively mitigate their impacts with VMT through paying mobility mitigation fees, which help fund implementation of projects and programs designed to mitigate anticipated future VMT in the region. Non-screened projects are of a size that can meaningfully mitigate VMT at the project level through implementation of mitigation strategies and paying fees that support regional VMT mitigations.

Screening criteria typically include small projects, such as a single-family residence, projects that would reduce trips or trip length, such as local serving retail or affordable housing, and projects with short or no vehicle trips, such as certain transportation projects like bike paths and sidewalks. Screening can also serve to reduce the time and cost for project development when the project is consistent with adopted local and regional plans.

Commercial, recreation, and other project types not defined here that do not meet the screening criteria will submit a detailed assessment of the project's impact on VMT. Applicants should consult TRPA staff for guidance on the most appropriate approach to analyzing impacts.

Projects that are inconsistent with adopted plans cannot be screened and must submit a detailed assessment of the project's impact on VMT.

Screening Approach

The screening criteria were created referencing available data, various jurisdictional approaches, and the State of California's Office of Planning and Research (OPR) guidance on implementation of SB 743, which utilizes VMT for project impact assessment for environmental review in that state (appendices 2 and 3).

When a project is screened it is not required to mitigate to the standard of significance for the project type. Screened projects are required to calculate VMT and pay the mobility mitigation fee associated with the project to offset the net additional VMT it generates.

Affordable Housing

Affordable housing that is 100% deed-restricted affordable, moderate, or achievable[5] and is in an area eligible for affordable housing bonus units[6] would be exempt from additional project impact assessment

5 Per 90.2 Other Terms Defined in the TRPA Code of Ordinances
6 Per 52.3.4 Affordable, Moderate, and Achievable-Income Housing in the TRPA Code of Ordinances

because data demonstrates an association between lower VMT rates and lower household incomes.[7] The low-income factor used in the TRPA model will be applied to VMT calculation for affordable housing to reflect the lower VMT associated with this type of project.

Active Transportation

Transportation projects involving active transportation or transit would be exempt from additional project impact assessment because these classes of projects would likely not lead to a substantial or measurable increase in VMT, e.g., bicycle, pedestrian, and transit projects.[8]

Previously Analyzed Projects

Projects analyzed in Area Plans with an environmental analysis per 65.2.4.E of the TRPA Code of Ordinances would be exempt from additional project impact assessment.

Low-VMT

The current project impact assessment process, based on daily vehicle trip ends (DVTE), identifies projects that produce less than 200 DVTE as having an insignificant effect and so not requiring additional analysis.[9] This screen is carried forward into the current framework as a VMT equivalent to identify lower VMT producing projects which do not require more complex analysis.

The low-VMT screen proposes screening projects anywhere in the region from additional analysis when the project produces less than the VMT equivalent of 200 DVTE: 1,300 VMT. The 1,300 VMT equivalent is calculated using the regional average in-basin trip length (6.53 miles[10]). With 1.4 million VMT in the Tahoe Basin on an average midweek early/late summer day, the low-VMT screen of 1,300 VMT represents less than 0.09% of daily VMT in the region.

The low-VMT screen differs from the OPR guidance to use 110 DVTE because that guidance does not recognize trip length, which can vary depending on project location and land use type. The low-VMT screen recognizes location, land use type, and trip length, and reflects the appropriate mechanisms for projects to mitigate their impacts based on their VMT. That is, when a project's impact with VMT is below the low-VMT screen it is best able to mitigate its' impacts by advancing regional VMT mitigating projects and programs from the RTP by paying the mobility mitigation fee, and, when a project is above the low-VMT screen, implementing mitigations at the project level and paying fees is effective for mitigating VMT. The RTP, with its robust VMT mitigation program and proven record for reducing VMT in the region, supports the low-VMT screen by providing effective VMT reductions for low-VMT screened projects to advance by paying mobility mitigation fees.

The screen adjusts VMT calculations for projects in or within a one-half mile buffer of a Town Center or Regional Center if it also uses parking rates that do not exceed local jurisdiction minimum parking rates. These centers, and their half-mile buffers, produce less VMT than all other zones in the region because of the proximity of a mix of land uses and non-personal automobile transportation options. This approach advances the Regional Plan goals for a more walkable, bikeable, and transit served region

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7 See: Household Income and Vehicle Fuel Economy in California (sjsu.edu) and Microsoft Word - CNT Working Paper revised 2015-12-18 kn mg edits

8 Per the Technical Advisory on Evaluating Transportation Impacts in CEQA

9 Per 65.2.3 Definitions of the TRPA Code of Ordinances

10 Based on 2018 from the TRPA Travel Demand Model

through improved land use and transportation solutions by moving development into and near to town and regional centers.

Projects will be screened based on their location and VMT using the following adjustment factors:

- Regional Centers and the half-mile buffer: A 35% reduction in VMT calculation based on the greater number of pedestrian, bicycle, and transit trips in Regional Centers.[11]
- Town Centers and the half-mile buffer: A 20% reduction in VMT calculation based on trip lengths in Town Centers averaging about 80% of the basinwide average.[11]

Projects that do not meet the low-VMT screen will be required to conduct additional analysis and apply mitigations (strategies and/or fees) to reduce the project's VMT to at or below the corresponding standard of significance.

Standards of Significance

Standards of significance set a defined level above which a project would have a significant transportation impact, as measured by VMT, and therefore require additional analysis and/or mitigation.

Standards of significance for the proposed system have been determined based on analysis and guidance from OPR, input from stakeholders and the Transportation Technical Advisory Committee, and adapted for the needs of the Tahoe region:

- 15% below the sub-regional[13] average VMT for residential uses[10]; e.g., VMT/Resident for Residential and VMT/Tourist Accommodation Unit, and 15% below the sub-regional[13] average VMT for Public Service projects [10]
- No-net increase in VMT for commercial, recreation and transportation projects[12]
- Other projects will be determined on a case-by-case basis

The framework uses sub-regional (i.e., jurisdictional[13]) standards of significance for residential, tourist accommodation uses, and public service uses. These standards of significance are designed to encourage applicants to reduce VMT by locating projects in the most efficient parts of each jurisdiction (Table 2).

Where a project replaces existing VMT-generating land uses that leads to a net overall decrease in VMT the project will lead to a less-than-significant transportation impact. If the project leads to a net overall increase in VMT, then the standards of significance described below would apply.

Mixed-use project evaluation will recognize internal trip capture within the project site in its trip generation calculation. The mixed-use project would be evaluated using the respective standards of significance for each of the project land use types, per OPR Guidance.

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11 Per the 2018 Summer TRPA Travel Mode Share Survey

12 Per the California Office of Planning and Research Technical Advisory on Evaluating Transportation Impacts in CEQA

13 Jurisdictions include Carson City, City of South Lake Tahoe, Douglas County, El Dorado County, Placer County, and Washoe County

Table 2: Standards of Significance

Project Types	Standard of Significance[14]
Commercial	No-net VMT
Mixed Uses	Evaluate each land use component of a mixed-use project independently, and apply the threshold of significance for each land use type included
Public Services	15% below sub-regional average VMT per Public Service Use [10][15]
Recreation	No-net VMT
Residential Uses	15% below sub-regional average VMT per resident[10]
Tourist Accommodation Unit	15% below sub-regional average VMT per TAU[10][15]
Transportation	No-net VMT

Mitigation

The purpose of mitigations is to ensure that new development and redevelopment, projected through the year 2045 by the TRPA Model for the 2020 RTP, offsets its VMT impacts through mitigations, where feasible, and mitigation fees.

All projects are expected to have a less-than-significant impact. Projects that are not screened must reduce their impact to less-than-significant through implementing appropriate VMT mitigation strategies. Non-screened projects that cannot mitigate to less-than-significant should consult TRPA staff for guidance on the most appropriate approach to achieving less-than-significant impact, which may include paying a fee for the remaining unmitigated VMT.

Projects that receive VMT credit through 65.2.8 of the TRPA Code of Ordinances or a jurisdiction level VMT credit program[16] will have the VMT credit recognized in project impact assessment and mobility mitigation fee calculation.

Screened projects, excluding transportation projects that include bicycle, pedestrian, and/or transit, will be required to pay the mobility mitigation fee if additional VMT is generated. Screened 100% deed-restricted affordable, moderate, and achievable housing projects will be required to pay a fee should new VMT be generated.

Mitigation Strategies

Mitigation strategies are those that may be used to reduce VMT associated with land use projects, land use plans, and non-active transportation projects in the Tahoe Basin.

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14 Calculated using the regional average in-basin trip length of 6.53 miles, per the 2018 TRPA Travel Demand Model

15 Sub-regional average trip length is used as a proxy for VMT

16 Per 65.2.8 B Regional and Cumulative Mitigation Credit Programs in the TRPA Code of Ordinances

Consultant, Fehr & Peers, identified the following VMT mitigation strategies to be appropriate to reduce project generated VMT in Tahoe, based on the draft 2020 RTP, the Placer County Resort Triangle Transportation Plan, the CAPCOA Quantifying Greenhouse Gas Mitigation Measures report, and additional research, (Appendix 4):

- Increase Transit Accessibility
- Integrate Affordable and Below Market Rate Housing
- Improve Design of Development
- Unbundle Parking Costs from Property Cost
- Implement Market Price Public Parking
- Implement Voluntary Commute Trip Reduction Program
- Implement Required Commute Trip Reduction Program
- Provide Ride-Sharing Programs
- Implement Subsidized or Discounted Transit Program
- Encourage Telecommuting and Alternative Work Schedules
- Marketing for Commute Trip Reduction Program
- Targeted Behavioral Interventions
- Employer-Sponsored Vanpool/Shuttle
- Price Workplace Parking
- Provide Traffic Calming Measures

Mobility Mitigation Fees

The Air Quality Management (AQM) fee is being updated and renamed to the Mobility Mitigation Fee.

Fees are used by the region's jurisdictions and implementing agencies to provide the transportation infrastructure necessary to implement the policies and achieve the goals of the RTP.

Each trip that produces VMT has an origin and a destination. The origin is the production of the trip and the destination is the attraction of the trip, with each being responsible for a proportional share of the trip's associated VMT. Since 1987, TRPA has weighted the origin/production of a vehicle trip at 90 percent, and the destination/attraction end of the trip at 10 percent. Within this framework, "beds" account for the origins/productions (e.g., houses, hotel/motel rooms, campgrounds) and commercial, recreation, public service, and other uses as the destinations/attractions, meaning Residential and Tourist Accommodation Units are charged 90% of the AQM fee and Commercial, Recreation, Public Service, and Other land use projects are charged 10% of the AQM fee.

The current approach to apportioning fees based on the land use type of the project is continued under the mobility mitigation fee.

TRPA will develop the mobility mitigation fee following the 2020 RTP adoption. The "per VMT" fee amount will be calculated using significant projects identified in the adopted RTP constrained project list, including costs and anticipated funding, that address new VMT from development and redevelopment projected in the TRPA model, and as modified by applicable constitutional principles and the policy considerations used to generate the existing AQM fee.

Two fee rates will be determined through this process: 1) a mobility mitigation fee rate charged to all new, unmitigated VMT, and 2) a fee to offset any unmitigated VMT above the standards of significance. This work will be completed in consultation with jurisdictions, stakeholders, and the development

community, and in consideration of current transportation fees in the region and in nearby communities. Updating the mobility mitigation fee will require a revision of the TRPA Rules of Procedure and Governing Board action at a public hearing.

Screened projects will pay the mobility mitigation fee on all new VMT up to the corresponding standard of significance.

After exhausting all reasonable mitigation options, non-screened projects that cannot reduce VMT to at or below the corresponding standard of significance should consult TRPA staff for guidance on the most appropriate approach to achieving less-than-significant impact, which may include paying a fee for the remaining unmitigated VMT.

It is anticipated that the updated program will collect roughly the same amount of fees as the existing AQM fee program.[17]

Local jurisdictions that have MOUs with TRPA will collect the TRPA mobility mitigation fee for covered projects. TRPA will collect the fee when no MOU is in place and for non-covered projects.

Use of the fees will continue to require approval by the TRPA Governing Board to ensure monies are being used towards projects identified in the RTP and that reduce VMT.

Local VMT Fees

Some jurisdictions have or could have fee programs to mitigate VMT at a local scale, e.g., Placer County's Tahoe Transportation Fee Program.

The mobility mitigation fee program will recognize these local fee program revenues when calculating the TRPA mobility mitigation fee.

VMT Calculation

Project generated VMT is calculated based on the land use type, size, and location of the proposed project using location-based data from the TRPA travel demand model.

The travel demand model's 282 TAZs have been grouped into a set of 79 zones to simplify analysis and to recognize the underlying land use and transportation contexts more closely, e.g., neighborhoods, transportation systems.

17 Approximately $400,000 per year

These 80 zones are used as the basis for providing VMT data for project generated VMT and mobility mitigation fee calculation for each defined land use type (Figure 2).

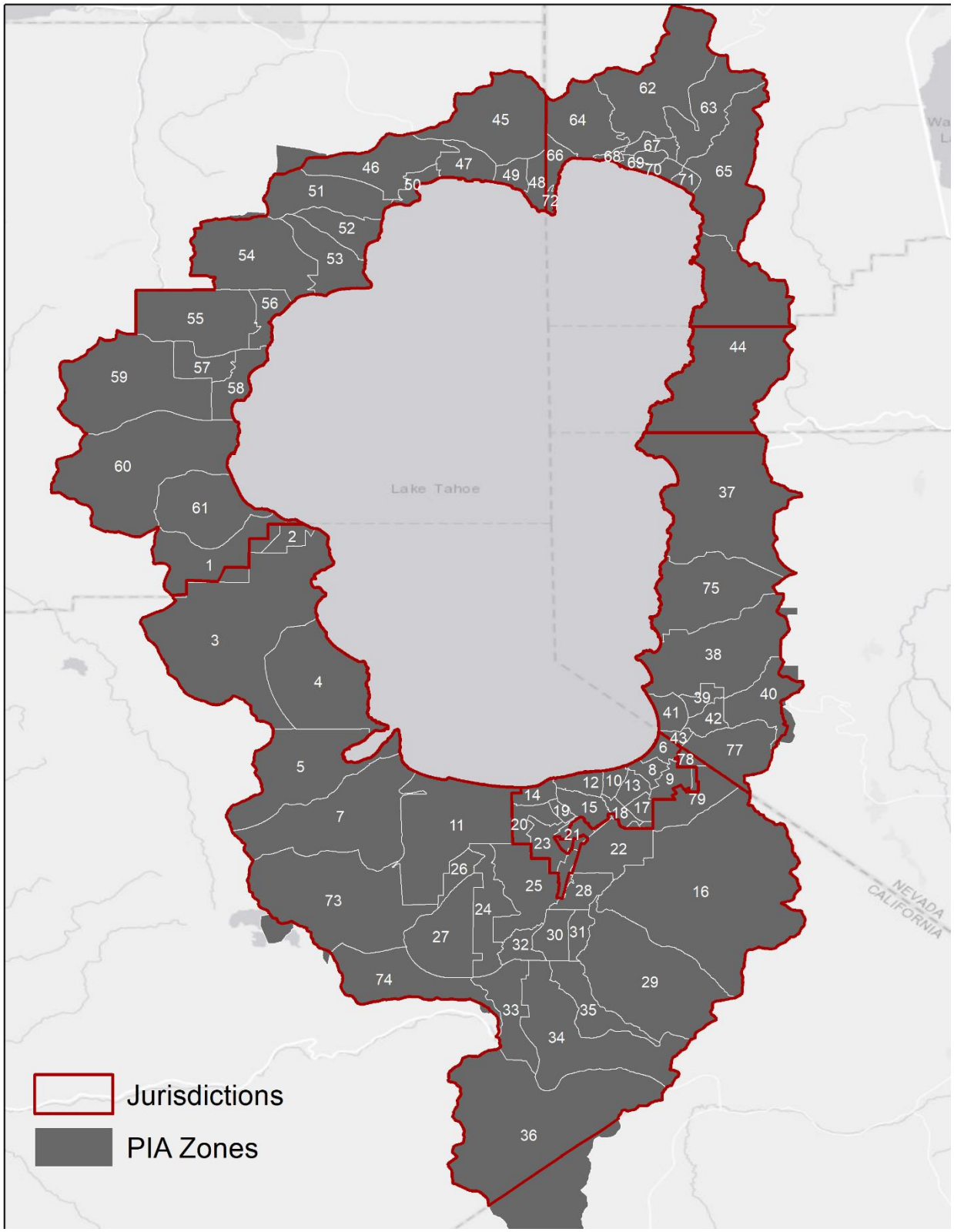


Figure 2: VMT Calculation Zones

Residential

Residential project VMT is calculated using the number of proposed residential units and location (i.e., zone) of the project. Residential VMT per capita is calculated by summing all residential VMT of residents in each zone and divided by the number of residents in the zone (Appendix 5). Resident is defined here per the US Census definition: all persons who are "usually resident" in a specified geographic area. Where a project is proposed will determine its assumed residential VMT per capita. To calculate residential project generated VMT, the project's zone VMT per capita is multiplied by the average number of people per household for that zone and is then multiplied by the number of proposed units:

*Zone VMT Per Capita * Zone Persons per Household * Number of Proposed Units*

Non-Residential Project Types

Project generated VMT for non-residential projects, e.g., Commercial, Recreation, Public Service, and TAU, are calculated using a combination of ITE trip rates and the TRPA model trip lengths for the project location (i.e., zone) (Appendix 6). Average trip length was calculated for each zone by averaging all trips that started or ended in the zone.

*Zone average trip length * ITE trip rate for project land use type*

Standard of Significance

The standard of significance VMT for each land use type utilizes the same methodology as previously described except that for projects evaluated using an efficiency VMT metric, the values are derived from TRPA model data at the sub-regional (i.e., jurisdiction) level, rather than per individual zone.

Mitigation Monitoring

TRPA is committed to monitoring the efficacy of the updated program. However, approaches to monitoring VMT mitigations at the project level are evolving. The National Center for Sustainable Transportation at the University of California, Davis[18] is initiating a project to develop recommendations for monitoring VMT impacts and assessing the efficacy of VMT reduction strategies at the project level. Staff have been working with this research team on a parallel effort, VMT Measurement in the Tahoe Region. The development of project impact assessment VMT mitigation monitoring will be informed by both efforts as they develop over time.

Framework Update

The framework will be reviewed and revised within a year following an adopted update to the Regional Transportation Plan so that the updated TRPA Model data and projections and RTP constrained project list, costs, and anticipated funding, are reflected in the project impact assessment and mitigation strategies and fees.

Tool Development

TRPA is developing a project impact assessment tool with Placer County and consultant, Fehr and Peers. The tool will be driven by data from the TRPA Travel Demand model according to the framework detailed here and for California jurisdiction impact assessment to comply with CA SB 743. The tool will

18 https://ncst.ucdavis.edu/project/monitoring-vehicle-miles-traveled-reduction-claims-local-development-review

be available to the public, consultants, developers, and others to assist in the screening process; to assess whether projects meet screening criteria; to evaluate VMT for non-screened residential, tourist accommodation, and public service projects; to incorporate appropriate VMT mitigations into projects determined to have a significant impact (i.e., those that exceed the standards of significance); and to calculate the mobility mitigation fee.

Contact Information:

For questions regarding the project impact assessment and mitigation fee update, please contact Melanie Sloan at (775) 589-5208 or msloan@trpa.org.

Appendix 1: Tahoe Activity-Based Travel Demand Model Assessment

FEHR PEERS

Memorandum

Date: July 17, 2020

To: Stephanie Holloway, Placer County
Melanie Sloan, TRPA

From: Rob Hananouchi, Kashfia Nehrin, & Ron Milam, Fehr & Peers

Subject: Tahoe Activity-Based Travel Demand Model Assessment

RS20-3907

This memorandum presents a qualitative assessment of the Tahoe activity-based travel demand model (Tahoe AB model) based on model documentation provided by Tahoe Regional Planning Agency (TRPA) staff. This assessment uses the model documentation to assess the Tahoe AB model's capabilities of producing vehicle miles of travel (VMT) estimates for transportation impact assessment in compliance with the California Environmental Quality Act (CEQA). The results of this assessment are compared alongside previously completed assessments of the California Statewide Travel Demand Model (CSTDM) and VMT sketch planning tools. The intent of this assessment is to start a dialogue with TRPA and local agencies about the strengths and weaknesses of available tools to estimate VMT for project-scale effects in the Tahoe Basin.

Background

TRPA and local lead agencies in the Tahoe Basin need to estimate VMT for impact assessment purposes. This includes environmental impact assessment per the requirements identified in Article VII of the Tahoe Regional Planning Compact and under the California Environmental Quality Act (CEQA). Article VII requirements would apply to all projects in the Tahoe Basin while CEQA requirements apply to projects in the State of California portion of the Tahoe Basin only.

The TRPA VMT Threshold Standard was adopted in 1982 to address nitrogen oxides (NOx) tailpipe emissions from vehicles and their effect on lake clarity. Since 1982, NOx emissions from mobile sources have greatly reduced as a result of increasingly stringent tailpipe emissions standards. However, VMT

remains an important performance measure in efforts to reduce auto dependence, reduce greenhouse gases (GHG), and comply with related TRPA and California goals. Therefore, TRPA is in the process of updating its VMT Threshold Standard for assessing the VMT impacts of projects in the Tahoe Basin.

Senate Bill (SB) 743 in California initiated considerable changes to the evaluation of transportation impacts under CEQA. Specifically, SB 743 directed the Governor's Office of Planning and Research (OPR) to amend the CEQA Guidelines to establish new metrics for determining the significance of transportation impacts, and established that automobile delay, as described by level of service (LOS) or similar measures of vehicular capacity or traffic congestion, shall not be considered a significant impact on the environment upon certification of the amended CEQA Guidelines by the Natural Resources Agency. The amended CEQA Guidelines were certified in December 2018, eliminating the use of LOS as a measure for environmental impact. The amended CEQA Guidelines also state that "generally, VMT is the most appropriate measure of transportation impacts" and require the use of VMT statewide as of July 1, 2020. The CEQA Guidelines further explain that a "lead agency may use models to estimate a project's vehicle miles traveled."

To aid in SB 743 implementation, OPR released a *Technical Advisory on Evaluating Transportation Impacts in CEQA* (Technical Advisory) in December 2018. The Technical Advisory acknowledges that "CEQA generally defers to lead agencies on the choice of methodology to analyze impacts." Therefore, the Technical Advisory provides "advice and recommendations," which CEQA lead agencies may use at their discretion for implementing SB 743 changes but "does not alter lead agency discretion in preparing environmental documents subject to CEQA." The Technical Advisory includes technical recommendations regarding the assessment of VMT. With regards to methodology for estimating VMT, the Technical Advisory states that "travel demand models, sketch models, spreadsheet models, research, and data can all be used to calculate and estimate VMT. To the extent possible, lead agencies should choose models that have sensitivity to features of the project that affect VMT." The Technical Advisory further states that "when using models and tools for [establishing thresholds of significance and estimating VMT], agencies should use comparable data and methods, in order to set up an 'apples-to-apples' comparison between thresholds, VMT estimates, and VMT mitigation estimates."

CEQA Expectations

CEQA compliance has two basic elements. The first is the legal risk of challenge associated with inadequately analyzing impacts due to use of models that do not meet benchmark expectations. The second is the mitigation risk of mis-identifying the impact and the mitigation strategies to reduce the impact. Agencies with a high risk of legal challenges will likely be concerned about both elements while

agencies with less legal risk should still be concerned about the second element since it is also relevant for all other transportation analysis based on model forecasts.

The CEQA Guidelines contain clear expectations for environmental analysis as noted below; however, the CEQA Guidelines are silent about what data, analysis methods, models, and mitigation approaches are adequate for transportation impacts.

CEQA Guidelines – Expectations for Environmental Impact Analysis

§ 15003 (F) = fullest possible protection of the environment…

§ 15003 (I) = adequacy, completeness, and good-faith effort at full disclosure…

§ 15125 (C) = EIR must demonstrate that the significant environmental impacts of the proposed project were adequately investigated…

§ 15144 = an agency must use its best efforts to find out and disclose…

§ 15151 = sufficient analysis to allow a decision which intelligently takes account of environmental consequences…

All of these suggest accuracy is important and have largely been recognized by the courts as the context for judging an adequate analysis. So, then what is the basis for determining adequacy, completeness, and a good faith effort when it comes to forecasting and transportation impact analysis? A review of relevant court cases suggests the following conclusions.

- CEQA does not require the use of any specific methodology. Agencies must have substantial evidence to support their significance conclusions. (Association of Irritated Residents v. County of Madera (2003) 107 Cal.App.4th 1383.)
- CEQA does not require a lead agency to conduct every test or perform all research, study, and experimentation recommended or demanded by commenters. (CEQA Guidelines, § 15204, subd. (a))
- CEQA does not require perfection in an EIR but rather adequacy, completeness and a good faith effort at full disclosure while including sufficient detail to enable those who did not participate in the EIR preparation to understand and consider meaningfully the issues raised by the project. (Kings County Farm Bureau v. City of Hanford (1990) 221 Cal.App.3d 692)
- Lead agencies should not use scientifically outdated information in assessing the significance of impacts. (Berkeley Keep Jets Over the Bay Comm. v. Board of Port Comm. (2001) 91 Cal.App.4th 1344.)

- Impact analysis should improve as more and better data becomes available and as scientific knowledge evolves. (Cleveland National Forest Foundation v. San Diego Association of Governments, Cal. Supreme Ct. S223603, 2017).

These conclusions tend to reinforce the basic tenet of CEQA that requires having substantial evidence to support all aspects of the impact analysis and related decisions. Further, analysis should rely on the latest state of the practice, or even best practice methods, to provide accurate and meaningful results. This expectation is grounded in the basic purpose behind environmental regulations like CEQA that attempt to accurately identify and disclose potential impacts and to develop effective mitigation. Having accurate and reliable travel forecasts is essential for meeting these expectations. A key challenge in following the state-of-the-practice is that it can vary depending on many factors. Some of the key factors are listed below:

- Complexity of the transportation network and number of operating modes
- Available data
- Urban versus rural setting
- Planned changes in the transportation network (particularly to major roads or transit systems)
- Availability of resources to develop and apply travel demand models
- Population and employment levels
- Congestion levels
- Regulatory requirements
- Types of technical and policy questions posed by decision makers
- Desired level of confidence in the analysis findings
- Anticipated level of legal scrutiny

In California, travel forecasts are generated using various forms of models that range from simple spreadsheets based on historic traffic growth trends to complex computer models that account for numerous factors that influence travel demand. According to Transportation and Land Development, 2nd Edition, ITE, 2002, the appropriate model depends on the size of the development project and its ability to affect the surrounding area. As projects increase in size, the likelihood of needing a complex model (such as a four-step model) increases because of the number of variables that influence travel demand and transportation network operations. The study area can also influence the type of model needed especially if congestion occurs or if multiple transportation modes operate in the study area. Either of these

conditions requires robust models that can account for the myriad of travel demand responses that can occur from land use or transportation network changes.

The other relevant national guidance on model applications and forecasting is the *NCHRP Report 765, Analytical Travel Forecasting Approaches for Project-Level Planning and Design*, Transportation Research Board, 2014. This is a detailed resource with many applicable sections. A few highlights related to forecasting expectations for models are listed below.

- A travel forecasting model should be sensitive to those policies and project alternatives that the model is expected to help evaluate.
- A travel forecasting model should be capable of satisfying validation standards that are appropriate to the application.
- Project-level travel forecasts, to the extent that they follow a conventional travel model, should be validated following the guidelines of the Travel Model Validation and Reasonableness Checking Manual, Second Edition from FHWA. Similar guidelines are provided in NCHRP Report 716. This level of validation is necessary, but not sufficient, for project-level forecasts. Project-level forecasts often require better accuracy than can be obtained from a travel model alone.
- The model should be subject to frequent recalibrations to ensure that validation standards are continuously met.

Tahoe AB Model Assessment

The information above was used to as the basis for the model assessment, which includes two components. The first component is a review of model ownership and maintenance, and the second component is assessing the adequacy of the Tahoe AB model against select criteria from the guidance material above.

Model Ownership and Maintenance Assessment

Public agencies that develop travel forecasting models for planning and impact analysis must maintain those models and frequently update and recalibrate them as explained above to ensure they remain

accurate and dependable for generating travel demand forecasts. This model ownership and maintenance assessment considers whether TRPA controls the following model components.

- Model documentation – does TRPA have the Tahoe AB model development documentation and any related user guidance?
  - Yes; TRPA maintains both model development documentation and a User Guide via a Github site that is publicly accessible.
- Model files – does TRPA maintain the model input and output files?
  - Yes; TRPA maintains both model input and output files.
- Model distribution – does TRPA control the distribution of the model files to users?
  - The Tahoe AB model is accessible through TRPA's Github site to distribute to users. However, currently TRPA does not require a user agreement or strictly control distribution of the model files.

Adequacy Assessment

The following section details the assessment of the Tahoe AB model's adequacy in producing reasonable travel (i.e., VMT) forecasts. This qualitative assessment uses the following specific criteria.

- Model documentation – availability of documentation regarding the model's development including its estimation, calibration, and validation as well as a user's guide.
- Completed calibration and validation within the past 5 years – recent calibration and validation is essential for ensuring the model accurately captures evolving changes in travel behavior. Per NCHRP Report 765, "The model should be subject to frequent recalibrations to ensure that validation standards are continuously met."
- Demonstrated sensitivity to VMT effects across demographic, land use, and multimodal network changes – validation reporting will be checked for static and dynamic tests per the *2017 Regional Transportation Plan Guidelines for Metropolitan Transportation Planning Organizations*, CTC, 2017 and *Travel Model Validation and Reasonableness Checking Manual, Second Edition*, TMIP, FHWA, 2010.
- Capable of producing both "project-generated VMT" and "project effect on VMT" estimates for households, home-based trips, work trips, and total trips – both metrics are essential for complete VMT analysis. Project-generated VMT is useful for understanding the VMT associated with the trips traveling to/from a project site. The 'project's effect on VMT' is more essential for understanding the full influence of the project since it can alter the VMT generation of neighboring land uses.

- Capable of producing regional, jurisdictional, and project-scale VMT estimates – VMT analysis for air quality, greenhouse gases, energy, and transportation impacts requires comparisons to thresholds at varying scales. For SB 743, the OPR Technical Advisory recommends thresholds based on comparisons to regional or city-wide averages.
- Level of VMT estimates that truncate trip lengths at model or political boundaries – The OPR Technical Advisory states that lead agencies should not truncate any VMT analysis because of jurisdictional or model boundaries. The intent of this recommendation is to ensure that VMT forecasts provide a full accounting of project effects.

The following matrix summarizes the assessment findings for the Tahoe AB model using these criteria.

Tahoe Activity Based Model

Screening Criteria	Screening Determination	Notes
Model Documentation	Available	Includes full overview of model, each sub-model, traffic assignment, external travel summary, and documentation of static and dynamic validation tests. Also includes User Guide.
Completed calibration and validation within the past 5 years	Yes – 2018	Static validation and calibration was conducted for 2018 conditions using Streetlight data and traffic counts. Three dynamic validation tests were also conducted.
Demonstrated sensitivity to VMT effects across demographic, land use, and multimodal network changes	No documentation of sensitivity tests for demographic changes.	Dynamic validation tests included: (1) modifying recreational attractiveness in Kings Beach, (2) adding residential units in Incline Village, and (3) increasing transit frequency. Each dynamic test revealed model outputs tended to change in the appropriate direction and magnitude for these land use and transportation changes.
	Yes – dynamic validation tests included land use and multimodal network changes.	
Capable of producing both "project-generated VMT" and "project effect on VMT" estimates for households, home-based trips, work trips, and total trips	Project-generated VMT – Yes	As an activity (tour)-based model, the Tahoe AB model can track household and work-based tours. The model does not automatically produce home-based or home-based work VMT output. However, these trip purposes are part of individual tour and could be isolated through additional programming.
	Project effect on VMT – Yes	
	Total VMT – Yes	
	Household VMT – Yes	
	Home-based VMT – Possible	
	Work VMT – Yes	
	Home-based work VMT – Possible	

Tahoe Activity Based Model

Screening Criteria	Screening Determination	Notes
Capable of producing regional, jurisdictional, and project-scale VMT estimates	Regional VMT – Yes	Would need to review the traffic analysis zone (TAZ) system to confirm TAZ boundaries nest within jurisdictional boundaries such that jurisdictional VMT could be isolated The model documentation included three dynamic validation tests. While the model produced reasonable results in these tests, this is too small a sample to verify sufficient sensitivity to the wide variety of potential projects that may require VMT analysis.. Model users should consider performing additional dynamic tests to verify model sensitivity for their projects within their specific geographic setting before applying the model 'off the shelf'.
	Jurisdictional VMT – Likely	
	Project-scale VMT – Uncertain	
Level of VMT estimates that truncate trip lengths at model or political boundaries	Minimal	The model includes the entire Tahoe Basin. External trips at model gateways are distinguished between short-distance and long-distance trips. External trip lengths for short-distance and long-distance trips have been added to the gateways to reflect trip lengths "outside the model area." These appended external trip lengths are calibrated/ validated based on Streetlight Data. Since Streetlight Data only captures the trip length to the "next stop outside the Tahoe Basin," it does not capture the full length of trips with intermediate stops (e.g., a trip from Sacramento to South Lake Tahoe with a stop in Placerville would only capture the leg from Placerville to South Lake Tahoe).

Overall, the Tahoe AB model generally is capable of producing VMT estimates for a variety of VMT metrics (i.e., Total VMT, Household VMT, Work VMT, etc.) at the regional, jurisdictional, and project level with the following conditions.

- Jurisdictional estimates will depend on the TAZ system and how will it conforms to jurisdictional boundaries.
- Project level sensitivity should be verified with each application by performing additional dynamic validation tests. The intent is to verify sensitivity for the type of project under analysis within the specific geographic area for that project. TRPA could also perform additional tests covering the most common projects to help reduce the level of modeling needed for subsequent projects. The dynamic tests could include a range of changes from minor to major and in different contexts (i.e., rural versus small-town versus urban (South Lake Tahoe)) to confirm that both the magnitude and

direction of change in travel behavior is appropriate. Some potential dynamic test options to consider include, but are not limited to:

- Demographic changes
  - Effects of converting residential units from short-term rental (STR) use to resident occupied units
- Land Use changes
  - New residential units targeted at certain income levels (i.e., workforce housing) at various locations in the Tahoe Basin (e.g., North Shore, South Shore, etc.)
  - Recreational attractions, which could range from:
    - Visitor/tourist-oriented amenities (i.e., commercial or recreational businesses)
    - Winter-sports attraction
    - Summer-sports attraction
    - Passive recreation destination (i.e., hiking trails, mountain biking trails, parkland, etc.)
- Transportation changes
  - Road diet
  - New roadways/bridges
  - New bikeway

Additional Considerations

Depending on the type of analysis, the following characteristics of the model may cause some limitations related to its forecasts.

- The Tahoe AB model does not have a freight or goods movement component. Currently, freight trips are accounted for in trips associated with residents, visitors, and workers such that they cannot be isolated and are not sensitive to change over time.

- The model inputs generally produce forecasts for a "model day" that represents a unique time period, specifically, the first two weeks of June, last week of August, and middle two weeks of September when summer recreation activity and local school operations briefly overlap. This "model day" may not match the appropriate analysis period for CEQA compliance.

Comparison to Other Tools & Methods

Fehr & Peers previously completed a qualitative assessment of the California Statewide Travel Demand Model (CSTDM) and sketch planning tools that estimate project-scale VMT. Appendix A presents the results of this qualitative assessment.

The table below provides a comparative assessment of these tools and data sources, alongside the Tahoe AB model. For quick comparison, the main findings are color coded as follows:

- Green – model or tool generally meets criterion expectations
- Orange – model or tool partially meets criterion expectations
- Red – model does not meet criterion expectations

Comparative Assessment of VMT Tools for Tahoe Basin

Criteria	Comparative Assessment		
	Tahoe AB Model	CSTDM	Sketch Planning Tools
Sensitive to VMT effects across demographic, land use, and multimodal network changes	No documentation of sensitivity tests for demographic changes.	Documentation does not reflect any sensitivity tests for demographic or land use changes.	Ranges from limited sensitivity to demographic and land use changes to some sensitivity to land use changes.
	Partial – dynamic validation tests included land use and multimodal network changes.	Documentation reflects sensitivity test for some multimodal network changes.	Most have no to limited sensitivity to multimodal network changes.
Capable of producing both "project-generated VMT" and "project effect on VMT" estimates for households, home-based trips, work trips, and total trips	Project-generated VMT – Yes	Project-generated VMT – No; scale is too large for project-level applications.	Most tools produce project-generated VMT estimates. Only UrbanFootprint and MXD+ are capable of producing project-effect on VMT.
	Project effect on VMT – Yes	Project effect on VMT – No; same as note above.	
	Total VMT – Yes	Total VMT – Yes	Some tools produce Total VMT only; others do household VMT only.
	Household VMT – Yes	Household VMT – Yes	
	Home-based VMT – Possible	Home-based VMT – Yes	Home-based VMT – No
	Work VMT – Yes	Work VMT – No	Work VMT – No
	Home-based work VMT – Possible	Home-based work VMT – No	Home-based work VMT – No

Comparative Assessment of VMT Tools for Tahoe Basin

Criteria	Comparative Assessment		
	Tahoe AB Model	CSTDM	Sketch Planning Tools
Capable of producing regional, jurisdictional, and project-scale VMT estimates	Regional VMT – Yes	Regional VMT – Yes	Regional VMT – No
	Jurisdictional VMT – Likely	Jurisdictional VMT – depends on jurisdiction's size and TAZ detail	Jurisdictional VMT – Most do not, but some may be able to produce for small jurisdictions.
	Project-scale VMT – Model is capable but requires verification for each project	Project-scale VMT – No; scale is too large for project-scale VMT estimates.	Project-scale VMT – Yes
Other strengths or limitations	Most detailed and locally-calibrated tool for the Tahoe Basin	Limited detail in the Tahoe Basin given the scale of the model.	Most tools can be applied relatively quickly, producing results with fewer inputs or processes than travel demand models. Some tools are dependent on subjective input of users. Most tools are not recommended for VMT calculations but could have utility for TDM mitigation evaluation. Tools are not calibrated to the Tahoe Basin.
	Model network does not extend beyond the Tahoe Basin, and therefore does not model trips with external origins or destinations (e.g., Sacramento, San Francisco Bay Area, Reno/Carson City, etc.)	Does not cover Nevada side of the Tahoe Basin. May not reflect full trip length for trips that leave California (i.e., trips to/from Nevada).	

While the Tahoe AB model has some limitations, it generally has fewer limitations than other available tools for producing VMT estimates for projects in the Tahoe Basin. Use of the model for project-scale application should include further dynamic validation tests as explained above. When a high level of confidence is desired in the model's VMT estimates, additional reasonableness checks can be made against StreetLight Data VMT estimates, which is described in further detail below.

Supplemental VMT Data

Big data vendors, such as StreetLight Data, offer VMT-specific data products that could be used to support VMT analyses. These big data vendors use anonymized location records from smart phones and

navigation devices to evaluate mobility patterns. This has several benefits when compared to baseline VMT estimates from travel forecasting models, including:

- Reflects actual travel behavior as opposed to the simulation of travel behavior generated by travel models
- Includes distinct travel behavior data over time, allowing for a breakdown by season or aggregation into a broader summary as opposed to modeling of a specific timeframe
    - This also allows for a more precise understanding for variation or changes in VMT over time (e.g., review changes resulting from a disruptive event, like the current COVID-19 pandemic).
    - Data can also be summarized over a longer time period to create a reasonable average estimate of daily VMT.

The VMT-specific data products offered by big data vendors can be used to estimate existing VMT levels for trips that travel to, from, through, and within the Tahoe Basin. Streetlight Data, in particular, offers VMT data products that produce VMT estimates for specific user-defined geographies and timeframes. Hence, customers can request VMT for a region (i.e., entire Tahoe Basin), jurisdiction (e.g., City of South Lake Tahoe), down to a specific census block group; and for a range of timeframes. This VMT data product can also disaggregate VMT into specific trip-purposes, such as work-related trips (i.e., commute trips), household or home-based trips, and visitor trips.

Since this data provides existing or past VMT-generation information, it could be used for proposed projects if those projects are generally consistent with the existing built environment characteristics (i.e., density, mix of uses, multimodal accessibility, etc.). However, it would not be appropriate to apply to proposed projects that would dramatically alter the existing demographics, land use, or multimodal transportation network.

Recommendations

This review revealed some limitations with the Tahoe AB model that can be addressed through the following model improvements.

- Address truncation of trip lengths for external trips with intermediate stops. This could be addressed by:
    - Obtaining customized smart phone/navigation device location data through a vendor to better capture the full length of the external trip tour.
    - Expanding the model network to include larger areas of Northern California and Northern Nevada that generate travel to/from the Tahoe Basin

- Add a freight component to the model to distinguish between freight travel and passenger travel
- Clearly define the required transportation 'analysis days' in the Basin and re-estimate the model to match those days
- Conduct additional dynamic tests to verify the model produces reasonable changes in VMT based on changes in demographics, land use, and transportation inputs at the project scale in various geographic locations throughout the Basin.
- Review, and if necessary, adjust TAZ boundaries to align with jurisdictional boundaries to produce model outputs by jurisdiction.
- Conduct additional reasonableness checks of the model's VMT estimates at the regional, jurisdictional, and project-scale against StreetLight Data VMT estimates based on mobile device data.

Appendix 2: Review of Screening Criteria for Vehicle Miles Travelled

MEMORANDUM

Date: January 13, 2021 – 3rd Draft

To: Melanie Sloan, Senior Planner – Transportation

From: Michael Conger, AICP, Senior Planner – Long Range Planning

Subject: **Review of Screening Criteria for Vehicle Miles Travelled**

Summary

In reviewing available data, various jurisdictions' approaches, and OPR's guidance, I have come to a key conclusion: there is little information about the relationship between land uses and Vehicle Miles Travelled (VMT). VMT is most conclusively estimated by considering trip generation from individual land uses and trip lengths which are most often done at a Transportation Analysis Zone (TAZ) level. As a result of the lack of definitive information, I recommend that we stick as closely as possible to the Governor's Office of Planning and Research (OPR) guidance, which is well substantiated.

Purpose

This document is intended to explain the recommendations in greater detail and identify various options for alternatives.

Findings in Brief

(1) Most jurisdictions are following OPR's guidelines, with some proposing jurisdiction-specific deviations.
(2) There is no readily accessible data on trip length as it relates to specific land uses.
(3) The line between local and regional retail for Tahoe falls somewhere between 10,000 and 40,000 square feet.
    a. Retailers under 10,000 square feet can be presumed to be local serving.
    b. Nonetheless some retailers over 10,000 square feet are also local serving.
    c. Most non-grocery retailers over 40,000 square feet will need to draw from beyond Tahoe and are therefore regional serving.
(4) 1,300 Vehicle Miles Travelled is an appropriate benchmark for determining the size of developments that can be screened.
(5) Trip-length / mode-share adjustments of 20 percent for Town Centers and 35 percent for the Regional Center / High-Density Tourist District are appropriate.

Recommendation

The following table summarizes the proposed recommendation in relation to OPR's guidance:

Screen	OPR Guidance	Recommendation
Small Projects	Generates ≤ 110 daily trips or sized ≤ 10,000 sqft	Require both ≤ 110 daily trips and ≤ 10,000 sqft

Affordable Housing	Projects with 100-percent affordable housing	Follow OPR recommendation but also include affordable housing in mixed-use developments
Local-serving retail	Retail projects with less than 50,000 square feet of retail space	• Retail projects with less than 10,000 square feet of space[19]; and • Retail projects with less than 40,000 square feet of space when "local-serving" • Include other local serving uses
Projects near Transit	Projects within ½ mile of a major transit stop or high-quality transit corridor	Exclude this screen, as there are no qualifying transit stops or corridors in the region
Projects in Low-VMT areas	Residential and office projects in areas where VMT is already below the threshold	Expand to include Centers; Limit to the following uses and sizes: • Moderate income and achievable housing • Redevelopment projects that result in lower VMT • Commercial projects • Recreation projects
Transportation Projects	Transportation projects that promote non-automobile transportation	*Same as OPR Recommendation*

Recommended Screens

Screen #1: Small Projects

OPR's Recommendation

OPR recommends that projects that generate no more than 110 daily trips or are no larger than 10,000 square feet be screened.

Proposed Approach for TRPA

TRPA should implement this screen but require that projects meet both the trip and square footage limitations rather than one or the other. This screen would apply regionwide.

Projects that Could Be Screened

Any type of project could use the small projects screen. The level of development that would be allowed is based on trip generation and square footage. The following non-exhaustive examples illustrate the level of development that could be allowed under the small projects screen:

- 1 single-family residence on an existing lot
- 11 condominiums of 900 square feet each
- 4 detached residences of 2,500 square feet each
- A small hotel addition of 13 tourist accommodation units
- 10,000 square feet of low-trip-generating service commercial use, like mini-storage

[19] Outside of Centers,

Rationale

These projects are relatively small. TRPA's current practice is to screen out projects from transportation analysis that generate fewer than 200 daily trips. The trip and square footage recommended by OPR comes from the Class 1 exemption from the California Environmental Quality Act (CEQA). OPR rationalizes that if this level of development has been identified as resulting in insignificant impacts, the associated VMT would also be below a level of significance.

Alternative Approaches

Using VMT for the Small Project Screen

Rather than using the number of daily trips, the small project screen could be set based on VMT. In this case, 700 VMT would be an appropriate figure[20]. Alternative B2 uses this approach. With VMT as a limiting factor, the level of screened development would depend upon location:

Land Use	**Low VMT Area Incline Village**	**Average VMT Area**	**High VMT Area Tahoe City**
Trip Length	4.09 mi	6.53 mi	10.52 mi
Detached residences (units)	17	11	6
Attached residences (units)	25	16	10
General Merchandise (sqft)	3,900	2,400	1,500
Restaurant (sqft)	800	500	300
Tourist accommodation (units)	17	11	6
Service / industrial (sqft)	4,800	3,000	1,900

Limiting the Small Project Screen to Low-VMT Areas

All or some components (e.g., residences and tourist accommodation units) of the small project screen could be limited to designated low-VMT areas and centers. The concern with this approach is that it may overlook the need to screen relatively small projects outside of these areas. If we are to take this approach, we will want to run several test cases to ensure that we are not unintentionally requiring smaller projects to go through VMT analysis.

Basing the screen on 200 trips / 1,300 VMT

Rather than using 110 trips / 700 VMT as the benchmark for the small project screen, TRPA could choose to increase the small project screen up to 200 trips. This is consistent with existing practice, where projects are screened from transportation analysis if they generate fewer than 200 trips.

Other Jurisdictions

Most other jurisdictions are implementing the small project screen using daily trips only, while some are using daily trips or square footage. Several jurisdictions have deviated from OPR's recommendation by allowing more trips (e.g., 300 daily trips, or in one case 525 daily trips). All jurisdictions reviewed are using some form of the small project screen.

[20] This is based on 110 daily trips multiplied by the region's average trip length of 6.534, rounded to the nearest hundred.

Screen #2: Affordable Housing Projects

OPR's Recommendation

OPR recommends that 100-percent affordable housing projects be screened.

Proposed Approach for TRPA

Implement the screen as proposed by OPR but also allow use of the screen when a mixed-use development contains at least 80 percent housing and the housing is 100-percent affordable. This screen would apply regionwide. Similarly, the affordable housing component of any mixed-use project could qualify for screening. Qualifying projects would need to meet parking and active transportation design criteria.

Rationale

OPR's technical guidance[21] provides substantial evidence to demonstrate that "adding affordable housing to infill locations generally improves jobs-housing match, in turn shortening commutes and reducing VMT." TRPA's growth management and zoning controls would restrict multi-family residential development to infill areas.

Alternative Approaches

Expanding the Screen to Include Moderate-Income and Achievable Housing

Using OPR's rationale, TRPA could choose to expand the affordable housing screen to also include moderate-income[22] and achievable[23] housing.

Limiting the Screen to Low-VMT Areas

TRPA could choose to apply the screen only to low-VMT areas. The negative of this approach is that there may be lucrative affordable housing sites in higher VMT areas that could still reduce commute length substantially.

Other Jurisdictions

Most other jurisdictions appear to be implementing the affordable housing screen as proposed, with several acknowledging the option for mixed-use. Several jurisdictions have chosen not to implement this screen, presumably for political reasons. A couple jurisdictions limit the use of this screen to low-VMT areas or areas near high-quality transit.

Screen #3: Local-Serving Retail

OPR's Recommendation

OPR recommends that local-serving retail uses be screened. Retail uses over 50,000 square feet could be presumed not to be local serving.

Proposed Approach for TRPA

The proposed approach for TRPA would be a two-tiered approach:

- Certain retail commercial uses would be presumed to be local serving if they are under a specific size limit:

[21] State of California, Governor's Office of Planning and Research (December 2018). Technical advisory: On evaluating transportation impacts in CEQA.
[22] 80-120 percent of annual median income.
[23] 120-160 percent of annual median income.

    - 10,000 square feet outside of Centers
    - 12,000 square feet inside of Town Centers
    - 13,500 square feet in the Regional Center / High-Density Tourist District
- Retail commercial uses that exceed those size limits but are under 40,000 square feet would be reviewed on a case-by-case basis to consider if they are local serving. TRPA may require a market study if there is a question about the local-serving nature of a business.

The proposal would also include an additional screen for other local serving uses, such as churches, banks, and doctors' offices. This screen would apply regionwide. Qualifying projects would need to meet parking and active transportation design criteria.

Rationale

OPR's technical guidance notes that "new retail development typically redistributes shopping trips rather than creating new trips… By adding retail opportunities into the urban fabric and thereby improving retail destination proximity, local-serving retail development tends to shorten trips and reduce VMT." Defining what is *local serving* is up to the individual lead agencies. Based on my review, the line between local serving and regional serving falls somewhere between 10,000 and 40,000 square feet. The proposal also includes other non-retail local serving uses. This is because these other uses act similarly to local-serving use in redistributing trips that may otherwise go to a further destination.

Alternative Approaches

Exclude the Case-by-Case Consideration for Structures up to 40,000 Square Feet

Making a case-by-case determination of the local-serving nature of a use may be complicate administration. In that case, we may want to eliminate case-by-case consideration from this framework. This would leave only structures below the lower limits as eligible for screening. If this were to occur, I recommend we establish a higher screening threshold for grocery stores and pharmacies, as these are commonly local serving even when over 10,000 square feet in size.

Eliminate the Non-Retail Uses

Rather than expanding the screen to include public service and other non-retail local serving uses, the screen could be limited just to retail uses.

Other Jurisdictions

Most other jurisdictions have adopted some form of the local-serving retail screen. The most common approach is to presume that a business is local serving if it is under 50,000 square feet. This is commonly adjusted by local jurisdictions. San Francisco, Palo Alto, and Goleta all use 10,000 square feet. San Diego expands the limit to 100,000 square feet and Rancho Cordova expands it to 200,000 square feet in certain parts of the city. It is also common for jurisdictions to include public service and other non-retail uses in the screen.

Screen #4: Low-VMT Areas

OPR's Recommendation

OPR recommends that residential and office projects that exhibit similar design characteristics be screened in areas where VMT is already below threshold.

Proposed Approach for TRPA

TRPA could establish a screen for areas where VMT is already below threshold levels based on mapped TAZ boundaries. The screen should also be expanded to include all Centers regardless of their VMT characteristics, as these areas have design standards and requirements that ensure development will be pedestrian oriented. The screen should apply only to certain classes of development:

(1) Moderate-Income and Achievable Housing Projects. Projects comprised 100 percent of moderate-income or achievable housing, or a mixed-use development with no more than 20 percent of non-residential uses where 100 percent of the residential component is moderate-income or achievable housing. This would also include any moderate-income / achievable housing components within a mixed-use development.

(2) Redevelopment Projects that Result in Less VMT. Projects that result in less net VMT than the development it is replacing.

(3) Commercial and Recreation Projects. Commercial and Recreation projects up to a certain size (based on 1,300 VMT):

Land Use	Outside of Center	Town Centers	Regional Center / High-Density Tourist District
Commercial (square feet)	6,500	8,000	9,000
Indoor Recreation (square feet)	6,500	8,000	9,000
Outdoor Recreation (acres)	20	24	27

Qualifying projects would need to meet parking and active transportation design criteria.

Rationale

Areas that are currently below threshold VMT will continue to be low VMT. OPR notes that projects "that incorporate similar features (i.e., density, mix of uses, transit accessibility), will tend to exhibit similarly low VMT." While OPR limits its analysis to residential and office projects, it may be appropriate to screen commercial and recreation projects of a certain size. Additionally, it would be appropriate to screen redevelopment projects that result in a net reduction in VMT.

Alternative Approaches

Break Commercial Sizes Down by Use

Commercial uses could be broken down into smaller categories and set square footages for each on the basis of 1,300 VMT:

Trip Rate Categories	General Categories	Retail Categories
• Auto repair and service • Bank • Hospital • Industrial services	• General merchandise	• Retail • Non-Retail • Restaurants

• Building materials/ lumber • Clinic • Convenience market • Discount store • Drinking place • Fast food restaurant • Furniture store • General light industrial • General office building • Hardware / paint store • High-turnover sit-down restaurant	• Laundry and dry cleaning • Manufacturing • Mini-warehouse • Movie theatre • New car sales • Nursery • Quality restaurant • Research center • Savings and loan • Self-service car wash • Service station • Specialty retail center • Supermarket • Warehousing • Wholesale market	• Convenience shopping • Specialty retail and offices • Personal services • Service / industrial • Restaurants • Entertainment	

Include Tourist Accommodation Units

TRPA could choose to include tourist accommodation units in the low-VMT screen. Based on the 1,300 VMT limit, this would amount to roughly:

- 22 units outside of centers
- 26 units in Town Centers
- 30 units in the Regional Center / High-Density Tourist District

Alternatively, a weighting factor could be applied (i.e., 100% trip length factor) to account for longer trip lengths (see Alternative A1).

Include Market-Rate Residential Units

TRPA could choose to include market-rate residential units. Because tourist and detached residential units have similar trip generation factors, the same number of units would result:

- 22 units outside of centers
- 26 units in Town Centers
- 30 units in the Regional Center / High-Density Tourist District

Exclude all but Residential and Office Uses

To keep as closely as possible to the OPR recommendations, TRPA could limit the low-VMT screen to apply only to residential and office projects.

Expand the Map

If the low-VMT map, which is based on subregional thresholds, is too limiting, we could consider applying the screen to areas that meet *either* the regional or the subregional threshold. This would substantially increase applicability.

Other Jurisdictions

Most of the reviewed jurisdictions are using the regional (rather than subregional or jurisdictional) threshold to screen low-VMT areas. These tend to be based on mapping layers provided to the city/county by their MPO, with TAZs as the base layer. In several cases, once you meet the locational criteria, all projects are screened. In other cases, only residential and office projects are screened. It is common to see this screen expanded to include industrial projects, employment-based projects, and redevelopment projects that result in lower VMT.

Screen #5: Transportation Projects

OPR's Recommendation

OPR recommends that transportation projects that do not promote automobile use be screened from VMT analysis. They include a list of project types.

Proposed Approach for TRPA

The OPR recommendation should be applied as the screen. The list of project types provided to TTAC in December can be used.

Rationale

While many transportation projects change travel patterns, a project that leads to additional vehicle travel on a roadway could result in generation of additional VMT. Certain classes of project would not likely lead to a substantial or measurable increase in vehicle travel and should be exempted from VMT analysis.

Alternative Approaches

No alternative approaches were considered.

Other Jurisdictions

All reviewed jurisdictions appear to implement some form of the transportation project screen. The individual types of projects listed tended to vary, however.

Findings

(1) **Most jurisdictions are following OPR's guidelines.** Most cities and counties have decided to adopt the same screening thresholds as those recommended in OPR's guidelines. While many jurisdictions have chosen to adjust the screening criteria, these adjustments tend to be relatively minor and stick within the larger framework of OPR's guidance. Some of the adjustments made include:

- Increasing or reducing the size of retailers defined as "local-serving." OPR recommends 50,000 square feet. The range appears to be 10,000 (San Francisco) to 200,000 square feet (Rancho Cordova).

- Increasing or reducing the range of "small projects" that may be screened out. OPR recommends 110 daily vehicle trips or 10,000 square feet. Some jurisdictions require both the trip generation and square footage. Others allow more than 110 trips – San Diego allows 300 trips and Long Beach allows 525 trips. Placer County's recommended screen would be based on 880 vehicle miles travelled[24] rather than the number of trips.

[24] 880 VMT is equivalent to 110 daily trips multiplied by Placer County's average trip length.

- Defining "local-serving" uses by use category. Alternatively, some jurisdictions require case-by-case consideration of whether a business is local-serving.

- Screening out redevelopment projects that result in fewer VMT than the projects they are replacing.

- Screening out local-serving public service uses.

(2) **There is no readily accessible data on trip length as it relates to specific land uses.** This analysis is intended to consider vehicle miles travelled as a metric. Unfortunately, there is very little data on how individual land uses affect trip length. Most studies point to trip length being most correlated to features of the surrounding environment and not to any individual proposed land use. For example, a coffee shop would generate larger trip lengths in an auto-dominated environment when compared with placement in a pedestrian-oriented downtown. As a result, the analysis I conducted focused largely on trip generation as a proxy for vehicle miles travelled. It is assumed that trip lengths are equal except where an adjustment was made[25]. Because data is limited, my recommendation is to stick as closely as possible to the OPR guidance.

(3) **The line between local and regional retail for Tahoe falls somewhere between 10,000 and 40,000 square feet.**

a. **Retailers under 10,000 square feet can be presumed as local serving.** According to the data, roughly 92 percent of Tahoe businesses in local-serving uses are under 10,000 square feet in size. As such, presumption of a local-serving nature is justified for businesses under 10,000 square feet.

b. **Nonetheless, some retailers over 10,000 square feet are local serving.** Local-serving businesses that are larger than 10,000 square feet include the following:
   - Grocery stores, such as Safeway or Raley's, which range from 35,000 to 65,000 square feet, with an average of 51,000 square feet.
   - Pharmacies, such as CVS or Rite Aid, which range from 7,000 to 35,000 square feet, with an average of 21,000 square feet.

   Both grocery stores and pharmacies, though larger than 10,000 square feet, tend to serve a local population and reduce VMT by locating in close proximity to their user base. Additionally, the data indicates that certain other types of businesses tend to be over 10,000 square feet. These include:
   - Industrial services (~100%)
   - Movie theatre (~100%)
   - Warehousing (~100%)
   - Mini-warehouse (storage units) (~80%)
   - Wholesale market (~50%)
   - Laundry and dry cleaning (~40%)

[25] For example, Alternative A1 uses weighting to adjust trip lengths down for convenience shopping and up for tourist accommodation units. All alternatives also use trip length/mode share weighting for Town Centers and the Regional Center.

- New car sales (~40%)
- Furniture stores (~30%)
- Building materials and lumber (~25%)
- General light industrial (~20%)

Several of the above uses (e.g., furniture store, and building materials and lumber) could be considered local serving in nature, as even larger facilities serve a primarily local population.

c. **Most non-grocery retailers over 40,000 square feet will need to draw from beyond Tahoe and are therefore regional serving.** For a variety of reasons, most large formula retail will not locate in the Tahoe region. The region includes two distinct markets – north shore and south shore. Only the south shore is capable of attracting non-grocery retailers of 40,000 square feet. Furthermore, the north and south shore are part of a larger sub-regional market area that includes places like Truckee and Carson City and a regional market area that includes the Reno area. Development restrictions in Tahoe are far stricter than in these other communities. To support large retailers over 40,000 square feet, the store would need to draw from outside of the region. This is made difficult by high mountain passes. Additionally, locations like Carson City are more centralized to other population centers in western Nevada. As a result, retailers tend to choose Carson City and Reno over the Lake Tahoe region.

(4) **1,300 VMT is an appropriate benchmark for determining the size of screened development.** TRPA has historically considered projects that generate more than 200 trips as crossing a threshold of significance for the purposes of environmental review. This equates to roughly 1,300 VMT. As such, to ensure that no major impacts would occur, we could continue to use 1,300 VMT as the de minimis benchmark to determine screening levels.

(5) **Trip-length / mode-share adjustments of 20 percent for Town Centers and 35 percent for the Regional Center / High-Density Tourist District are appropriate.** Trip lengths in Town Centers average about 80 percent of the basinwide average, based on an analysis of underlying TAZs. This justifies applying a trip length reduction factor of 20 percent in Centers. An additional 15 percent mode-share reduction factor is also justified for projects in the Regional Center and High-Density Tourist District, as a greater number of trips in this area are pedestrian, bicycle, and transit. These adjustment factors align with the 2018 summer travel surveys, which indicates roughly 35 percent of trips in the tourist core were non-automobile.

Additional Recommendations

- **Run several types of projects through the screens and make adjustments, as necessary.** The screens should be tested by running several different scenarios. This would include variations in land use, size, existing use, and location. A preliminary list follows:

  (1) Single family residence on an existing legal lot of record
    a. Inside Low-VMT area
    b. Outside Low-VMT area
  (2) Adding a secondary unit
    a. Inside Low-VMT area

b. Outside Low-VMT area

(3) 10-unit luxury condominium in Tourist Core Area Plan
(4) 20-unit boutique hotel in Tourist Core Area Plan
(5) Redevelopment of an existing shopping center in Tahoe City
(6) Change in use – 2,500 square foot retail to restaurant
(7) 7,000 square foot gym in Tahoe Valley area
(8) Redevelopment of a shopping center in Tahoe Valley
(9) Large-scale redevelopment at Nevada North Stateline

Methodology

OPR Guidance

OPR guidance was used as a starting point for developing the screening recommendations. OPR recommends six types of projects be screened:

- Small projects
- Affordable housing projects
- Local-serving retail
- Projects in low-VMT areas
- Projects near high-quality transit
- Transportation projects

All but the projects near high-quality transit are carried forward as recommendations. High-quality transit was excluded, as there are presently no high-quality transit corridors in the Tahoe Region. High quality transit refers to rail transit, a ferry terminal served by bus or rail, or major bus routes operating on 15-minute headways during peak hours.

I also reviewed various local jurisdictions' screening recommendations and noted other common adjustments being made. Some opportunities for adjustment include the following:

- Requiring that small projects not exceed *both* 110 daily trips and 10,000 square feet in size, rather than one or the other.
- Expanding the affordable housing screen to include moderate and achievable housing
- Defining the maximum square footage for retail to be presumed as *local serving*.
- Defining criteria for mapped low-VMT areas.
- Limiting the amount of development to be screened in low-VMT areas.

Review of Local Jurisdiction Proposals

In addition to the OPR guidance, I also reviewed the following jurisdictions' recommended screening approaches:

- Arroyo Grande
- Carlsbad
- Fairfield
- Goleta
- Long Beach
- Los Altos
- Los Angeles County
- Menifee
- Monrovia
- Palo Alto
- Placer County
- Rancho Cordova
- Redlands
- San Diego
- San Diego County
- San Francisco
- San Jose
- Truckee
- Tulare

Tahoe Business Data

My analysis relied upon data from 2014 that was obtained as part of the Development Rights Strategic Initiative. This data identifies all businesses in the Tahoe Basin and includes a range of business square footage. As part of the Development Rights effort, a land use type and trip rate category were applied to each business. This data was used to draw conclusions about the size and nature of Tahoe businesses and to estimate VMT impacts using trip generation as a proxy.

Queries were run on this data, including the following:

- Business sizes by business type
- Trip rates by business category

Retailer Typologies

For the purposes of comparison, several retailer typologies were developed (see Table 1). These typologies are based upon store sizes for several retailers in the Northern Nevada and Greater Sacramento areas. Data was gathered on store size by estimating gross leasable area using Google Earth. The stores that were reviewed fell into the following categories:

- Regional retailer
- Home hardware
- Specialty anchor
- Department store
- Discount store
- Grocery
- Discount grocery
- Specialty grocery
- Pharmacy
- Convenience store

These categories were further condensed into a series of retail typologies.

Category		**Size** (1,000 sqft)	**Market**	**Population** (1,000)
	Boutique Retail • T-shirt store • Art gallery	0-2.5	Local	0-2
	Small Retail • Local pet store • 7-Eleven • Hardware store • Dollar General	2.5-10	Local	1-3
	Grocery Stores and Pharmacies • Raley's • CVS • Safeway • Rite Aid	10-65	Local or Sub-regional	3-19
	Large General Retail • K-Mart • JC Penney	50-75	Sub-regional	17-23
	Large Specialty Retail • Ross • Bevmo! • Bed Bath & Beyond • Dick's Sporting Goods • Big Lots • Petco	10-100+	Local or Sub-regional	3-30+
	Big-Box Retail • Costco • Kohls • Wal-Mart • Macy's	75-200+	Sub-regional or Regional	37-110+

	• Home Depot	• Target			

Markets

- Local – includes just the south shore and north shore areas respectively, with travel generally from 0-10 miles
- Sub-regional – includes local areas, plus Carson City and the Truckee area for the north shore, and the Carson Valley for the south shore, with travel generally up to 30 miles
- Regional – includes sub-regional areas, plus the Reno metro area, with travel generally up to 50 miles

Businesses Likely to Locate in Tahoe	Businesses Unlikely to Locate in Tahoe
• Boutique retail • Small retail • Grocery stores and pharmacies • Specialty retail under 40,000 square feet	• Big-box retail • Specialty retail over 40,000 square feet • Large general retail

National Retailer Sizes

7-Eleven	2900	Best Buy	36800
Dollar General	10100	Whole Foods	43200
Bevmo	11600	Safeway	45500
Dollar Tree	12400	Dick's Sporting Goods	48000
Trader Joe's	14200	Raley's	49900
Petco	14500	Smith's	62200
CVS	19300	JC Penney	63600
Rite Aid	23200	K-Mart	70500
Michaels	23800	Kohls	82400
Smart & Final	25900	Dillard's	102100
TJ Maxx	26600	Home Depot	107700
Grocery Outlet	27100	Macy's	124200
Bed Bath and Beyond	28700	Target	125300
Ross	29900	Costco	141100
Marshalls	31500	Walmart	197500
Big Lots	35100		

Construction Trends

On average, we allocate roughly 10,000 square feet of Commercial Floor Area each year, based on years 2013-2018. In three of these six years, more CFA square footage was banked than allocated for new development.

Service Population Calculations

Service population for each store was calculated based on several different statistics, including the median household income and population per household. It is assumed that 40% of household income is used for retail spending[26] and that such spending is divided as follows[27]:

- Apparel.....7.1%
- General Merchandise 12.1%
- Furniture / Appliances.....2.3%
- Specialty.....13.8%
- Food 20.8%
- Eating / Drinking 13.4%
- Building/Hardware.....6.4%
- Auto Dealers / Parts 12.3%
- Service Stations.....11.8%

Retail sales were estimated as follows[27]:

- $250/square foot for boutique retail, small retail, and large specialty retail
- $300/square foot for general retail and big box retail
- $400/square foot for grocery stores and pharmacies

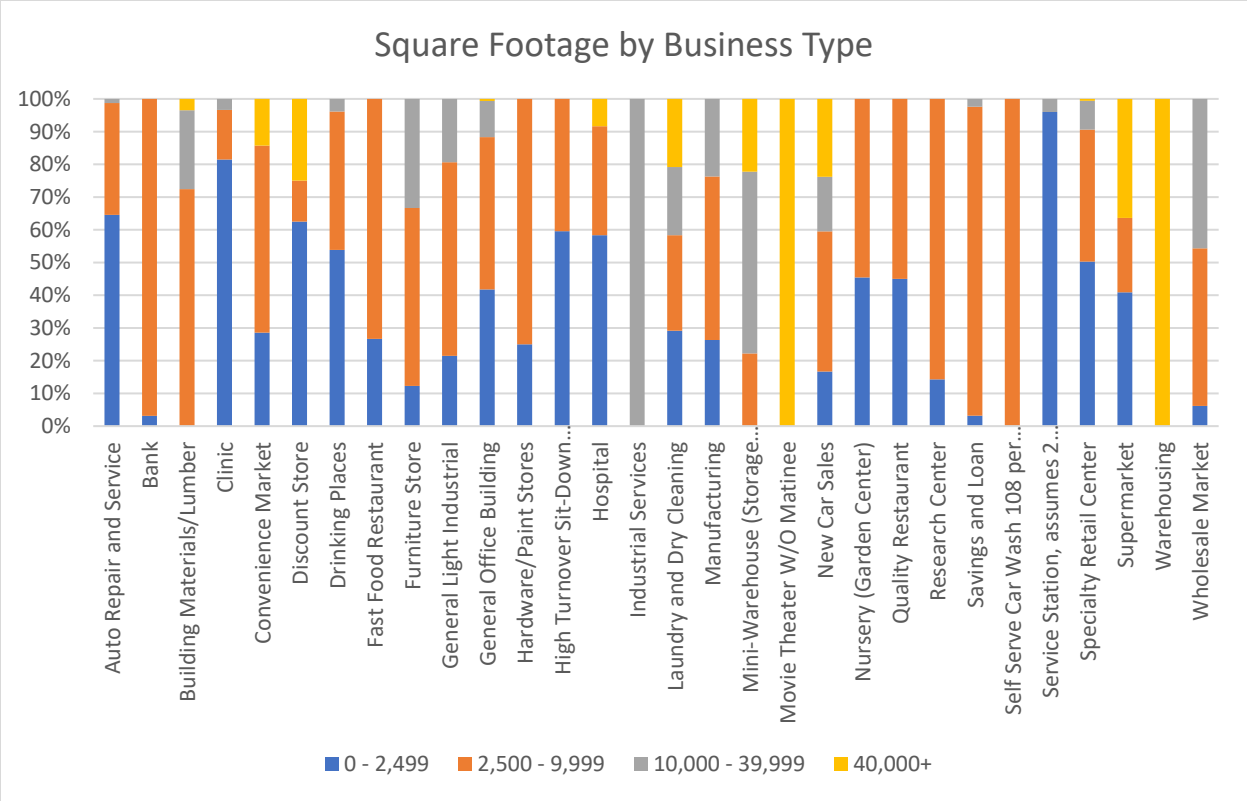
This spending was then allocated to estimated percentages for each business type. Retail capture was estimated at 50 percent for all uses except grocery and pharmacy, which was allocated 75 percent capture. The number of households needed to support each store at its low, medium, and high square footages were then calculated.

Local-Serving Retail

Determining retail square footage

Roughly 88 percent of businesses in the Lake Tahoe Region are less than 10,000 square feet in size, indicating a tendency towards smaller businesses. Additionally, 92 percent of businesses with local-serving uses are no larger than 10,000 square feet. Most national formula retailers that draw from a sub-regional or regional market area are over 40,000 square feet in size. As such, an appropriate place to draw the line between local- and regional-serving uses would be somewhere between 10,000 and 40,000 square feet. To be conservative in our screening, a 10,000 square foot limit would be recommended. Construction trends indicate that it has been uncommon for a commercial project to exceed 10,000 square feet. Nonetheless, it would be appropriate to consider the local-serving nature of businesses between 10,000 and 40,000 square feet on a case-by-case basis. Over 3,800 retailers are included in the 2014 business data. These retailers are divided into the following categories based on the trip generation rates assigned to them:

[26] The Natelson Dale Group (2012). San Miguel Economic Strategy
[27] From Urban Land Institute (2008). Dollars and Cents of Shopping Centers



Roughly 88 percent of businesses are under 10,000 square feet in size. Roughly 92 percent of businesses characterized as "local-serving" are under 10,000 square feet in size.

Adjusting for Centers

VMT is the product of trip generation and trip length. Trip lengths in Regional Plan-designated centers are roughly 80 percent of the average regional trip length as calculated. Because trip lengths in Centers are shorter, buildings in Centers would generate fewer VMT. The recommended 20 percent adjustment accounts for this by allowing larger buildings in Centers. A further 15 percent adjustment, for a total of 35 percent is recommended for the Regional Center and High-Density Tourist District. This is intended to account for modal shift, as the Regional Transportation Plan calls for this area to be well-served by transit and active transportation opportunities. The overall 35 percent adjustment figure is consistent with information on non-auto trips from the *2018 Summer TRPA Travel Mode Share Survey* for locations near the Stateline area, which estimated non-automotive trip percentage in this area as approximately 37 percent[28].

Low-VMT Areas

Determining square footage based on trip generation

Using the business data, trips generated by commercial floor area were estimated using a basis of 300 trips at the average trip length (6.534 miles). This equates to just under 2,000 vehicle miles travelled as the screen for low-VMT areas, which is then used as a basis to determine the number of commercial

[28] From LSC Transportation Consultants (August 18, 2020). Old Colony Inn Redevelopment / TCAP Amendments – Trip Generation and VMT Analysis.

trips that could be generated. The generated trips translate into building square footage using ITE trip generation rates. The following were used for trip generation rates:

Screening	Land Use	Trip Rate
Recommendation	Commercial	32.17 trips / 1,000 sqft
	Indoor Recreation	33.82 trips / 1,000 sqft
	Outdoor Recreation	10.99 trips / acre
Alternatives A1 and A2	Tourist Accommodation Units*	9.67 trips / unit
	General Merchandise	44.42 trips / 1,000 sqft
	Convenience Shopping*	349.48 trips / 1,000 sqft
	Specialty Retail and Offices	18.41 trips / 1,000 sqft
	Personal Services	44.32 trips / 1,000 sqft
	Service / Industrial	35.36 trips / 1,000 sqft
	Restaurants	203.7 trips / 1,000 sqft
	Entertainment	78.06 trips / 1,000 sqft
	Public Services	9.17 trips / 1,000 sqft 24 sqft / person
	Recreation	33.82 trips / 1,000 sqft
Alternative A2	Residential	9.52 trips / unit
Alternative A3	Tourist Accommodation	9.67 trips / unit
	Commercial Retail	52.01 trips / 1,000 sqft
	Commercial Non-Retail	22.4 trips / 1,000 sqft
	Restaurants	203.7 trips / 1,000 sqft
	Public Services	9.17 trips / 1,000 sqft 24 sqft / person
	Recreation	33.82 trips / 1,000 sqft
Alternative B1	Commercial	32.17 trips / 1,000 sqft
	Public Services	27.92 trips / 1,000 sqft 24 sqft / person
	Indoor Recreation	33.82 trips / 1,000 sqft
	Outdoor Recreation	10.99 trips / acre
Alternative B2	Commercial	32.17 trips / 1,000 sqft
	Public Services	14.72 trips / employee
	Indoor Recreation	33.82 trips / 1,000 sqft
	Outdoor Recreation	10.99 trips / acre

* - weighting is applied in Alternative A1.

Commercial Trip Rates

Trip rates for the various commercial categories were generated using the same methodology as the Development Rights Strategic Initiative. A trip rate has been assigned to each business in the Tahoe Basin. Once a category is assigned, the average trip rate is calculated.

Public Services Trip Rates

Public service use trip rates were generated several different ways. The recommendation uses a Government Office Complex as a proxy to determine the trip rate. Alternatives A1 through A3 use a

church as a proxy to determine trip rate. Alternative B establishes a per-employee trip rate by using the same methodology as the commercial trip rates.

Recreation Trip Rates

Recreation trip rates were determined through two methods. The recommendation and all alternatives use an indoor trip rate associated with a recreation center. The recommendation includes an outdoor recreation screen using acreage, which is based on the same methodology as used for the commercial trip rates.

Removing tourist-accommodation and market-rate residential

In the recommendation, tourist accommodation and market-rate residential were removed from consideration, though they were included in various alternatives. The rationale for removing these uses is that tourist accommodation results in longer vehicle miles travelled as they cater to people from outside of the region. Additionally, as a large share of market-rate residences function as second homes and vacation rentals[29], longer average trip lengths are anticipated. This is justification to exclude these uses from screening.

Adjusting for Centers

The same 20 percent adjustment for Town Centers and 35 percent adjustment for the Regional Center / High-Density Tourist District as applied for local-serving retail were applied to the low-VMT areas.

Weighting in Alternative A1

The following weighting was applied to Alternative A1

- Tourist Accommodation Units had a 100% trip length adjustment added. This is on the basis that at least two trips begin/end outside of the region.
- Convenience shopping ha d a 75% trip length reduction added. This is on the basis that the nature of convenience shopping leads to lower trip lengths.

Site Design Criteria

OPR guidance notes that not all project meeting the screening criteria may be suitable for screening. For example, a project in a low-VMT area may not be suitable for screening if it is automobile-oriented, excessively parked, and disconnected from pedestrian and bicycle infrastructure. To recognize this, all projects other than small projects should also comply with certain design criteria, specifically:

- Parking. To be screened out a project should not have excess parking.
- Active Transportation. To be screened out a project should have some connection to the active transportation system or be close by to existing infrastructure.

OPR considered several other disqualifying factors, but these were focused on the transit priority area screen, which we are not proposing to carry forward. OPR's suggestion is that projects that are not built at an FAR of at least 0.75 should not be considered for screening under that criterion.

[29] Tahoe Prosperity Center (October 2019). South Shore Region Housing Needs and Opportunities.

Parking Practices in the Tahoe Region

Location	Parking Rates	Adjustments
CITY OF SOUTH LAKE TAHOE		
Tourist Core AP	Multi-Family Residential (MFR): 2 spaces/unit General merchandise: 1 space / 300 sqft	Allowed through Special Use Permit
Tahoe Valley AP		
Bijou / Al Tahoe CP		
South Y Industrial Tract CP		
Balance of City		
DOUGLAS COUNTY		
Round Hill CP	General merchandise: 1 space / 300 sqft MFR: 1 space / 2 beds and ½ space per bedroom	Allowed with submittal of parking analysis
South Shore AP	Retail: 1 space / 250 sqft MFR: 2 spaces / unit plus 1 guest space / 4 units	Allowed with submittal of parking analysis
Balance of County		No mechanism available
WASHOE COUNTY		
Incline Village Commercial CP	MFR: 1 space / 2 beds and ½ space per bedroom General merchandise: 1 space / 300 sqft	Allowed with submittal of parking analysis
Incline Village Tourist CP		
Nevada North Stateline CP		
Ponderosa Ranch CP		
Balance of County	MFR: 1.6-2.1 spaces/unit Retail: 3 spaces/1,000 sqft	Allowed with Director discretion
EL DORADO COUNTY		
Meyers AP	MFR: 1.5 spaces/unit General retail: 1 space / 300 sqft active use + 1 space / 600 sqft storage	No mechanism
Balance of County		No mechanism
PLACER COUNTY		
Placer County Tahoe Basin AP	MFR: 1 per bedroom for the first 2 bedrooms and ½ space per additional bedroom General merchandise: 3.33 per 1,000 sqft	Allowed with submittal of parking analysis

All Washoe County community plan areas have a maximum parking equal to 10 percent over the minimum parking. City substitute standards have a maximum parking equal to 25 percent over the minimum parking.

Section 34.4, *Parking* in the TRPA Code of Ordinances is "[Reserved]." As a result, parking standards in local plans or municipal codes apply.

Project-Based Parking Practices that Can Reduce VMT

- Decoupling parking from lease/rent price
- Establishing paid parking
- Providing bicycle parking

Active Transportation Practices in the Tahoe Region

Location	Goals / Policies	Standards / Guidelines
CITY OF SOUTH LAKE TAHOE		
Tourist Core AP	• Provide bike/pedestrian connections (T-2.2) • Provide infrastructure as conditions of approval (T-2.4, T-2.5) • Maintain paths year-round (T-2.7) • Develop complete streets (T-5)	• Provide internal pedestrian circulation and connections to the sidewalk, neighboring properties, and transit. (Standard D) • Interior walkway design standards (Standard D.5) • Provide bicycle parking (Standard E)
Tahoe Valley AP	• Provide bike/pedestrian connections (T-3.1, 4.1) • Require projects to construct sidewalks (T-3.4) • Remove obstacles in right-of-way (T-3.5) • Plow trails in winter (T-4.3)	• Provide internal pedestrian circulation and connections to the sidewalk, neighboring properties, and transit. (Standard D) • Interior walkway design standards (Standard D.5) • Provide bicycle parking (Standard E)
Bijou / Al Tahoe CP	• Pedestrian and bicycle facilities shall be constructed as part of the CIP (Trans. 4.C) • Implement improvements as part of the CIP or conditions of project approval (Impl. 1.d)	• Cross sections for Highway 50, arterial streets, and local commercial streets.
South Y Industrial Tract CP	None	• Sidewalk improvements on both sides of D Street
Balance of City	None	• A pedestrian circulation system shall be incorporated into the site. (Standard 1.A(4)) • Guidelines for design, wayfinding (Guideline 4)
DOUGLAS COUNTY		
Round Hill CP	• Develop pedestrian linkages (Transp. 6a) • Pedestrian/recreation trail to be developed as part of the	None

Location	Goals / Policies	Standards / Guidelines
	CIP or conditions of approval (Transp. 6c) • Develop a trail system (Rec. 2a)	
South Shore AP	• Pedestrian linkage between parking lots shall be provided (T-4.2)	• Pedestrian access standards/guidelines (Sec. 2.5) • Bicycle access standards/guidelines (Sec. 2.6)
WASHOE COUNTY		
Incline Village Commercial CP	• Expand bicycle paths (ICCP 8.1) • Create a pedestrian corridor along SR 28 (ICCP 9.1.1) • Create pedestrian connections (ICCP 9.1.3)	None – some policies implemented as standards
Incline Village Tourist CP	• Projects shall provide on-site pedestrian paths (ITCP 2.1.2) • Provide trail connections (ITCP 8.1)	None – some policies implemented as standards
Nevada North Stateline CP	• Projects shall connect with the path system (NNSCP 1.3) • Pedestrian paths and bicycle trails shall be provided (NNSCP 5.2.2) • On-site pedestrian networks required (NNSCP 8.1.1) • Bike lanes should be created (NNSCP 9.1.1) • Bike parking to be provided (NNSCP 9.1.2)	None – some policies implemented as standards
Ponderosa Ranch CP	• Expand the path system (PRCP 8.1, 8.2)	None
EL DORADO COUNTY		
Meyers AP	• Encourage bike and pedestrian linkage (Transp. 6) • Build bicycle and pedestrian facilities per active transportation plan (Transp. Action 14-16; Rec. Action 2) • Remove snow on bike/pedestrian paths (Transp. Action 17)	• Pedestrian circulation shall be incorporated into a project site plan (Standard B.1.b.B)

Location	Goals / Policies	Standards / Guidelines
PLACER COUNTY		
Placer County Tahoe Basin AP	• Create complete streets (T-P-23) • Provide pedestrian and bicycle connections with projects (T-P-26) • Explore funding sources to maintain paths in the winter (T-P-28) • Preserve facility condition (T-P-29)	• Streetscape and roadway design and construction obligation – cross sections, widths, etc. (Standard 3.06)

Code of Ordinances

Section 36.5.2.B: "An active transportation circulation system shall be incorporated into the site plan to assure that all active transportation users can move safely and easily both on the site and between properties and activities within the neighborhood year-round." – Applies to commercial, tourist accommodation, public service, and multi-residential projects. All projects that include such facilities also must file a maintenance plan (36.5.5)

Section 65.3 requires granting of an easement for development of at least five residential or tourist units or up to 10,000 square feet when a property is situated along a designated bicycle or pedestrian trail.

Project-Based Active Transportation Practices that Can Reduce VMT

- Connecting with existing active transportation infrastructure
- Providing active transportation infrastructure across the site

Summary of Alternatives

Alternatives A1 through A3 are modified versions of the screens presented to TTAC in December. Alternative B is a modified version of the preliminary recommendation.

Alternative A

Alternative A consists of three versions derived from staff's December TTAC recommendation. All versions of Alternative A requires that a project (other than a single-family residence) be located within a low-VMT area. This contrasts with the preliminary recommendation and Alternative B, both of which offer several screens for projects outside of low-VMT areas.

Alternative A1

Alternative A1 is the modified original version with weighting. It breaks down commercial uses into multiple categories and assigns a square footage based on each category's trip generation rate. Unlike the recommendation, this alternative include tourist accommodation units. Under this alternative, two of the uses are weighted. Convenience shopping is adjusted down by 75 percent to account for low trip lengths. Tourist accommodation units are adjusted up by 100 percent to account for high trip lengths.

Alternative A2

Alternative A2 is the modified original version without weighting, using the same commercial categories as Alternative A1. It also includes residential units as a possible screen, as they result in similar VMT generation to tourist accommodation units[30].

	Outside of Centers	Town Centers	Regional Center
Residential (units)	22	26	30
Tourist Accommodation (units)			
Without Weighting	22	26	30
With Weighting	11	13	15
Commercial			
General Merchandise (sqft)	5,000	6,000	6,500
Convenience Shopping (sqft)	500	500	1,000
With Weighting	2,500	3,000	3,500
Specialty Retail and Offices (sqft)	11,500	14,000	16,000
Personal Services (sqft)	5,000	6,000	6,500
Service / Industrial (sqft)	6,000	7,500	8,000
Restaurants (sqft)	1,000	1,500	1,500
Entertainment (sqft)	3,000	3,500	3,500
Public Services (persons)	900		
Recreation (sqft)	6,500	8,000	9,000
Transportation Projects	[same as recommendation]		

Alternative A3

Alternative A3 collapses commercial categories down into three: retail commercial, non-retail commercial, and restaurants. No weighting is applied.

	Outside of Centers	Town Centers	Regional Center
Commercial			
Retail[31] (sqft)	4,000	5,000	5,500
Non-Retail	9,500	11,500	13,000
Restaurants (sqft)	1,000	1,500	1,500

Alternative B

Alternatives B1 and B2 are modified versions of the recommendation.

[30] I was unable to come up with a rationale for excluding residential units, but not tourist accommodation units, from the screening. If we include one, we should include the other or come up with a compelling reason to distinguish between the two.

[31] A further alternative could consider weighting retail trips on the basis that they will be reducing trip lengths.

Comparison Table of the Alternatives

	December TTAC Proposal	Recommendation	Alternatives A1 through A3	Alternative B1 and B2
Small Project Screen	No	Yes	No	Yes
Affordable Housing Screen	Low-VMT Areas	Basinwide	Low-VMT Areas	Basinwide
AH Screen Includes Moderate / Achievable	Yes	Low-VMT Areas	Yes	Yes
Local-Serving Retail Screen	Low-VMT Areas	Basinwide	Low-VMT Areas	Basinwide
Low-VMT Area Screen	Subregional Threshold and Town Centers	Subregional Threshold and Town Centers	Subregional Threshold and Town Centers	Alt B1: Regional Threshold and Town Centers Alt B2: Subregional Threshold and Town Centers
Tourist Accommodation	Low-VMT Areas	No	Low-VMT Areas	No
Redevelopment Projects	No	Low-VMT Areas	No	No
Market-Rate Residential	No	No	Alt A1 & A3: No Alt A2: Low-VMT Areas	No
Public Services Uses	Low-VMT Areas	Basinwide	Low-VMT Areas	Alt B1: Low-VMT Areas Alt B2: Basinwide
Transportation Projects	Low-VMT Areas	Basinwide	Low-VMT Areas	Basinwide
Weighting Used	No	No	Alt A1: Yes Alt A2 & A3: No	No

Alternative B1

Alternative B1 is similar to the recommendation with the following distinctions:

- The affordable housing project screen includes moderate-income and achievable housing and does not account for mixed-use development.
- The local-serving use screen is limited to retail projects only and does not afford case-by-case consideration.

Maximum Size	Outside Centers	Town Centers	Regional Center
Retail Commercial (sqft)	10,000	12,000	13,500

- The low-VMT area screen uses the regional threshold rather than the subregional threshold

Maximum Size	Outside Centers	Town Centers	Regional Center
Commercial[32] (sqft)	6,500	8,000	9,000
Public Services (persons[33])	300	350	425
Indoor Recreation (sqft)	6,500	8,000	9,000
Outdoor Recreation (acres)	20	24	27

- There is no option for redevelopment projects to be screened in low-VMT areas.
- Public services are added as a screen in low-VMT areas.
- Design criteria relies on the ITE Parking Generation manual.

Alternative B2

Alternative B2 is similar to the Alternative B1, with the following distinctions:

- The small project screen is determined based on Vehicle Miles Travelled rather than trip generation or building size. As a result, the level of project that gets screened depends on the trip lengths in the project's TAZ.
- The affordable housing project screen includes mixed-use projects where at least 80 percent of the development is residential and 100 percent of that is affordable, moderate, or achievable.
- The local-serving retail screen is expanded to include other local-serving uses. The square footage screens are also doubled for grocery stores and pharmacies, as these tend to be local serving even when over 10,000 square feet in size. Under this alternative, a planner would need to screen a project and make a determination that the use is indeed local serving.

Maximum Size	**Outside Centers**	**Town Centers**	**Regional Center**
Food and Beverage Retail Sales (sqft)			
Grocery Store	20,000	24,000	27,000
Other	10,000	12,000	13,500
Health Care Services (sqft)			
Drug Store / Pharmacy	20,000	24,000	27,000
Other	10,000	12,000	13,500
Other Local-Serving Uses (sqft)	10,000	12,000	13,500

[32] Includes all commercial uses in Table 21.4-A

[33] Structural capacity as permitted under the fire code.

- Rather than using the subregional threshold, the low-VMT screen would use the regional threshold. This expands the number of TAZs that could use the screen. Additionally, public services uses would be screened based on number of employees rather than capacity.

Maximum Size	Outside Centers	Town Centers	Regional Center
Public Services (employees)	15	18	20

- The parking and active transportation criteria would be rephrased to be disqualifying factors rather than design criteria.

Proposed Screening Recommendation

(1) **Small Projects**. Projects that generate fewer than 110 trips and involve no more than 10,000 square feet in structural development.

Examples of Small Projects

- 1 single-family residence on an existing lot
- 11 condominiums of 900 square feet each
- 4 detached residences of 2,500 square feet each
- A small hotel addition of 13 tourist accommodation units
- 10,000 square feet of low-trip-generating service commercial use

(2) **Affordable Housing Projects.** Projects comprised of 100-percent affordable housing; or mixed-use projects with a maximum 20 percent of non-residential use and all residential areas comprised of 100 percent affordable housing.

(3) **Local-Serving Retail and Other Local-Serving Uses.**

a. **Qualifying Uses.** The following uses qualify for screening under this provision:

Commercial

Retail

- Building materials and hardware
- Food and beverage retail sales
- Furniture, home furnishings, and equipment
- General merchandise stores
- Mail order and vending
- Outdoor retail sales

Services

- Business support services
- Financial services
- Health care services

Public Services

General

- Religious assembly
- Day care centers / pre-schools
- Government offices
- Hospitals
- Local public health and safety facilities
- Schools – college
- Schools – kindergarten through secondary
- Social service organizations
- Threshold-related research facilities

b. **Local-Serving Presumption.** Qualifying projects with structural areas at or below the following levels are presumed to be local serving:

i. 10,000 square feet outside of Centers

ii. 12,000 square feet within Town Centers
iii. 13,500 square feet within the Regional Center and High-Density Tourist District

c. **Local-Serving Determination.** TRPA may determine that individual local-serving projects with structural areas that are under 40,000 square feet, but exceed what is allowed by Subparagraph C.1, are local-serving businesses. In cases where the local-serving nature of a retail business is in question, TRPA may require preparation of a market study.

(4) **Projects in Centers and Low-VMT Areas.** Certain classes of projects within designated Centers and areas where existing VMT is already below the subregional threshold:

a. **Moderate-Income and Achievable Housing.** Projects comprised of 100-percent moderate-income or achievable housing; or mixed-use projects with a maximum 20 percent of non-residential use and all residential areas comprised of 100 percent moderate-income or achievable housing.

b. **Redevelopment Projects that Result in Reduced VMT.** Redevelopment projects where the proposed project VMT is below the VMT of the project it is replacing.

c. **Commercial and Recreational Development.** Commercial and recreational development up to a specified size limit:

Maximum Size	**Outside Centers**	**Town Centers**	**Regional Center**
Commercial[34] (sqft)	10,000	12,000	13,500
Indoor Recreation (sqft)	10,000	12,000	13,500
Outdoor Recreation (acres)	30	36	40

(5) **Transportation Projects.** Projects involving active transportation or transit, including:

- Bicycle, pedestrian, and transit projects
- New bicycle lanes or sidewalks
- Bicycle or pedestrian improvements to the roadway system (e.g., "green lanes," bike boxes, pedestrian-activated crossings, etc.)
- Amendments to the RTP / SCS to include new bicycle, pedestrian, and transit projects (excluding microtransit), located within one-half mile of a transit stop within the boundaries of the City of South Lake Tahoe or the Regional Center, Town Center, or High-Density Tourist District.
- New bicycle, pedestrian, and transit projects (excluding microtransit) not included in the RTP / SCS, but which are located within one-half mile of a transit stop, within the boundaries of the City of South Lake Tahoe or within the boundaries of a Regional Center, Town Center, or the High-Density Tourist District.

[34] Includes all commercial uses in Table 21.4-A

DESIGN CRITERIA

(1) **Maximum parking.** Project parking shall not exceed the number of spaces required by the local city or county.

(2) **Integration with the active transportation network.** Commercial, tourist accommodation, public service, and multi-residential projects shall comply with the requirements for an integrated active transportation network, as set forth in Subparagraph 36.5.2.B.

Appendix 3: Technical Advisory on Evaluating Transportation Impacts in CEQA

TECHNICAL ADVISORY

ON EVALUATING TRANSPORTATION IMPACTS IN CEQA

December 2018

Contents

A. Introduction

This technical advisory is one in a series of advisories provided by the Governor's Office of Planning and Research (OPR) as a service to professional planners, land use officials, and CEQA practitioners. OPR issues technical assistance on issues that broadly affect the practice of land use planning and the California Environmental Quality Act (CEQA) (Pub. Resources Code, § 21000 et seq.). (Gov. Code, § 65040, subds. (g), (l), (m).) The purpose of this document is to provide advice and recommendations, which agencies and other entities may use at their discretion. This document does not alter lead agency discretion in preparing environmental documents subject to CEQA. This document should not be construed as legal advice.

Senate Bill 743 (Steinberg, 2013), which was codified in Public Resources Code section 21099, required changes to the guidelines implementing CEQA (CEQA Guidelines) (Cal. Code Regs., Title 14, Div. 6, Ch. 3, § 15000 et seq.) regarding the analysis of transportation impacts. As one appellate court recently explained: "During the last 10 years, the Legislature has charted a course of long-term sustainability based on denser infill development, reduced reliance on individual vehicles and improved mass transit, all with the goal of reducing greenhouse gas emissions. Section 21099 is part of that strategy . . . ." (*Covina Residents for Responsible Development v. City of Covina* (2018) 21 Cal.App.5th 712, 729.) Pursuant to Section 21099, the criteria for determining the significance of transportation impacts must "promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses." (*Id.*, subd. (b)(1); see generally, adopted CEQA Guidelines, § 15064.3, subd. (b) [Criteria for Analyzing Transportation Impacts].) To that end, in developing the criteria, OPR has proposed, and the California Natural Resources Agency (Agency) has certified and adopted, changes to the CEQA Guidelines that identify vehicle miles traveled (VMT) as the most appropriate metric to evaluate a project's transportation impacts. With the California Natural Resources Agency's certification and adoption of the changes to the CEQA Guidelines, automobile delay, as measured by "level of service" and other similar metrics, generally no longer constitutes a significant environmental effect under CEQA. (Pub. Resources Code, § 21099, subd. (b)(3).)

This advisory contains technical recommendations regarding assessment of VMT, thresholds of significance, and mitigation measures. Again, OPR provides this Technical Advisory as a resource for the public to use at their discretion. OPR is not enforcing or attempting to enforce any part of the recommendations contained herein. (Gov. Code, § 65035 ["It is not the intent of the Legislature to vest in the Office of Planning and Research any direct operating or regulatory powers over land use, public works, or other state, regional, or local projects or programs."].)

This December 2018 technical advisory is an update to the advisory it published in April 2018. OPR will continue to monitor implementation of these new provisions and may update or supplement this advisory in response to new information and advancements in modeling and methods.

B. Background

VMT and Greenhouse Gas Emissions Reduction. Senate Bill 32 (Pavley, 2016) requires California to reduce greenhouse gas (GHG) emissions 40 percent below 1990 levels by 2030, and Executive Order B-16-12 provides a target of 80 percent below 1990 emissions levels for the transportation sector by 2050. The transportation sector has three major means of reducing GHG emissions: increasing vehicle efficiency, reducing fuel carbon content, and reducing the amount of vehicle travel. The California Air Resources Board (CARB) has provided a path forward for achieving these emissions reductions from the transportation sector in its 2016 Mobile Source Strategy. CARB determined that it will not be possible to achieve the State's 2030 and post-2030 emissions goals without reducing VMT growth. Further, in its 2018 Progress Report on California's Sustainable Communities and Climate Protection Act, CARB found that despite the State meeting its 2020 climate goals, "emissions from statewide passenger vehicle travel per capita [have been] increasing and going in the wrong direction," and "California cannot meet its [long-term] climate goals without curbing growth in single-occupancy vehicle activity."[1] CARB also found that "[w]ith emissions from the transportation sector continuing to rise despite increases in fuel efficiency and decreases in the carbon content of fuel, California will not achieve the necessary greenhouse gas emissions reductions to meet mandates for 2030 and beyond without significant changes to how communities and transportation systems are planned, funded, and built."[2]

Thus, to achieve the State's long-term climate goals, California needs to reduce per capita VMT. This can occur under CEQA through VMT mitigation. Half of California's GHG emissions come from the transportation sector[3], therefore, reducing VMT is an effective climate strategy, which can also result in co-benefits.[4] Furthermore, without early VMT mitigation, the state may follow a path that meets GHG targets in the early years, but finds itself poorly positioned to meet more stringent targets later. For example, in absence of VMT analysis and mitigation in CEQA, lead agencies might rely upon verifiable offsets for GHG mitigation, ignoring the longer-term climate change impacts resulting from land use development and infrastructure investment decisions. As stated in CARB's 2017 Scoping Plan:

> "California's future climate strategy will require increased focus on integrated land use planning to support livable, transit-connected communities, and conservation of agricultural and other lands. Accommodating population and economic growth through travel- and energy-efficient land use provides GHG-efficient growth, reducing GHGs from both transportation and building energy use. GHGs can be further reduced at the project level through implementing energy-efficient construction and travel demand management approaches."[5] (*Id.* at p. 102.)

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[1] California Air Resources Board (Nov. 2018) *2018 Progress Report on California's Sustainable Communities and Climate Protection Act*, pp. 4, 5, available at https://ww2.arb.ca.gov/sites/default/files/2018-11/Final2018Report_SB150_112618_02_Report.pdf.
[2] *Id.*, p. 28.
[3] See https://ca50million.ca.gov/transportation/
[4] Fang et al. (2017) *Cutting Greenhouse Gas Emissions Is Only the Beginning: A Literature Review of the Co-Benefits of Reducing Vehicle Miles Traveled*.
[5] California Air Resources Board (Nov. 2017) *California's 2017 Climate Change Scoping Plan*, p. 102, available at https://www.arb.ca.gov/cc/scopingplan/scoping_plan_2017.pdf.

In light of this, the 2017 Scoping Plan describes and quantifies VMT reductions needed to achieve our long-term GHG emissions reduction goals, and specifically points to the need for statewide deployment of the VMT metric in CEQA:

> "Employing VMT as the metric of transportation impact statewide will help to ensure GHG reductions planned under SB 375 will be achieved through on-the-ground development, and will also play an important role in creating the additional GHG reductions needed beyond SB 375 across the State. Implementation of this change will rely, in part, on local land use decisions to reduce GHG emissions associated with the transportation sector, both at the project level, and in long-term plans (including general plans, climate action plans, specific plans, and transportation plans) and supporting sustainable community strategies developed under SB 375."[6]

VMT and Other Impacts to Health and Environment. VMT mitigation also creates substantial benefits (sometimes characterized as "co-benefits" to GHG reduction) in both in the near-term and the long-term. Beyond GHG emissions, increases in VMT also impact human health and the natural environment. Human health is impacted as increases in vehicle travel lead to more vehicle crashes, poorer air quality, increases in chronic diseases associated with reduced physical activity, and worse mental health. Increases in vehicle travel also negatively affect other road users, including pedestrians, cyclists, other motorists, and many transit users. The natural environment is impacted as higher VMT leads to more collisions with wildlife and fragments habitat. Additionally, development that leads to more vehicle travel also tends to consume more energy, water, and open space (including farmland and sensitive habitat). This increase in impermeable surfaces raises the flood risk and pollutant transport into waterways.[7]

VMT and Economic Growth. While it was previously believed that VMT growth was a necessary component of economic growth, data from the past two decades shows that economic growth is possible without a concomitant increase in VMT. (Figure 1.) Recent research shows that requiring development projects to mitigate LOS may actually reduce accessibility to destinations and impede economic growth.[8,9]

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[6] *Id.* at p. 76.

[7] Fang et al. (2017) *Cutting Greenhouse Gas Emissions Is Only the Beginning: A Literature Review of the Co-Benefits of Reducing Vehicle Miles Traveled*, available at https://ncst.ucdavis.edu/wp-content/uploads/2017/03/NCST-VMT-Co-Benefits-White-Paper_Fang_March-2017.pdf.

[8] Haynes et al. (Sept. 2015) *Congested Development: A Study of Traffic Delays, Access, and Economic Activity in Metropolitan Los Angeles*, available at http://www.its.ucla.edu/wp-content/uploads/sites/6/2015/11/Haynes_Congested-Development_1-Oct-2015_final.pdf.

[9] Osman et al. (Mar. 2016) *Not So Fast: A Study of Traffic Delays, Access, and Economic Activity in the San Francisco Bay Area*, available at http://www.its.ucla.edu/wp-content/uploads/sites/6/2016/08/Taylor-Not-so-Fast-04-01-2016_final.pdf.

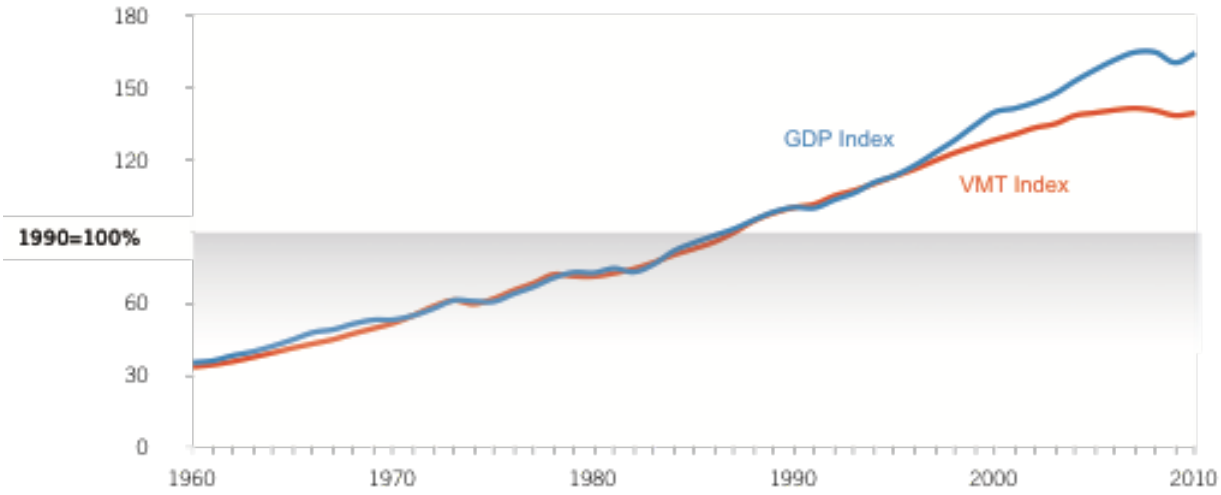

Figure 1. Kooshian and Winkelman (2011) *VMT and Gross Domestic Product (GDP), 1960-2010*.

C. Technical Considerations in Assessing Vehicle Miles Traveled

Many practitioners are familiar with accounting for VMT in connection with long-range planning, or as part of the CEQA analysis of a project's greenhouse gas emissions or energy impacts. This document provides technical information on how to assess VMT as part of a transportation impacts analysis under CEQA. Appendix 1 provides a description of which VMT to count and options on how to count it. Appendix 2 provides information on induced travel resulting from roadway capacity projects, including the mechanisms giving rise to induced travel, the research quantifying it, and information on additional approaches for assessing it.

1. Recommendations Regarding Methodology

Proposed Section 15064.3 explains that a "lead agency may use models to estimate a project's vehicle miles traveled . . . ." CEQA generally defers to lead agencies on the choice of methodology to analyze impacts. (*Santa Monica Baykeeper v. City of Malibu* (2011) 193 Cal.App.4th 1538, 1546; see *Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal.3d 376, 409 ["the issue is not whether the studies are irrefutable or whether they could have been better" … rather, the "relevant issue is only whether the studies are sufficiently credible to be considered" as part of the lead agency's overall evaluation].) This section provides suggestions to lead agencies regarding methodologies to analyze VMT associated with a project.

Vehicle Types. Proposed Section 15064.3, subdivision (a), states, "For the purposes of this section, 'vehicle miles traveled' refers to the amount and distance of automobile travel attributable to a project." Here, the term "automobile" refers to on-road passenger vehicles, specifically cars and light trucks. Heavy-duty truck VMT could be included for modeling convenience and ease of calculation (for example, where models or data provide combined auto and heavy truck VMT). For an apples-to-apples

comparison, vehicle types considered should be consistent across project assessment, significance thresholds, and mitigation.

Residential and Office Projects. Tour- and trip-based approaches[10] offer the best methods for assessing VMT from residential/office projects and for comparing those assessments to VMT thresholds. These approaches also offer the most straightforward methods for assessing VMT reductions from mitigation measures for residential/office projects. When available, tour-based assessment is ideal because it captures travel behavior more comprehensively. But where tour-based tools or data are not available for all components of an analysis, a trip-based assessment of VMT serves as a reasonable proxy.

Models and methodologies used to calculate thresholds, estimate project VMT, and estimate VMT reduction due to mitigation should be comparable. For example:

- A tour-based assessment of project VMT should be compared to a tour-based threshold, or a trip-based assessment to a trip-based VMT threshold.
- Where a travel demand model is used to determine thresholds, the same model should also be used to provide trip lengths as part of assessing project VMT.
- Where only trip-based estimates of VMT reduction from mitigation are available, a trip-based threshold should be used, and project VMT should be assessed in a trip-based manner.

When a trip-based method is used to analyze a residential project, the focus can be on home-based trips. Similarly, when a trip-based method is used to analyze an office project, the focus can be on home-based work trips.

When tour-based models are used to analyze an office project, either employee work tour VMT or VMT from all employee tours may be attributed to the project. This is because workplace location influences overall travel. For consistency, the significance threshold should be based on the same metric: either employee work tour VMT or VMT from all employee tours.

For office projects that feature a customer component, such as a government office that serves the public, a lead agency can analyze the customer VMT component of the project using the methodology for retail development (see below).

Retail Projects. Generally, lead agencies should analyze the effects of a retail project by assessing the change in total VMT[11] because retail projects typically re-route travel from other retail destinations. A retail project might lead to increases or decreases in VMT, depending on previously existing retail travel patterns.

[10] See Appendix 1, *Considerations About Which VMT to Count,* for a description of these approaches.
[11] See Appendix 1, *Considerations About Which VMT to Count, "*Assessing Change in Total VMT" section, for a description of this approach.

Considerations for All Projects. Lead agencies should not truncate any VMT analysis because of jurisdictional or other boundaries, for example, by failing to count the portion of a trip that falls outside the jurisdiction or by discounting the VMT from a trip that crosses a jurisdictional boundary. CEQA requires environmental analyses to reflect a "good faith effort at full disclosure." (CEQA Guidelines, § 15151.) Thus, where methodologies exist that can estimate the full extent of vehicle travel from a project, the lead agency should apply them to do so. Where those VMT effects will grow over time, analyses should consider both a project's short-term and long-term effects on VMT.

Combining land uses for VMT analysis is not recommended. Different land uses generate different amounts of VMT, so the outcome of such an analysis could depend more on the mix of uses than on their travel efficiency. As a result, it could be difficult or impossible for a lead agency to connect a significance threshold with an environmental policy objective (such as a target set by law), inhibiting the CEQA imperative of identifying a project's significant impacts and providing mitigation where feasible. Combining land uses for a VMT analysis could streamline certain mixes of uses in a manner disconnected from policy objectives or environmental outcomes. Instead, OPR recommends analyzing each use separately, or simply focusing analysis on the dominant use, and comparing each result to the appropriate threshold. Recommendations for methods of analysis and thresholds are provided below. In the analysis of each use, a mixed-use project should take credit for internal capture.

Any project that includes in its geographic bounds a portion of an existing or planned Transit Priority Area (i.e., the project is within a ½ mile of an existing or planned major transit stop or an existing stop along a high quality transit corridor) may employ VMT as its primary metric of transportation impact for the entire project. (See Pub. Resources Code, § 21099, subds. (a)(7), (b)(1).)

Cumulative Impacts. A project's cumulative impacts are based on an assessment of whether the "incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects." (Pub. Resources Code, § 21083, subd. (b)(2); see CEQA Guidelines, § 15064, subd. (h)(1).) When using an absolute VMT metric, i.e., total VMT (as recommended below for retail and transportation projects), analyzing the combined impacts for a cumulative impacts analysis may be appropriate. However, metrics such as VMT per capita or VMT per employee, i.e., metrics framed in terms of efficiency (as recommended below for use on residential and office projects), cannot be summed because they employ a denominator. A project that falls below an efficiency-based threshold that is aligned with long-term environmental goals and relevant plans would have no cumulative impact distinct from the project impact. Accordingly, a finding of a less-than-significant project impact would imply a less than significant cumulative impact, and vice versa. This is similar to the analysis typically conducted for greenhouse gas emissions, air quality impacts, and impacts that utilize plan compliance as a threshold of significance. (See *Center for Biological Diversity v. Department of Fish & Wildlife* (2015) 62 Cal.4th 204, 219, 223; CEQA Guidelines, § 15064, subd. (h)(3).)

D. General Principles to Guide Consideration of VMT

SB 743 directs OPR to establish specific "criteria for determining the significance of transportation impacts of projects[.]" (Pub. Resources Code, § 21099, subd. (b)(1).) In establishing this criterion, OPR was guided by the general principles contained within CEQA, the CEQA Guidelines, and applicable case law.

To assist in the determination of significance, many lead agencies rely on "thresholds of significance." The CEQA Guidelines define a "threshold of significance" to mean "an identifiable **quantitative, qualitative**[12] **or performance level** of a particular environmental effect, non-compliance with which means the effect will ***normally*** be determined to be significant by the agency and compliance with which means the effect ***normally*** will be determined to be less than significant." (CEQA Guidelines, § 15064.7, subd. (a) (emphasis added).) Lead agencies have discretion to develop and adopt their own, or rely on thresholds recommended by other agencies, "provided the decision of the lead agency to adopt such thresholds is supported by substantial evidence." (*Id*. at subd. (c); *Save Cuyama Valley v. County of Santa Barbara* (2013) 213 Cal.App.4th 1059, 1068.) Substantial evidence means "enough relevant information and reasonable inferences from this information that a fair argument can be made to support a conclusion, even though other conclusions might also be reached." (*Id*. at § 15384 (emphasis added); *Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th 1099, 1108-1109.)

Additionally, the analysis leading to the determination of significance need not be perfect. The CEQA Guidelines describe the standard for adequacy of environmental analyses:

> An EIR should be prepared with a sufficient degree of analysis to provide decision makers with information which enables them to **make a decision which intelligently takes account of environmental consequences**. An evaluation of the environmental effects of a proposed project need not be exhaustive, but the sufficiency of an EIR is to be reviewed in the light of what is **reasonably feasible**. Disagreement among experts does not make an EIR inadequate, but the EIR should summarize the main points of disagreement among the experts. The **courts have looked not for perfection** but for **adequacy**, **completeness**, and a **good faith effort** at full disclosure.

(CEQA Guidelines, § 15151 (emphasis added).)

These general principles guide OPR's recommendations regarding thresholds of significance for VMT set forth below.

[12] Generally, qualitative analyses should only be conducted when methods do not exist for undertaking a quantitative analysis.

E. Recommendations Regarding Significance Thresholds

As noted above, lead agencies have the discretion to set or apply their own thresholds of significance. (*Center for Biological Diversity v. California Dept. of Fish & Wildlife* (2015) 62 Cal.4th 204, 218-223 [lead agency had discretion to use compliance with AB 32's emissions goals as a significance threshold]; *Save Cuyama Valley v. County of Santa Barbara* (2013) 213 Cal.App.4th at p. 1068.) However, Section 21099 of the Public Resources Code states that the criteria for determining the significance of transportation impacts must promote: (1) reduction of greenhouse gas emissions; (2) development of multimodal transportation networks; and (3) a diversity of land uses. It further directed OPR to prepare and develop criteria for determining significance. (Pub. Resources Code, § 21099, subd. (b)(1).) This section provides OPR's suggested thresholds, as well as considerations for lead agencies that choose to adopt their own

The VMT metric can support the three statutory goals: "the reduction of greenhouse gas emissions, the development of multimodal transportation networks, *and* a diversity of land uses." (Pub. Resources Code, § 21099, subd. (b)(1), emphasis added.) However, in order for it to promote and support all three, lead agencies should select a significance threshold that aligns with state law on all three. State law concerning the development of multimodal transportation networks and diversity of land uses requires planning for and prioritizing increases in complete streets and infill development, but does not mandate a particular depth of implementation that could translate into a particular threshold of significance. Meanwhile, the State has clear quantitative targets for GHG emissions reduction set forth in law and based on scientific consensus, and the depth of VMT reduction needed to achieve those targets has been quantified. Tying VMT thresholds to GHG reduction also supports the two other statutory goals. Therefore, to ensure adequate analysis of transportation impacts, OPR recommends using quantitative VMT thresholds linked to GHG reduction targets when methods exist to do so.

Various legislative mandates and state policies establish quantitative greenhouse gas emissions reduction targets. For example:

- Assembly Bill 32 (2006) requires statewide GHG emissions reductions to 1990 levels by 2020 and continued reductions beyond 2020.

- Senate Bill 32 (2016) requires at least a 40 percent reduction in GHG emissions from 1990 levels by 2030.

- Pursuant to Senate Bill 375 (2008), the California Air Resources Board GHG emissions reduction targets for metropolitan planning organizations (MPOs) to achieve based on land use patterns and transportation systems specified in Regional Transportation Plans and Sustainable Community Strategies (RTP/SCS). Current targets for the State's largest MPOs call for a 19 percent reduction in GHG emissions from cars and light trucks from 2005 emissions levels by 2035.

- Executive Order B-30-15 (2015) sets a GHG emissions reduction target of 40 percent below 1990 levels by 2030.

- Executive Order S-3-05 (2005) sets a GHG emissions reduction target of 80 percent below 1990 levels by 2050.

- Executive Order B-16-12 (2012) specifies a GHG emissions reduction target of 80 percent below 1990 levels by 2050 specifically for transportation.

- Executive Order B-55-18 (2018) established an additional statewide goal of achieving carbon neutrality as soon as possible, but no later than 2045, and maintaining net negative emissions thereafter. It states, "The California Air Resources Board shall work with relevant state agencies to develop a framework for implementation and accounting that tracks progress toward this goal."

- Senate Bill 391 requires the California Transportation Plan to support 80 percent reduction in GHGs below 1990 levels by 2050.

- The *California Air Resources Board Mobile Source Strategy* (2016) describes California's strategy for containing air pollutant emissions from vehicles, and quantifies VMT growth compatible with achieving state targets.

- The California Air Resources Board's *2017 Climate Change Scoping Plan Update: The Strategy for Achieving California's 2030 Greenhouse Gas Target* describes California's strategy for containing GHG emissions from vehicles, and quantifies VMT growth compatible with achieving state targets.

Considering these various targets, the California Supreme Court observed:

> Meeting our statewide reduction goals does not preclude all new development. Rather, the Scoping Plan … assumes continued growth and depends on increased efficiency and conservation in land use and transportation from all Californians.

(*Center for Biological Diversity v. California Dept. of Fish & Wildlife*, *supra*, 62 Cal.4th at p. 220.) Indeed, the Court noted that when a lead agency uses consistency with climate goals as a way to determine significance, particularly for long-term projects, the lead agency must consider the project's effect on meeting long-term reduction goals. (*Ibid*.) And more recently, the Supreme Court stated that "CEQA requires public agencies . . . to ensure that such analysis stay in step with evolving scientific knowledge and state regulatory schemes." (*Cleveland National Forest Foundation v. San Diego Assn. of Governments* (2017) 3 Cal.5th 497, 504.)

Meeting the targets described above will require substantial reductions in existing VMT per capita to curb GHG emissions and other pollutants. But targets for overall GHG emissions reduction do not translate directly into VMT thresholds for individual projects for many reasons, including:

- Some, but not all, of the emissions reductions needed to achieve those targets could be accomplished by other measures, including increased vehicle efficiency and decreased fuel carbon content. The CARB's *First Update to the Climate Change Scoping Plan* explains:

"Achieving California's long-term criteria pollutant and GHG emissions goals will require four strategies to be employed: (1) improve vehicle efficiency and develop zero emission technologies, (2) reduce the carbon content of fuels and provide market support to get these lower-carbon fuels into the marketplace, (3) **plan and build communities to reduce vehicular GHG emissions and provide more transportation options, and (4) improve the efficiency and throughput of existing transportation systems.**"[13] CARB's *2018 Progress Report on California's Sustainable Communities and Climate Protection Act* states on page 28 that "California cannot meet its climate goals without curbing growth in single-occupancy vehicle activity." In other words, vehicle efficiency and better fuels are necessary, but insufficient, to address the GHG emissions from the transportation system. Land use patterns and transportation options also will need to change to support reductions in vehicle travel/VMT.

- New land use projects alone will not sufficiently reduce per-capita VMT to achieve those targets, nor are they expected to be the sole source of VMT reduction.

- Interactions between land use projects, and also between land use and transportation projects, existing and future, together affect VMT.

- Because location within the region is the most important determinant of VMT, in some cases, streamlining CEQA review of projects in travel efficient locations may be the most effective means of reducing VMT.

- When assessing climate impacts of some types of land use projects, use of an efficiency metric (e.g., per capita, per employee) may provide a better measure of impact than an absolute numeric threshold. (*Center for Biological Diversity*, *supra*.)

Public Resources Code section 21099 directs OPR to propose criteria for determining the significance of transportation impacts. In this Technical Advisory, OPR provides its recommendations to assist lead agencies in selecting a significance threshold that may be appropriate for their particular projects. While OPR's Technical Advisory is not binding on public agencies, CEQA allows lead agencies to "consider thresholds of significance . . . recommended by other public agencies, provided the decision to adopt those thresholds is supported by substantial evidence." (CEQA Guidelines, § 15064.7, subd. (c).) Based on OPR's extensive review of the applicable research, and in light of an assessment by the California Air Resources Board quantifying the need for VMT reduction in order to meet the State's long-term climate goals, **OPR recommends that a per capita or per employee VMT that is fifteen percent below that of existing development may be a reasonable threshold**.

Fifteen percent reductions in VMT are achievable at the project level in a variety of place types.[14]

Moreover, a fifteen percent reduction is consistent with SB 743's direction to OPR to select a threshold that will help the State achieve its climate goals. As described above, section 21099 states that the

[13] California Air Resources Board (May 2014) *First Update to the Climate Change Scoping Plan*, p. 46 (emphasis added).
[14] CAPCOA (2010) *Quantifying Greenhouse Gas Mitigation Measures*, p. 55, available at http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf.

criteria for determining significance must "promote the reduction in greenhouse gas emissions." In its document *California Air Resources Board 2017 Scoping Plan-Identified VMT Reductions and Relationship to State Climate Goals*[15], CARB assesses VMT reduction per capita consistent with its evidence-based modeling scenario that would achieve State climate goals of 40 percent GHG emissions reduction from 1990 levels by 2030 and 80 percent GHG emissions reduction levels from 1990 by 2050. Applying California Department of Finance population forecasts, CARB finds per-capita light-duty vehicle travel would need to be approximately 16.8 percent lower than existing, and overall per-capita vehicle travel would need to be approximately 14.3 percent lower than existing levels under that scenario. Below these levels, a project could be considered low VMT and would, on that metric, be consistent with 2017 Scoping Plan Update assumptions that achieve climate state climate goals.

CARB finds per capita vehicle travel would need to be kept below what today's policies and plans would achieve.

CARB's assessment is based on data in the 2017 Scoping Plan Update and 2016 Mobile Source Strategy. In those documents, CARB previously examined the relationship between VMT and the state's GHG emissions reduction targets. The Scoping Plan finds:

> "While the State can do more to accelerate and incentivize these local decisions, local actions that reduce VMT are also necessary to meet transportation sector-specific goals and achieve the 2030 target under SB 32. Through developing the Scoping Plan, CARB staff is more convinced than ever that, in addition to achieving GHG reductions from cleaner fuels and vehicles, California must also reduce VMT. Stronger SB 375 GHG reduction targets will enable the State to make significant progress toward needed reductions, but alone will not provide the VMT growth reductions needed; there is a gap between what SB 375 can provide and what is needed to meet the State's 2030 and 2050 goals."[16]

Note that, at present, consistency with RTP/SCSs does not necessarily lead to a less-than-significant VMT impact.[17] As the Final 2017 Scoping Plan Update states,

> VMT reductions are necessary to achieve the 2030 target and must be part of any strategy evaluated in this Plan. Stronger SB 375 GHG reduction targets will enable the State to make significant progress toward this goal, but alone will not provide all of the VMT growth reductions that will be needed. There is a gap between what SB 375 can provide and what is needed to meet the State's 2030 and 2050 goals."[18]

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[15] California Air Resources Board (Jan. 2019) *California Air Resources Board 2017 Scoping Plan-Identified VMT Reductions and Relationship to State Climate Goals*, available at https://ww2.arb.ca.gov/resources/documents/carb-2017-scoping-plan-identified-vmt-reductions-and-relationship-state-climate.

[16] California Air Resources Board (Nov. 2017) *California's 2017 Climate Change Scoping Plan*, p. 101.

[17] California Air Resources Board (Feb. 2018) *Updated Final Staff Report: Proposed Update to the SB 375 Greenhouse Gas Emission Reduction Targets*, Figure 3, p. 35, available at https://www.arb.ca.gov/cc/sb375/sb375_target_update_final_staff_report_feb2018.pdf.

[18] California Air Resources Board (Nov. 2017) *California's 2017 Climate Change Scoping Plan*, p. 75.

Also, in order to capture the full effects of induced travel resulting from roadway capacity projects, an RTP/SCS would need to include an assessment of land use effects of those projects, and the effects of those land uses on VMT. (See section titled "*Estimating VMT Impacts from Transportation Projects"* below.) RTP/SCSs typically model VMT using a collaboratively-developed land use "vision" for the region's land use, rather than studying the effects on land use of the proposed transportation investments.

In summary, achieving 15 percent lower per capita (residential) or per employee (office) VMT than existing development is both generally achievable and is supported by evidence that connects this level of reduction to the State's emissions goals.

1. Screening Thresholds for Land Use Projects

Many agencies use "screening thresholds" to quickly identify when a project should be expected to cause a less-than-significant impact without conducting a detailed study. (See e.g., CEQA Guidelines, §§ 15063(c)(3)(C), 15128, and Appendix G.) As explained below, this technical advisory suggests that lead agencies may screen out VMT impacts using project size, maps, transit availability, and provision of affordable housing.

Screening Threshold for Small Projects

Many local agencies have developed screening thresholds to indicate when detailed analysis is needed. Absent substantial evidence indicating that a project would generate a potentially significant level of VMT, or inconsistency with a Sustainable Communities Strategy (SCS) or general plan, projects that generate or attract fewer than 110 trips per day[19] generally may be assumed to cause a less-than-significant transportation impact.

Map-Based Screening for Residential and Office Projects

Residential and office projects that locate in areas with low VMT, and that incorporate similar features (i.e., density, mix of uses, transit accessibility), will tend to exhibit similarly low VMT. Maps created with VMT data, for example from a travel survey or a travel demand model, can illustrate areas that are

[19] CEQA provides a categorical exemption for existing facilities, including additions to existing structures of up to 10,000 square feet, so long as the project is in an area where public infrastructure is available to allow for maximum planned development and the project is not in an environmentally sensitive area. (CEQA Guidelines, § 15301, subd. (e)(2).) Typical project types for which trip generation increases relatively linearly with building footprint (i.e., general office building, single tenant office building, office park, and business park) generate or attract an additional 110-124 trips per 10,000 square feet. Therefore, absent substantial evidence otherwise, it is reasonable to conclude that the addition of 110 or fewer trips could be considered not to lead to a significant impact.

currently below threshold VMT (see recommendations below). Because new development in such locations would likely result in a similar level of VMT, such maps can be used to screen out residential and office projects from needing to prepare a detailed VMT analysis.

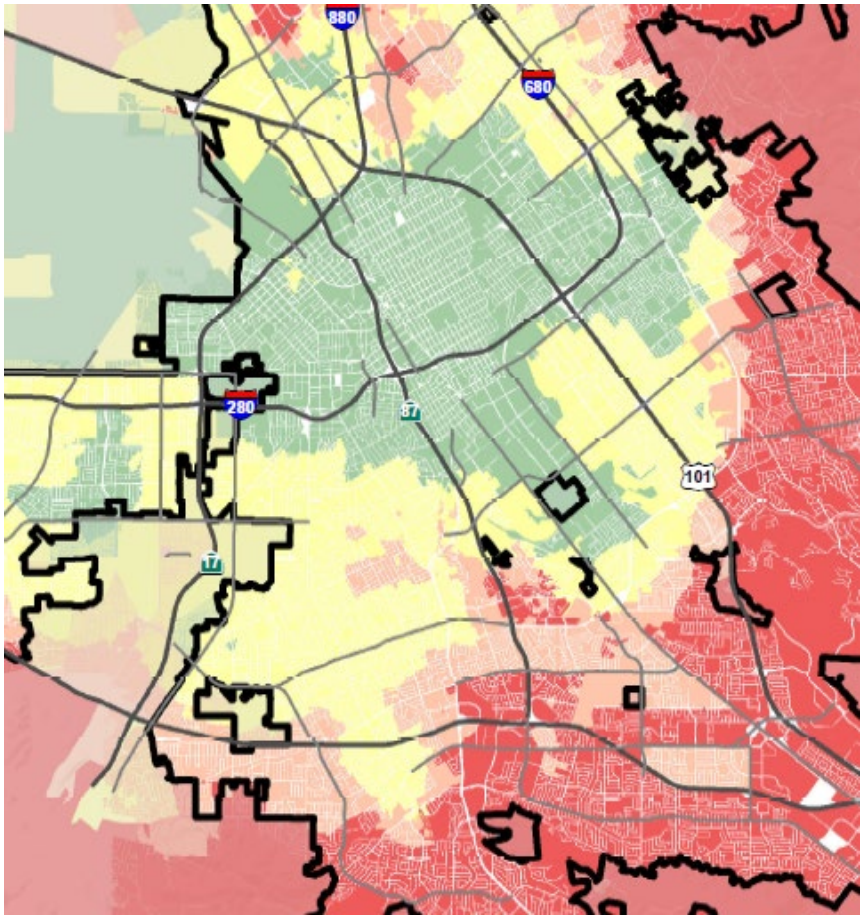

Figure 2. Example map of household VMT that could be used to delineate areas eligible to receive streamlining for VMT analysis. (Source: City of San José, Department of Transportation, draft output of City Transportation Model.)

Presumption of Less Than Significant Impact Near Transit Stations

Proposed CEQA Guideline Section 15064.3, subdivision (b)(1), states that lead agencies generally should presume that certain projects (including residential, retail, and office projects, as well as projects that are a mix of these uses) proposed within ½ mile of an existing major transit stop[20] or an existing stop

[20] Pub. Resources Code, § 21064.3 ("'Major transit stop' means a site containing an existing rail transit station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service interval of 15 minutes or less during the morning and afternoon peak commute periods.").

along a high quality transit corridor[21] will have a less-than-significant impact on VMT. This presumption would not apply, however, if project-specific or location-specific information indicates that the project will still generate significant levels of VMT. For example, the presumption might not be appropriate if the project:

- Has a Floor Area Ratio (FAR) of less than 0.75
- Includes more parking for use by residents, customers, or employees of the project than required by the jurisdiction (if the jurisdiction requires the project to supply parking)
- Is inconsistent with the applicable Sustainable Communities Strategy (as determined by the lead agency, with input from the Metropolitan Planning Organization)
- Replaces affordable residential units with a smaller number of moderate- or high-income residential units

A project or plan near transit which replaces affordable residential units[22] with a smaller number of moderate- or high-income residential units may increase overall VMT because the increase in VMT of displaced residents could overwhelm the improvements in travel efficiency enjoyed by new residents.[23]

If any of these exceptions to the presumption might apply, the lead agency should conduct a detailed VMT analysis to determine whether the project would exceed VMT thresholds (see below).

Presumption of Less Than Significant Impact for Affordable Residential Development

Adding affordable housing to infill locations generally improves jobs-housing match, in turn shortening commutes and reducing VMT.[24,25] Further, "… low-wage workers in particular would be more likely to choose a residential location close to their workplace, if one is available."[26] In areas where existing jobs-housing match is closer to optimal, low income housing nevertheless generates less VMT than market-

[21] Pub. Resources Code, § 21155 ("For purposes of this section, a high-quality transit corridor means a corridor with fixed route bus service with service intervals no longer than 15 minutes during peak commute hours.").
[22] Including naturally-occurring affordable residential units.
[23] Chapple et al. (2017) *Developing a New Methodology for Analyzing Potential Displacement,* Chapter 4, pp. 159-160, available at https://www.arb.ca.gov/research/apr/past/13-310.pdf.
[24] Karner and Benner (2016) *The convergence of social equity and environmental sustainability: Jobs-housing fit and commute distance* ("[P]olicies that advance a more equitable distribution of jobs and housing by linking the affordability of locally available housing with local wage levels are likely to be associated with reduced commuting distances").
[25] Karner and Benner (2015) *Low-wage jobs-housing fit: identifying locations of affordable housing shortages.*
[26] Karner and Benner (2015) *Low-wage jobs-housing fit: identifying locations of affordable housing shortages.*

rate housing.[27,28] Therefore, a project consisting of a high percentage of affordable housing may be a basis for the lead agency to find a less-than-significant impact on VMT. Evidence supports a presumption of less than significant impact for a 100 percent affordable residential development (or the residential component of a mixed-use development) in infill locations. Lead agencies may develop their own presumption of less than significant impact for residential projects (or residential portions of mixed use projects) containing a particular amount of affordable housing, based on local circumstances and evidence. Furthermore, a project which includes any affordable residential units may factor the effect of the affordability on VMT into the assessment of VMT generated by those units.

2. Recommended Numeric Thresholds for Residential, Office, and Retail Projects

Recommended threshold for residential projects: A proposed project exceeding a level of 15 percent below existing VMT per capita may indicate a significant transportation impact. Existing VMT per capita may be measured as regional VMT per capita or as city VMT per capita. Proposed development referencing a threshold based on city VMT per capita (rather than regional VMT per capita) should not cumulatively exceed the number of units specified in the SCS for that city, and should be consistent with the SCS.

Residential development that would generate vehicle travel that is 15 or more percent below the existing residential VMT per capita, measured against the region or city, may indicate a less-than-significant transportation impact. In MPO areas, development measured against city VMT per capita (rather than regional VMT per capita) should not cumulatively exceed the population or number of units specified in the SCS for that city because greater-than-planned amounts of development in areas above the region-based threshold would undermine the VMT containment needed to achieve regional targets under SB 375.

For residential projects in unincorporated county areas, the local agency can compare a residential project's VMT to (1) the region's VMT per capita, or (2) the aggregate population-weighted VMT per capita of all cities in the region. In MPO areas, development in unincorporated areas measured against aggregate city VMT per capita (rather than regional VMT per capita) should not cumulatively exceed the population or number of units specified in the SCS for that city because greater-than-planned amounts of development in areas above the regional threshold would undermine achievement of regional targets under SB 375.

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[27] Chapple et al. (2017) *Developing a New Methodology for Analyzing Potential Displacement*, available at https://www.arb.ca.gov/research/apr/past/13-310.pdf.
[28] CAPCOA (2010) *Quantifying Greenhouse Gas Mitigation Measures*, pp. 176-178, available at http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf.

These thresholds can be applied to either household (i.e., tour-based) VMT or home-based (i.e., trip-based) VMT assessments.[29] It is critical, however, that the agency be consistent in its VMT measurement approach throughout the analysis to maintain an "apples-to-apples" comparison. For example, if the agency uses a home-based VMT for the threshold, it should also be use home-based VMT for calculating project VMT and VMT reduction due to mitigation measures.

Recommended threshold for office projects: A proposed project exceeding a level of 15 percent below existing regional VMT per employee may indicate a significant transportation impact.

Office projects that would generate vehicle travel exceeding 15 percent below existing VMT per employee for the region may indicate a significant transportation impact. In cases where the region is substantially larger than the geography over which most workers would be expected to live, it might be appropriate to refer to a smaller geography, such as the county, that includes the area over which nearly all workers would be expected to live.

Office VMT screening maps can be developed using tour-based data, considering either total employee VMT or employee work tour VMT. Similarly, tour-based analysis of office project VMT could consider either total employee VMT or employee work tour VMT. Where tour-based information is unavailable for threshold determination, project assessment, or assessment of mitigation, home-based work trip VMT should be used throughout all steps of the analysis to maintain an "apples-to-apples" comparison.

Recommended threshold for retail projects: A net increase in total VMT may indicate a significant transportation impact.

Because new retail development typically redistributes shopping trips rather than creating new trips,[30] estimating the total change in VMT (i.e., the difference in total VMT in the area affected with and without the project) is the best way to analyze a retail project's transportation impacts.

By adding retail opportunities into the urban fabric and thereby improving retail destination proximity, local-serving retail development tends to shorten trips and reduce VMT. Thus, lead agencies generally may presume such development creates a less-than-significant transportation impact. Regional-serving retail development, on the other hand, which can lead to substitution of longer trips for shorter ones, may tend to have a significant impact. Where such development decreases VMT, lead agencies should consider the impact to be less-than-significant.

Many cities and counties define local-serving and regional-serving retail in their zoning codes. Lead agencies may refer to those local definitions when available, but should also consider any project-

[29] See Appendix 1 for a description of these approaches.
[30] Lovejoy, et al. (2013) *Measuring the impacts of local land-use policies on vehicle miles of travel: The case of the first big-box store in Davis, California, The Journal of Transport and Land Use*.

specific information, such as market studies or economic impacts analyses that might bear on customers' travel behavior. Because lead agencies will best understand their own communities and the likely travel behaviors of future project users, they are likely in the best position to decide when a project will likely be local-serving. Generally, however, retail development including stores larger than 50,000 square feet might be considered regional-serving, and so lead agencies should undertake an analysis to determine whether the project might increase or decrease VMT.

Mixed-Use Projects

Lead agencies can evaluate each component of a mixed-use project independently and apply the significance threshold for each project type included (e.g., residential and retail). Alternatively, a lead agency may consider only the project's dominant use. In the analysis of each use, a project should take credit for internal capture. Combining different land uses and applying one threshold to those land uses may result in an inaccurate impact assessment.

Other Project Types

Of land use projects, residential, office, and retail projects tend to have the greatest influence on VMT. For that reason, OPR recommends the quantified thresholds described above for purposes of analysis and mitigation. Lead agencies, using more location-specific information, may develop their own more specific thresholds, which may include other land use types. In developing thresholds for other project types, or thresholds different from those recommended here, lead agencies should consider the purposes described in section 21099 of the Public Resources Code and regulations in the CEQA Guidelines on the development of thresholds of significance (e.g., CEQA Guidelines, § 15064.7).

Strategies and projects that decrease local VMT but increase total VMT should be avoided. Agencies should consider whether their actions encourage development in a less travel-efficient location by limiting development in travel-efficient locations.

Redevelopment Projects

Where a project replaces existing VMT-generating land uses, if the replacement leads to a net overall decrease in VMT, the project would lead to a less-than-significant transportation impact. If the project leads to a net overall increase in VMT, then the thresholds described above should apply.

As described above, a project or plan near transit which replaces affordable[31] residential units with a smaller number of moderate- or high-income residential units may increase overall VMT, because

[31] Including naturally-occurring affordable residential units.

displaced residents' VMT may increase.[32] A lead agency should analyze VMT for such a project even if it otherwise would have been presumed less than significant. The assessment should incorporate an estimate of the aggregate VMT increase experienced by displaced residents. That additional VMT should be included in the numerator of the VMT per capita assessed for the project.

If a residential or office project leads to a net increase in VMT, then the project's VMT per capita (residential) or per employee (office) should be compared to thresholds recommended above. Per capita and per employee VMT are efficiency metrics, and, as such, apply only to the existing project without regard to the VMT generated by the previously existing land use.

If the project leads to a net increase in provision of locally-serving retail, transportation impacts from the retail portion of the development should be presumed to be less than significant. If the project consists of regionally-serving retail, and increases overall VMT compared to with existing uses, then the project would lead to a significant transportation impact.

RTP/SCS Consistency (All Land Use Projects)

Section 15125, subdivision (d), of the CEQA Guidelines provides that lead agencies should analyze impacts resulting from inconsistencies with regional plans, including regional transportation plans. For this reason, if a project is inconsistent with the Regional Transportation Plan and Sustainable Communities Strategy (RTP/SCS), the lead agency should evaluate whether that inconsistency indicates a significant impact on transportation. For example, a development may be inconsistent with an RTP/SCS if the development is outside the footprint of development or within an area specified as open space as shown in the SCS.

3. Recommendations Regarding Land Use Plans

As with projects, agencies should analyze VMT outcomes of land use plans across the full area over which the plan may substantively affect travel patterns, including beyond the boundary of the plan or jurisdiction's geography. And as with projects, VMT should be counted in full rather than split between origin and destination. (Emissions inventories have sometimes spit cross-boundary trips in order to sum to a regional total, but CEQA requires accounting for the full impact without truncation or discounting). Analysis of specific plans may employ the same thresholds described above for projects. A general plan, area plan, or community plan may have a significant impact on transportation if proposed new residential, office, or retail land uses would in aggregate exceed the respective thresholds recommended above. Where the lead agency tiers from a general plan EIR pursuant to CEQA Guidelines sections 15152 and 15166, the lead agency generally focuses on the environmental impacts that are specific to the later project and were not analyzed as significant impacts in the prior EIR. (Pub. Resources Code, § 21068.5; Guidelines, § 15152, subd. (a).) Thus, in analyzing the later project, the lead agency

[32] Chapple et al. (2017) *Developing a New Methodology for Analyzing Potential Displacement,* Chapter 4, pp. 159-160, available at https://www.arb.ca.gov/research/apr/past/13-310.pdf.

would focus on the VMT impacts that were not adequately addressed in the prior EIR. In the tiered document, the lead agency should continue to apply the thresholds recommended above.

Thresholds for plans in non-MPO areas may be determined on a case-by-case basis.

4. Other Considerations

Rural Projects Outside of MPOs

In rural areas of non-MPO counties (i.e., areas not near established or incorporated cities or towns), fewer options may be available for reducing VMT, and significance thresholds may be best determined on a case-by-case basis. Note, however, that clustered small towns and small town main streets may have substantial VMT benefits compared to isolated rural development, similar to the transit oriented development described above.

Impacts to Transit

Because criteria for determining the significance of transportation impacts must promote "the development of multimodal transportation networks" pursuant to Public Resources Code section 21099, subd. (b)(1), lead agencies should consider project impacts to transit systems and bicycle and pedestrian networks. For example, a project that blocks access to a transit stop or blocks a transit route itself may interfere with transit functions. Lead agencies should consult with transit agencies as early as possible in the development process, particularly for projects that are located within one half mile of transit stops.

When evaluating impacts to multimodal transportation networks, lead agencies generally should not treat the addition of new transit users as an adverse impact. An infill development may add riders to transit systems and the additional boarding and alighting may slow transit vehicles, but it also adds destinations, improving proximity and accessibility. Such development also improves regional vehicle flow by adding less vehicle travel onto the regional network.

Increased demand throughout a region may, however, cause a cumulative impact by requiring new or additional transit infrastructure. Such impacts may be adequately addressed through a fee program that fairly allocates the cost of improvements not just to projects that happen to locate near transit, but rather across a region to all projects that impose burdens on the entire transportation system, since transit can broadly improve the function of the transportation system.

F. Considering the Effects of Transportation Projects on Vehicle Travel

Many transportation projects change travel patterns. A transportation project which leads to additional vehicle travel on the roadway network, commonly referred to as "induced vehicle travel," would need to quantify the amount of additional vehicle travel in order to assess air quality impacts, greenhouse gas emissions impacts, energy impacts, and noise impacts. Transportation projects also are required to

examine induced growth impacts under CEQA. (See generally, Pub. Resources Code, §§ 21065 [defining "project" under CEQA as an activity as causing either a direct or reasonably foreseeable indirect physical change], 21065.3 [defining "project-specific effect" to mean all direct or indirect environmental effects], 21100, subd. (b) [required contents of an EIR].) For any project that increases vehicle travel, explicit assessment and quantitative reporting of the amount of additional vehicle travel should not be omitted from the document; such information may be useful and necessary for a full understanding of a project's environmental impacts. (See Pub. Resources Code, §§ 21000, 21001, 21001.1, 21002, 21002.1 [discussing the policies of CEQA].) A lead agency that uses the VMT metric to assess the transportation impacts of a transportation project may simply report that change in VMT as the impact. When the lead agency uses another metric to analyze the transportation impacts of a roadway project, changes in amount of vehicle travel added to the roadway network should still be analyzed and reported.[33]

While CEQA does not require perfection, it is important to make a reasonably accurate estimate of transportation projects' effects on vehicle travel in order to make reasonably accurate estimates of GHG emissions, air quality emissions, energy impacts, and noise impacts. (See, e.g., *California Clean Energy Com. v. City of Woodland* (2014) 225 Cal.App.4th 173, 210 [EIR failed to consider project's transportation energy impacts]; *Ukiah Citizens for Safety First v. City of Ukiah* (2016) 248 Cal.App.4th 256, 266.) Appendix 2 describes in detail the causes of induced vehicle travel, the robust empirical evidence of induced vehicle travel, and how models and research can be used in conjunction to quantitatively assess induced vehicle travel with reasonable accuracy.

If a project would likely lead to a measurable and substantial increase in vehicle travel, the lead agency should conduct an analysis assessing the amount of vehicle travel the project will induce. Project types that would likely lead to a measurable and substantial increase in vehicle travel generally include:

- Addition of through lanes on existing or new highways, including general purpose lanes, HOV lanes, peak period lanes, auxiliary lanes, or lanes through grade-separated interchanges

Projects that would not likely lead to a substantial or measurable increase in vehicle travel, and therefore generally should not require an induced travel analysis, include:

- Rehabilitation, maintenance, replacement, safety, and repair projects designed to improve the condition of existing transportation assets (e.g., highways; roadways; bridges; culverts; Transportation Management System field elements such as cameras, message signs, detection, or signals; tunnels; transit systems; and assets that serve bicycle and pedestrian facilities) and that do not add additional motor vehicle capacity
- Roadside safety devices or hardware installation such as median barriers and guardrails

[33] See, e.g., California Department of Transportation (2006) *Guidance for Preparers of Growth-related, Indirect Impact Analyses*, available at http://www.dot.ca.gov/ser/Growth-related_IndirectImpactAnalysis/GRI_guidance06May_files/gri_guidance.pdf.

- Roadway shoulder enhancements to provide “breakdown space,” dedicated space for use only by transit vehicles, to provide bicycle access, or to otherwise improve safety, but which will not be used as automobile vehicle travel lanes
- Addition of an auxiliary lane of less than one mile in length designed to improve roadway safety
- Installation, removal, or reconfiguration of traffic lanes that are not for through traffic, such as left, right, and U-turn pockets, two-way left turn lanes, or emergency breakdown lanes that are not utilized as through lanes
- Addition of roadway capacity on local or collector streets provided the project also substantially improves conditions for pedestrians, cyclists, and, if applicable, transit
- Conversion of existing general purpose lanes (including ramps) to managed lanes or transit lanes, or changing lane management in a manner that would not substantially increase vehicle travel
- Addition of a new lane that is permanently restricted to use only by transit vehicles
- Reduction in number of through lanes
- Grade separation to separate vehicles from rail, transit, pedestrians or bicycles, or to replace a lane in order to separate preferential vehicles (e.g., HOV, HOT, or trucks) from general vehicles
- Installation, removal, or reconfiguration of traffic control devices, including Transit Signal Priority (TSP) features
- Installation of traffic metering systems, detection systems, cameras, changeable message signs and other electronics designed to optimize vehicle, bicycle, or pedestrian flow
- Timing of signals to optimize vehicle, bicycle, or pedestrian flow
- Installation of roundabouts or traffic circles
- Installation or reconfiguration of traffic calming devices
- Adoption of or increase in tolls
- Addition of tolled lanes, where tolls are sufficient to mitigate VMT increase
- Initiation of new transit service
- Conversion of streets from one-way to two-way operation with no net increase in number of traffic lanes
- Removal or relocation of off-street or on-street parking spaces
- Adoption or modification of on-street parking or loading restrictions (including meters, time limits, accessible spaces, and preferential/reserved parking permit programs)
- Addition of traffic wayfinding signage
- Rehabilitation and maintenance projects that do not add motor vehicle capacity
- Addition of new or enhanced bike or pedestrian facilities on existing streets/highways or within existing public rights-of-way
- Addition of Class I bike paths, trails, multi-use paths, or other off-road facilities that serve non-motorized travel
- Installation of publicly available alternative fuel/charging infrastructure
- Addition of passing lanes, truck climbing lanes, or truck brake-check lanes in rural areas that do not increase overall vehicle capacity along the corridor

1. Recommended Significance Threshold for Transportation Projects

As noted in Section 15064.3 of the CEQA Guidelines, lead agencies for roadway capacity projects have discretion, consistent with CEQA and planning requirements, to choose which metric to use to evaluate transportation impacts. This section recommends considerations for evaluating impacts using vehicle miles traveled. Lead agencies have discretion to choose a threshold of significance for transportation projects as they do for other types of projects. As explained above, Public Resources Code section 21099, subdivision (b)(1), provides that criteria for determining the significance of transportation impacts must promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses. (*Id.;* see generally, adopted CEQA Guidelines, § 15064.3, subd. (b) [Criteria for Analyzing Transportation Impacts].) With those goals in mind, OPR prepared and the Agency adopted an appropriate transportation metric.

Whether adopting a threshold of significance, or evaluating transportation impacts on a case-by-case basis, a lead agency should ensure that the analysis addresses:

- Direct, indirect and cumulative effects of the transportation project (CEQA Guidelines, § 15064, subds. (d), (h))
- Near-term and long-term effects of the transportation project (CEQA Guidelines, §§ 15063, subd. (a)(1), 15126.2, subd. (a))
- The transportation project's consistency with state greenhouse gas reduction goals (Pub. Resources Code, § 21099)[34]
- The impact of the transportation project on the development of multimodal transportation networks (Pub. Resources Code, § 21099)
- The impact of the transportation project on the development of a diversity of land uses (Pub. Resources Code, § 21099)

The CARB Scoping Plan and the CARB Mobile Source Strategy delineate VMT levels required to achieve legally mandated GHG emissions reduction targets. A lead agency should develop a project-level threshold based on those VMT levels, and may apply the following approach:

1. Propose a fair-share allocation of those budgets to their jurisdiction (e.g., by population);

[34] The California Air Resources Board has ascertained the limits of VMT growth compatible with California containing greenhouse gas emissions to levels research shows would allow for climate stabilization. (See *The 2017 Climate Change Scoping Plan: The Strategy for Achieving California's 2030 Greenhouse Gas Target* (p. 78, p. 101); *Mobile Source Strategy* (p. 37).) CARB's *Updated Final Staff Report on Proposed Update to the SB 375 Greenhouse Gas Emission Reduction Targets* illustrates that the current Regional Transportation Plans and Sustainable Communities Strategies will fall short of achieving the necessary on-road transportation-related GHG emissions reductions called for in the 2017 Scoping Plan (Figure 3, p. 35). Accordingly, OPR recommends not basing GHG emissions or transportation impact analysis for a transportation project solely on consistency with an RTP/SCS.

2. Determine the amount of VMT growth likely to result from background population growth, and subtract that from their "budget";
3. Allocate their jurisdiction's share between their various VMT-increasing transportation projects, using whatever criteria the lead agency prefers.

2. Estimating VMT Impacts from Transportation Projects

CEQA requires analysis of a project's potential growth-inducing impacts. (Pub. Resources Code, § 21100, subd. (b)(5); CEQA Guidelines, § 15126.2, subd. (d).) Many agencies are familiar with the analysis of growth inducing impacts associated with water, sewer, and other infrastructure. This technical advisory addresses growth that may be expected from roadway expansion projects.

Because a roadway expansion project can induce substantial VMT, incorporating quantitative estimates of induced VMT is critical to calculating both transportation and other impacts of these projects. Induced travel also has the potential to reduce or eliminate congestion relief benefits. An accurate estimate of induced travel is needed to accurately weigh costs and benefits of a highway capacity expansion project.

The effect of a transportation project on vehicle travel should be estimated using the "change in total VMT" method described in *Appendix 1*. This means that an assessment of total VMT without the project and an assessment with the project should be made; the difference between the two is the amount of VMT attributable to the project. The assessment should cover the full area in which driving patterns are expected to change. As with other types of projects, the VMT estimation should not be truncated at a modeling or jurisdictional boundary for convenience of analysis when travel behavior is substantially affected beyond that boundary.

Transit and Active Transportation Projects

Transit and active transportation projects generally reduce VMT and therefore are presumed to cause a less-than-significant impact on transportation. This presumption may apply to all passenger rail projects, bus and bus rapid transit projects, and bicycle and pedestrian infrastructure projects. Streamlining transit and active transportation projects aligns with each of the three statutory goals contained in SB 743 by reducing GHG emissions, increasing multimodal transportation networks, and facilitating mixed use development.

Roadway Projects

Reducing roadway capacity (for example, by removing or repurposing motor vehicle travel lanes) will generally reduce VMT and therefore is presumed to cause a less-than-significant impact on transportation. Generally, no transportation analysis is needed for such projects.

Building new roadways, adding roadway capacity in congested areas, or adding roadway capacity to areas where congestion is expected in the future, typically induces additional vehicle travel. For the types of projects previously indicated as likely to lead to additional vehicle travel, an estimate should be made of the change in vehicle travel resulting from the project.

For projects that increase roadway capacity, lead agencies can evaluate induced travel quantitatively by applying the results of existing studies that examine the magnitude of the increase of VMT resulting from a given increase in lane miles. These studies estimate the percent change in VMT for every percent change in miles to the roadway system (i.e., "elasticity").[35] Given that lead agencies have discretion in choosing their methodology, and the studies on induced travel reveal a range of elasticities, lead agencies may appropriately apply professional judgment in studying the transportation effects of a particular project. The most recent major study, estimates an elasticity of 1.0, meaning that every percent change in lane miles results in a one percent increase in VMT.[36]

To estimate VMT impacts from roadway expansion projects:

1. Determine the total lane-miles over an area that fully captures travel behavior changes resulting from the project (generally the region, but for projects affecting interregional travel look at all affected regions).
2. Determine the percent change in total lane miles that will result from the project.
3. Determine the total existing VMT over that same area.
4. Multiply the percent increase in lane miles by the existing VMT, and then multiply that by the elasticity from the induced travel literature:

[% increase in lane miles] x [existing VMT] x [elasticity] = [VMT resulting from the project]

A National Center for Sustainable Transportation tool can be used to apply this method: https://ncst.ucdavis.edu/research/tools

This method would not be suitable for rural (non-MPO) locations in the state which are neither congested nor projected to become congested. It also may not be suitable for a new road that provides new connectivity across a barrier (e.g., a bridge across a river) if it would be expected to substantially

[35] See U.C. Davis, Institute for Transportation Studies (Oct. 2015) *Increasing Highway Capacity Unlikely to Relieve Traffic Congestion*; Boarnet and Handy (Sept. 2014) *Impact of Highway Capacity and Induced Travel on Passenger Vehicle Use and Greenhouse Gas Emissions*, California Air Resources Board Policy Brief, available at https://www.arb.ca.gov/cc/sb375/policies/hwycapacity/highway_capacity_brief.pdf.
[36] See Duranton and Turner (2011) *The Fundamental Law of Road Congestion: Evidence from US cities*, available at http://www.nber.org/papers/w15376.

shorten existing trips. If it is likely to be substantial, the trips-shortening effect should be examined explicitly.

The effects of roadway capacity on vehicle travel can also be applied at a programmatic level. For example, in a regional planning process the lead agency can use that program-level analysis to streamline later project-level analysis. (See CEQA Guidelines, § 15168.) A program-level analysis of VMT should include effects of the program on land use patterns, and the VMT that results from those land use effects. In order for a program-level document to adequately analyze potential induced demand from a project or program of roadway capacity expansion, lead agencies cannot assume a fixed land use pattern (i.e., a land use pattern that does not vary in response to the provision of roadway capacity). A proper analysis should account for land use investment and development pattern changes that react in a reasonable manner to changes in accessibility created by transportation infrastructure investments (whether at the project or program level).

Mitigation and Alternatives

Induced VMT has the potential to reduce or eliminate congestion relief benefits, increase VMT, and increase other environmental impacts that result from vehicle travel.[37] If those effects are significant, the lead agency will need to consider mitigation or alternatives. In the context of increased travel that is induced by capacity increases, appropriate mitigation and alternatives that a lead agency might consider include the following:

- Tolling new lanes to encourage carpools and fund transit improvements
- Converting existing general purpose lanes to HOV or HOT lanes
- Implementing or funding off-site travel demand management
- Implementing Intelligent Transportation Systems (ITS) strategies to improve passenger throughput on existing lanes

Tolling and other management strategies can have the additional benefit of preventing congestion and maintaining free-flow conditions, conferring substantial benefits to road users as discussed above.

G. Analyzing Other Impacts Related to Transportation

While requiring a change in the methodology of assessing transportation impacts, Public Resources Code section 21099 notes that this change "does not relieve a public agency of the requirement to analyze a project's potentially significant transportation impacts related to air quality, noise, safety, or any other impact associated with transportation." OPR expects that lead agencies will continue to

[37] See National Center for Sustainable Transportation (Oct. 2015) *Increasing Highway Capacity Unlikely to Relieve Traffic Congestion*, available at http://www.dot.ca.gov/newtech/researchreports/reports/2015/10-12-2015-NCST_Brief_InducedTravel_CS6_v3.pdf; see Duranton and Turner (2011) *The Fundamental Law of Road Congestion: Evidence from US cities*, available at http://www.nber.org/papers/w15376.

address mobile source emissions in the air quality and noise sections of an environmental document and the corresponding studies that support the analysis in those sections. Lead agencies should continue to address environmental impacts of a proposed project pursuant to CEQA's requirements, using a format that is appropriate for their particular project.

Because safety concerns result from many different factors, they are best addressed at a programmatic level (i.e., in a general plan or regional transportation plan) in cooperation with local governments, metropolitan planning organizations, and, where the state highway system is involved, the California Department of Transportation. In most cases, such an analysis would not be appropriate on a project-by-project basis. Increases in traffic volumes at a particular location resulting from a project typically cannot be estimated with sufficient accuracy or precision to provide useful information for an analysis of safety concerns. Moreover, an array of factors affect travel demand (e.g., strength of the local economy, price of gasoline), causing substantial additional uncertainty. Appendix B of OPR's General Plan Guidelines summarizes research which could be used to guide a programmatic analysis under CEQA. Lead agencies should note that automobile congestion or delay does not constitute a significant environmental impact (Pub. Resources Code, §21099(b)(2)), and safety should not be used as a proxy for road capacity.

H. VMT Mitigation and Alternatives

When a lead agency identifies a significant impact, it must identify feasible mitigation measures that could avoid or substantially reduce that impact. (Pub. Resources Code, § 21002.1, subd. (a).) Additionally, CEQA requires that an environmental impact report identify feasible alternatives that could avoid or substantially reduce a project's significant environmental impacts.

Indeed, the California Court of Appeal recently held that a long-term regional transportation plan was deficient for failing to discuss an alternative which could significantly reduce total vehicle miles traveled. In *Cleveland National Forest Foundation v. San Diego Association of Governments, et al.* (2017) 17 Cal.App.5th 413, the court found that omission "inexplicable" given the lead agency's "acknowledgment in its Climate Action Strategy that the state's efforts to reduce greenhouse gas emissions from on-road transportation will not succeed if the amount of driving, or vehicle miles traveled, is not significantly reduced." (*Cleveland National Forest Foundation*, *supra*, 17 Cal.App.5th at p. 436.) Additionally, the court noted that the project alternatives focused primarily on congestion relief even though "the [regional] transportation plan is a long-term and congestion relief is not necessarily an effective long-term strategy." (*Id.* at p. 437.) The court concluded its discussion of the alternatives analysis by stating: "Given the acknowledged long-term drawbacks of congestion relief alternatives, there is not substantial evidence to support the EIR's exclusion of an alternative focused primarily on significantly reducing vehicle trips." (*Ibid*.)

Several examples of potential mitigation measures and alternatives to reduce VMT are described below. However, the selection of particular mitigation measures and alternatives are left to the discretion of

the lead agency, and mitigation measures may vary, depending on the proposed project and significant impacts, if any. Further, OPR expects that agencies will continue to innovate and find new ways to reduce vehicular travel.

Potential measures to reduce vehicle miles traveled include, but are not limited to:

- Improve or increase access to transit.
- Increase access to common goods and services, such as groceries, schools, and daycare.
- Incorporate affordable housing into the project.
- Incorporate neighborhood electric vehicle network.
- Orient the project toward transit, bicycle and pedestrian facilities.
- Improve pedestrian or bicycle networks, or transit service.
- Provide traffic calming.
- Provide bicycle parking.
- Limit or eliminate parking supply.
- Unbundle parking costs.
- Provide parking cash-out programs.
- Implement roadway pricing.
- Implement or provide access to a commute reduction program.
- Provide car-sharing, bike sharing, and ride-sharing programs.
- Provide transit passes.
- Shifting single occupancy vehicle trips to carpooling or vanpooling, for example providing ride-matching services.
- Providing telework options.
- Providing incentives or subsidies that increase the use of modes other than single-occupancy vehicle.
- Providing on-site amenities at places of work, such as priority parking for carpools and vanpools, secure bike parking, and showers and locker rooms.
- Providing employee transportation coordinators at employment sites.
- Providing a guaranteed ride home service to users of non-auto modes.

Notably, because VMT is largely a regional impact, regional VMT-reduction programs may be an appropriate form of mitigation. In lieu fees have been found to be valid mitigation where there is both a commitment to pay fees and evidence that mitigation will actually occur. (*Save Our Peninsula Committee v. Monterey County Bd. of Supervisors* (2001) 87 Cal.App.4th 99, 140-141; *Gentry v. City of Murrieta* (1995) 36 Cal.App.4th 1359; *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 727–728.) Fee programs are particularly useful to address cumulative impacts. (CEQA Guidelines, § 15130, subd. (a)(3) [a "project's incremental contribution is less than cumulatively considerable if the project is required to implement or fund its fair share of a mitigation measure or measures designed to alleviate the cumulative impact"].) The mitigation program must undergo CEQA evaluation, either on the program as a whole, or the in-lieu fees or other mitigation must be evaluated

on a project-specific basis. (*California Native Plant Society v. County of El Dorado* (2009) 170 Cal.App.4th 1026.) That CEQA evaluation could be part of a larger program, such as a regional transportation plan, analyzed in a Program EIR. (CEQA Guidelines, § 15168.)

Examples of project alternatives that may reduce vehicle miles traveled include, but are not limited to:

- Locate the project in an area of the region that already exhibits low VMT.
- Locate the project near transit.
- Increase project density.
- Increase the mix of uses within the project or within the project's surroundings.
- Increase connectivity and/or intersection density on the project site.
- Deploy management strategies (e.g., pricing, vehicle occupancy requirements) on roadways or roadway lanes.

Appendix 1. Considerations About Which VMT to Count

Consistent with the obligation to make a good faith effort to disclose the environmental consequences of a project, lead agencies have discretion to choose the most appropriate methodology to evaluate project impacts.[38] A lead agency can evaluate a project's effect on VMT in numerous ways. The purpose of this document is to provide technical considerations in determining which methodology may be most useful for various project types.

Background on Estimating Vehicle Miles Traveled

Before discussing specific methodological recommendations, this section provides a brief overview of modeling and counting VMT, including some key terminology.

Here is an illustrative example of some methods of estimating vehicle miles traveled. Consider the following hypothetical travel day (all by automobile):

1. Residence to Coffee Shop
2. Coffee Shop to Work
3. Work to Sandwich Shop
4. Sandwich Shop to Work
5. Work to Residence
6. Residence to Store
7. Store to Residence

Trip-based assessment of a project's effect on travel behavior counts VMT from individual trips to and from the project. It is the most basic, and traditionally the most common, method of counting VMT. A trip-based VMT assessment of the residence in the above example would consider segments 1, 5, 6 and 7. For residential projects, the sum of home-based trips is called *home-based* VMT.

A *tour-based* assessment counts the entire home-back-to-home tour that includes the project. A tour-based VMT assessment of the residence in the above example would consider segments 1, 2, 3, 4, and 5 in one tour, and 6 and 7 in a second tour. A tour-based assessment of the workplace would include segments 1, 2, 3, 4, and 5. Together, all tours comprise *household* VMT.

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[38] The California Supreme Court has explained that when an agency has prepared an environmental impact report:

> [T]he issue is not whether the [lead agency's] studies are irrefutable or whether they could have been better. The relevant issue is only whether the studies are sufficiently credible to be considered as part of the total evidence that supports the [lead agency's] finding[.]

(*Laurel Heights Improvement Assn. v. Regents of the University of California* (1988) 47 Cal.3d 376, 409; see also *Eureka Citizens for Responsible Gov't v. City of Eureka* (2007) 147 Cal.App.4th 357, 372.)

Both trip- and tour-based assessments can be used as measures of transportation efficiency, using denominators such as per capita, per employee, or per person-trip.

Trip- and Tour-based Assessment of VMT

As illustrated above, a tour-based assessment of VMT is a more complete characterization of a project's effect on VMT. In many cases, a project affects travel behavior beyond the first destination. The location and characteristics of the home and workplace will often be the main drivers of VMT. For example, a residential or office development located near high quality transit will likely lead to some commute trips utilizing transit, affecting mode choice on the rest of the tour.

Characteristics of an office project can also affect an employee's VMT beyond the work tour. For example, a workplace located at the urban periphery, far from transit, can require an employee to own a car, which in turn affects the entirety of an employee's travel behavior and VMT. For this reason, when estimating the effect of an office development on VMT, it may be appropriate to consider total employee VMT if data and tools, such as tour-based models, are available. This is consistent with CEQA's requirement to evaluate both direct and *indirect* effects of a project. (See CEQA Guidelines, § 15064, subd. (d)(2).)

Assessing Change in Total VMT

A third method, estimating the *change in total VMT* with and without the project, can evaluate whether a project is likely to divert existing trips, and what the effect of those diversions will be on total VMT. This method answers the question, "What is the net effect of the project on area VMT?" As an illustration, assessing the total change in VMT for a grocery store built in a food desert that diverts trips from more distant stores could reveal a net VMT reduction. The analysis should address the full area over which the project affects travel behavior, even if the effect on travel behavior crosses political boundaries.

Using Models to Estimate VMT

Travel demand models, sketch models, spreadsheet models, research, and data can all be used to calculate and estimate VMT (see Appendix F of the preliminary discussion draft). To the extent possible, lead agencies should choose models that have sensitivity to features of the project that affect VMT. Those tools and resources can also assist in establishing thresholds of significance and estimating VMT reduction attributable to mitigation measures and project alternatives. When using models and tools for those various purposes, agencies should use comparable data and methods, in order to set up an "apples-to-apples" comparison between thresholds, VMT estimates, and VMT mitigation estimates.

Models can work together. For example, agencies can use travel demand models or survey data to estimate existing trip lengths and input those into sketch models such as CalEEMod to achieve more

accurate results. Whenever possible, agencies should input localized trip lengths into a sketch model to tailor the analysis to the project location. However, in doing so, agencies should be careful to avoid double counting if the sketch model includes other inputs or toggles that are proxies for trip length (e.g., distance to city center). Generally, if an agency changes any sketch model defaults, it should record and report those changes for transparency of analysis. Again, trip length data should come from the same source as data used to calculate thresholds to be sure of an "apples-to-apples" comparison.

Additional background information regarding travel demand models is available in the California Transportation Commission's "2010 Regional Transportation Plan Guidelines," beginning at page 35.

Appendix 2. Induced Travel: Mechanisms, Research, and Additional Assessment Approaches

Induced travel occurs where roadway capacity is expanded in an area of present or projected future congestion. The effect typically manifests over several years. Lower travel times make the modified facility more attractive to travelers, resulting in the following trip-making changes:

- **Longer trips.** The ability to travel a long distance in a shorter time increases the attractiveness of destinations that are farther away, increasing trip length and vehicle travel.
- **Changes in mode choice.** When transportation investments are devoted to reducing automobile travel time, travelers tend to shift toward automobile use from other modes, which increases vehicle travel.
- **Route changes.** Faster travel times on a route attract more drivers to that route from other routes, which can increase or decrease vehicle travel depending on whether it shortens or lengthens trips.
- **Newly generated trips.** Increasing travel speeds can induce additional trips, which increases vehicle travel. For example, an individual who previously telecommuted or purchased goods on the internet might choose to accomplish those tasks via automobile trips as a result of increased speeds.
- **Land Use Changes.** Faster travel times along a corridor lead to land development farther along that corridor; that new development generates and attracts longer trips, which increases vehicle travel. Over several years, this induced growth component of induced vehicle travel can be substantial, making it critical to include in analyses.

Each of these effects has implications for the total amount of vehicle travel. These effects operate over different time scales. For example, changes in mode choice might occur immediately, while land use changes typically take a few years or longer. CEQA requires lead agencies to analyze both short-term and long-term effects.

Evidence of Induced Vehicle Travel. A large number of peer reviewed studies[39] have demonstrated a causal link between highway capacity increases and VMT increases. Many provide quantitative estimates of the magnitude of the induced VMT phenomenon. Collectively, they provide high quality evidence of the existence and magnitude of the induced travel effect.

[39] See, e.g., Boarnet and Handy (Sept. 2014) Impact of Highway Capacity and Induced Travel on Passenger Vehicle Use and Greenhouse Gas Emissions, California Air Resources Board Policy Brief, available at https://www.arb.ca.gov/cc/sb375/policies/hwycapacity/highway_capacity_brief.pdf; National Center for Sustainable Transportation (Oct. 2015) *Increasing Highway Capacity Unlikely to Relieve Traffic Congestion*, available at http://www.dot.ca.gov/research/researchreports/reports/2015/10-12-2015-NCST_Brief_InducedTravel_CS6_v3.pdf.

Most of these studies express the amount of induced vehicle travel as an "elasticity," which is a multiplier that describes the additional vehicle travel resulting from an additional lane mile of roadway capacity added. For example, an elasticity of 0.6 would signify an 0.6 percent increase in vehicle travel for every 1.0 percent increase in lane miles. Many of these studies distinguish "short run elasticity" (increase in vehicle travel in the first few years) from "long run elasticity" (increase in vehicle travel beyond the first few years). Long run elasticity is larger than short run elasticity, because as time passes, more of the components of induced vehicle travel materialize. Generally, short run elasticity can be thought of as excluding the effects of land use change, while long run elasticity includes them. Most studies find a long run elasticity between 0.6 and just over 1.0,[40] meaning that every increase in lanes miles of one percent leads to an increase in vehicle travel of 0.6 to 1.0 percent. The most recent major study finds the elasticity of vehicle travel by lanes miles added to be 1.03; in other words, each percent increase in lane miles results in a 1.03 percent increase in vehicle travel.[41] (An elasticity greater than 1.0 can occur because new lanes induce vehicle travel that spills beyond the project location.) In CEQA analysis, the long-run elasticity should be used, as it captures the full effect of the project rather than just the early-stage effect.

Quantifying Induced Vehicle Travel Using Models. Lead agencies can generally achieve the most accurate assessment of induced vehicle travel resulting from roadway capacity increasing projects by applying elasticities from the academic literature, because those estimates include vehicle travel resulting from induced land use. If a lead agency chooses to use a travel demand model, additional analysis would be needed to account for induced land use. This section describes some approaches to undertaking that additional analysis.

Proper use of a travel demand model can capture the following components of induced VMT:

- Trip length (generally increases VMT)
- Mode shift (generally shifts from other modes toward automobile use, increasing VMT)
- Route changes (can act to increase or decrease VMT)
- Newly generated trips (generally increases VMT)
    - Note that not all travel demand models have sensitivity to this factor, so an off-model estimate may be necessary if this effect could be substantial.

However, estimating long-run induced VMT also requires an estimate of the project's effects on land use. This component of the analysis is important because it has the potential to be a large component of

[40] See Boarnet and Handy (Sept. 2014) *Impact of Highway Capacity and Induced Travel on Passenger Vehicle Use and Greenhouse Gas Emissions*, California Air Resources Board Policy Brief, p. 2, available at https://www.arb.ca.gov/cc/sb375/policies/hwycapacity/highway_capacity_brief.pdf.

[41] Duranton and Turner (2011) *The Fundamental Law of Road Congestion: Evidence from US cities*, available at http://www.nber.org/papers/w15376.

the overall induced travel effect. Options for estimating and incorporating the VMT effects that are caused by the subsequent land use changes include:

1. *Employ an expert panel.* An expert panel could assess changes to land use development that would likely result from the project. This assessment could then be analyzed by the travel demand model to assess effects on vehicle travel. Induced vehicle travel assessed via this approach should be verified using elasticities found in the academic literature.
2. *Adjust model results to align with the empirical research.* If the travel demand model analysis is performed without incorporating projected land use changes resulting from the project, the assessed vehicle travel should be adjusted upward to account for those land use changes. The assessed VMT after adjustment should fall within the range found in the academic literature.
3. *Employ a land use model, running it iteratively with a travel demand model.* A land use model can be used to estimate the land use effects of a roadway capacity increase, and the traffic patterns that result from the land use change can then be fed back into the travel demand model. The land use model and travel demand model can be iterated to produce an accurate result.

A project which provides new connectivity across a barrier, such as a new bridge across a river, may provide a shortened path between existing origins and destinations, thereby shortening existing trips. In rare cases, this trip-shortening effect might be substantial enough to reduce the amount of vehicle travel resulting from the project below the range found in the elasticities in the academic literature, or even lead a net reduction in vehicle travel overall. In such cases, the trip-shortening effect could be examined explicitly.

Whenever employing a travel demand model to assess induced vehicle travel, any limitation or known lack of sensitivity in the analysis that might cause substantial errors in the VMT estimate (for example, model insensitivity to one of the components of induced VMT described above) should be disclosed and characterized, and a description should be provided on how it could influence the analysis results. A discussion of the potential error or bias should be carried into analyses that rely on the VMT analysis, such as greenhouse gas emissions, air quality, energy, and noise.

Appendix 4: Review of Vehicle Miles Traveled Mitigation Strategies for Use in the Tahoe Basin

FEHR PEERS

Memorandum

Date: November 20, 2020

To: Stephanie Holloway, Placer County
Melanie Sloan, TRPA

From: Rod Brown, Rob Hananouchi, and Ron Milam, Fehr & Peers

Subject: Review of Vehicle Miles Traveled Mitigation Strategies for Use in the Tahoe Basin

RS20-3907

Introduction

This memorandum reviews and evaluates potential mitigation strategies that may be used to reduce vehicle miles of travel (VMT) associated with land use projects, land use plans, and transportation projects in the Tahoe Basin. Three sources were reviewed for potential strategies:

- *Quantifying Greenhouse Gas Mitigation Measures*, California Air Pollution Control Officers Association (CAPCOA), August 2010
- *Lake Tahoe Regional Transportation Plan (Draft)*, TRPA, September 2020
- *Resort Triangle Transportation Plan*, Placer County, September 2020

Each of the documents reviewed for this memorandum is summarized below.

When applying mitigation strategies in the Tahoe Basin, the following factors are important to consider:

- Few studies have been conducted in areas that are similar to Tahoe, which have unique factors such as high amounts of visitor travel and large seasonality factors. Therefore, declaring that a specific strategy, or combination of strategies, will reduce VMT below a threshold of significance may pose a potential risk if this finding is challenged, unless additional data is compiled to demonstrate that the strategy will achieve the necessary VMT reduction in the Tahoe context. However, these VMT reduction strategies still should be considered when identifying measures that mitigate VMT impacts to the extent feasible.

FEHR PEERS

Memorandum

Date: July 17, 2020

To: Stephanie Holloway, Placer County
Melanie Sloan, TRPA

From: Rob Hananouchi, Kashfia Nehrin, & Ron Milam, Fehr & Peers

Subject: Tahoe Activity-Based Travel Demand Model Assessment

RS20-3907

This memorandum presents a qualitative assessment of the Tahoe activity-based travel demand model (Tahoe AB model) based on model documentation provided by Tahoe Regional Planning Agency (TRPA) staff. This assessment uses the model documentation to assess the Tahoe AB model's capabilities of producing vehicle miles of travel (VMT) estimates for transportation impact assessment in compliance with the California Environmental Quality Act (CEQA). The results of this assessment are compared alongside previously completed assessments of the California Statewide Travel Demand Model (CSTDM) and VMT sketch planning tools. The intent of this assessment is to start a dialogue with TRPA and local agencies about the strengths and weaknesses of available tools to estimate VMT for project-scale effects in the Tahoe Basin.

Background

TRPA and local lead agencies in the Tahoe Basin need to estimate VMT for impact assessment purposes. This includes environmental impact assessment per the requirements identified in Article VII of the Tahoe Regional Planning Compact and under the California Environmental Quality Act (CEQA). Article VII requirements would apply to all projects in the Tahoe Basin while CEQA requirements apply to projects in the State of California portion of the Tahoe Basin only.

The TRPA VMT Threshold Standard was adopted in 1982 to address nitrogen oxides (NOx) tailpipe emissions from vehicles and their effect on lake clarity. Since 1982, NOx emissions from mobile sources have greatly reduced as a result of increasingly stringent tailpipe emissions standards. However, VMT

remains an important performance measure in efforts to reduce auto dependence, reduce greenhouse gases (GHG), and comply with related TRPA and California goals. Therefore, TRPA is in the process of updating its VMT Threshold Standard for assessing the VMT impacts of projects in the Tahoe Basin.

Senate Bill (SB) 743 in California initiated considerable changes to the evaluation of transportation impacts under CEQA. Specifically, SB 743 directed the Governor's Office of Planning and Research (OPR) to amend the CEQA Guidelines to establish new metrics for determining the significance of transportation impacts, and established that automobile delay, as described by level of service (LOS) or similar measures of vehicular capacity or traffic congestion, shall not be considered a significant impact on the environment upon certification of the amended CEQA Guidelines by the Natural Resources Agency. The amended CEQA Guidelines were certified in December 2018, eliminating the use of LOS as a measure for environmental impact. The amended CEQA Guidelines also state that "generally, VMT is the most appropriate measure of transportation impacts" and require the use of VMT statewide as of July 1, 2020. The CEQA Guidelines further explain that a "lead agency may use models to estimate a project's vehicle miles traveled."

To aid in SB 743 implementation, OPR released a *Technical Advisory on Evaluating Transportation Impacts in CEQA* (Technical Advisory) in December 2018. The Technical Advisory acknowledges that "CEQA generally defers to lead agencies on the choice of methodology to analyze impacts." Therefore, the Technical Advisory provides "advice and recommendations," which CEQA lead agencies may use at their discretion for implementing SB 743 changes but "does not alter lead agency discretion in preparing environmental documents subject to CEQA." The Technical Advisory includes technical recommendations regarding the assessment of VMT. With regards to methodology for estimating VMT, the Technical Advisory states that "travel demand models, sketch models, spreadsheet models, research, and data can all be used to calculate and estimate VMT. To the extent possible, lead agencies should choose models that have sensitivity to features of the project that affect VMT." The Technical Advisory further states that "when using models and tools for [establishing thresholds of significance and estimating VMT], agencies should use comparable data and methods, in order to set up an 'apples-to-apples' comparison between thresholds, VMT estimates, and VMT mitigation estimates."

CEQA Expectations

CEQA compliance has two basic elements. The first is the legal risk of challenge associated with inadequately analyzing impacts due to use of models that do not meet benchmark expectations. The second is the mitigation risk of mis-identifying the impact and the mitigation strategies to reduce the impact. Agencies with a high risk of legal challenges will likely be concerned about both elements while

agencies with less legal risk should still be concerned about the second element since it is also relevant for all other transportation analysis based on model forecasts.

The CEQA Guidelines contain clear expectations for environmental analysis as noted below; however, the CEQA Guidelines are silent about what data, analysis methods, models, and mitigation approaches are adequate for transportation impacts.

CEQA Guidelines – Expectations for Environmental Impact Analysis

§ 15003 (F) = fullest possible protection of the environment…

§ 15003 (I) = adequacy, completeness, and good-faith effort at full disclosure…

§ 15125 (C) = EIR must demonstrate that the significant environmental impacts of the proposed project were adequately investigated…

§ 15144 = an agency must use its best efforts to find out and disclose…

§ 15151 = sufficient analysis to allow a decision which intelligently takes account of environmental consequences…

All of these suggest accuracy is important and have largely been recognized by the courts as the context for judging an adequate analysis. So, then what is the basis for determining adequacy, completeness, and a good faith effort when it comes to forecasting and transportation impact analysis? A review of relevant court cases suggests the following conclusions.

- CEQA does not require the use of any specific methodology. Agencies must have substantial evidence to support their significance conclusions. (Association of Irritated Residents v. County of Madera (2003) 107 Cal.App.4th 1383.)
- CEQA does not require a lead agency to conduct every test or perform all research, study, and experimentation recommended or demanded by commenters. (CEQA Guidelines, § 15204, subd. (a))
- CEQA does not require perfection in an EIR but rather adequacy, completeness and a good faith effort at full disclosure while including sufficient detail to enable those who did not participate in the EIR preparation to understand and consider meaningfully the issues raised by the project. (Kings County Farm Bureau v. City of Hanford (1990) 221 Cal.App.3d 692)
- Lead agencies should not use scientifically outdated information in assessing the significance of impacts. (Berkeley Keep Jets Over the Bay Comm. v. Board of Port Comm. (2001) 91 Cal.App.4th 1344.)

- Impact analysis should improve as more and better data becomes available and as scientific knowledge evolves. (Cleveland National Forest Foundation v. San Diego Association of Governments, Cal. Supreme Ct. S223603, 2017).

These conclusions tend to reinforce the basic tenet of CEQA that requires having substantial evidence to support all aspects of the impact analysis and related decisions. Further, analysis should rely on the latest state of the practice, or even best practice methods, to provide accurate and meaningful results. This expectation is grounded in the basic purpose behind environmental regulations like CEQA that attempt to accurately identify and disclose potential impacts and to develop effective mitigation. Having accurate and reliable travel forecasts is essential for meeting these expectations. A key challenge in following the state-of-the-practice is that it can vary depending on many factors. Some of the key factors are listed below:

- Complexity of the transportation network and number of operating modes
- Available data
- Urban versus rural setting
- Planned changes in the transportation network (particularly to major roads or transit systems)
- Availability of resources to develop and apply travel demand models
- Population and employment levels
- Congestion levels
- Regulatory requirements
- Types of technical and policy questions posed by decision makers
- Desired level of confidence in the analysis findings
- Anticipated level of legal scrutiny

In California, travel forecasts are generated using various forms of models that range from simple spreadsheets based on historic traffic growth trends to complex computer models that account for numerous factors that influence travel demand. According to Transportation and Land Development, 2nd Edition, ITE, 2002, the appropriate model depends on the size of the development project and its ability to affect the surrounding area. As projects increase in size, the likelihood of needing a complex model (such as a four-step model) increases because of the number of variables that influence travel demand and transportation network operations. The study area can also influence the type of model needed especially if congestion occurs or if multiple transportation modes operate in the study area. Either of these

conditions requires robust models that can account for the myriad of travel demand responses that can occur from land use or transportation network changes.

The other relevant national guidance on model applications and forecasting is the *NCHRP Report 765, Analytical Travel Forecasting Approaches for Project-Level Planning and Design*, Transportation Research Board, 2014. This is a detailed resource with many applicable sections. A few highlights related to forecasting expectations for models are listed below.

- A travel forecasting model should be sensitive to those policies and project alternatives that the model is expected to help evaluate.
- A travel forecasting model should be capable of satisfying validation standards that are appropriate to the application.
- Project-level travel forecasts, to the extent that they follow a conventional travel model, should be validated following the guidelines of the Travel Model Validation and Reasonableness Checking Manual, Second Edition from FHWA. Similar guidelines are provided in NCHRP Report 716. This level of validation is necessary, but not sufficient, for project-level forecasts. Project-level forecasts often require better accuracy than can be obtained from a travel model alone.
- The model should be subject to frequent recalibrations to ensure that validation standards are continuously met.

Tahoe AB Model Assessment

The information above was used to as the basis for the model assessment, which includes two components. The first component is a review of model ownership and maintenance, and the second component is assessing the adequacy of the Tahoe AB model against select criteria from the guidance material above.

Model Ownership and Maintenance Assessment

Public agencies that develop travel forecasting models for planning and impact analysis must maintain those models and frequently update and recalibrate them as explained above to ensure they remain

accurate and dependable for generating travel demand forecasts. This model ownership and maintenance assessment considers whether TRPA controls the following model components.

- Model documentation – does TRPA have the Tahoe AB model development documentation and any related user guidance?
  - Yes; TRPA maintains both model development documentation and a User Guide via a Github site that is publicly accessible.
- Model files – does TRPA maintain the model input and output files?
  - Yes; TRPA maintains both model input and output files.
- Model distribution – does TRPA control the distribution of the model files to users?
  - The Tahoe AB model is accessible through TRPA's Github site to distribute to users. However, currently TRPA does not require a user agreement or strictly control distribution of the model files.

Adequacy Assessment

The following section details the assessment of the Tahoe AB model's adequacy in producing reasonable travel (i.e., VMT) forecasts. This qualitative assessment uses the following specific criteria.

- Model documentation – availability of documentation regarding the model's development including its estimation, calibration, and validation as well as a user's guide.
- Completed calibration and validation within the past 5 years – recent calibration and validation is essential for ensuring the model accurately captures evolving changes in travel behavior. Per NCHRP Report 765, "The model should be subject to frequent recalibrations to ensure that validation standards are continuously met."
- Demonstrated sensitivity to VMT effects across demographic, land use, and multimodal network changes – validation reporting will be checked for static and dynamic tests per the *2017 Regional Transportation Plan Guidelines for Metropolitan Transportation Planning Organizations*, CTC, 2017 and *Travel Model Validation and Reasonableness Checking Manual, Second Edition*, TMIP, FHWA, 2010.
- Capable of producing both "project-generated VMT" and "project effect on VMT" estimates for households, home-based trips, work trips, and total trips – both metrics are essential for complete VMT analysis. Project-generated VMT is useful for understanding the VMT associated with the trips traveling to/from a project site. The 'project's effect on VMT' is more essential for understanding the full influence of the project since it can alter the VMT generation of neighboring land uses.

- Capable of producing regional, jurisdictional, and project-scale VMT estimates – VMT analysis for air quality, greenhouse gases, energy, and transportation impacts requires comparisons to thresholds at varying scales. For SB 743, the OPR Technical Advisory recommends thresholds based on comparisons to regional or city-wide averages.
- Level of VMT estimates that truncate trip lengths at model or political boundaries – The OPR Technical Advisory states that lead agencies should not truncate any VMT analysis because of jurisdictional or model boundaries. The intent of this recommendation is to ensure that VMT forecasts provide a full accounting of project effects.

The following matrix summarizes the assessment findings for the Tahoe AB model using these criteria.

Tahoe Activity Based Model

Screening Criteria	Screening Determination	Notes
Model Documentation	Available	Includes full overview of model, each sub-model, traffic assignment, external travel summary, and documentation of static and dynamic validation tests. Also includes User Guide.
Completed calibration and validation within the past 5 years	Yes – 2018	Static validation and calibration was conducted for 2018 conditions using Streetlight data and traffic counts. Three dynamic validation tests were also conducted.
Demonstrated sensitivity to VMT effects across demographic, land use, and multimodal network changes	No documentation of sensitivity tests for demographic changes.	Dynamic validation tests included: (1) modifying recreational attractiveness in Kings Beach, (2) adding residential units in Incline Village, and (3) increasing transit frequency. Each dynamic test revealed model outputs tended to change in the appropriate direction and magnitude for these land use and transportation changes.
	Yes – dynamic validation tests included land use and multimodal network changes.	
Capable of producing both "project-generated VMT" and "project effect on VMT" estimates for households, home-based trips, work trips, and total trips	Project-generated VMT – Yes	As an activity (tour)-based model, the Tahoe AB model can track household and work-based tours. The model does not automatically produce home-based or home-based work VMT output. However, these trip purposes are part of individual tour and could be isolated through additional programming.
	Project effect on VMT – Yes	
	Total VMT – Yes	
	Household VMT – Yes	
	Home-based VMT – Possible	
	Work VMT – Yes	
	Home-based work VMT – Possible	

Tahoe Activity Based Model

Screening Criteria	Screening Determination	Notes
Capable of producing regional, jurisdictional, and project-scale VMT estimates	Regional VMT – Yes	Would need to review the traffic analysis zone (TAZ) system to confirm TAZ boundaries nest within jurisdictional boundaries such that jurisdictional VMT could be isolated The model documentation included three dynamic validation tests. While the model produced reasonable results in these tests, this is too small a sample to verify sufficient sensitivity to the wide variety of potential projects that may require VMT analysis.. Model users should consider performing additional dynamic tests to verify model sensitivity for their projects within their specific geographic setting before applying the model 'off the shelf'.
	Jurisdictional VMT – Likely	
	Project-scale VMT – Uncertain	
Level of VMT estimates that truncate trip lengths at model or political boundaries	Minimal	The model includes the entire Tahoe Basin. External trips at model gateways are distinguished between short-distance and long-distance trips. External trip lengths for short-distance and long-distance trips have been added to the gateways to reflect trip lengths "outside the model area." These appended external trip lengths are calibrated/ validated based on Streetlight Data. Since Streetlight Data only captures the trip length to the "next stop outside the Tahoe Basin," it does not capture the full length of trips with intermediate stops (e.g., a trip from Sacramento to South Lake Tahoe with a stop in Placerville would only capture the leg from Placerville to South Lake Tahoe).

Overall, the Tahoe AB model generally is capable of producing VMT estimates for a variety of VMT metrics (i.e., Total VMT, Household VMT, Work VMT, etc.) at the regional, jurisdictional, and project level with the following conditions.

- Jurisdictional estimates will depend on the TAZ system and how will it conforms to jurisdictional boundaries.
- Project level sensitivity should be verified with each application by performing additional dynamic validation tests. The intent is to verify sensitivity for the type of project under analysis within the specific geographic area for that project. TRPA could also perform additional tests covering the most common projects to help reduce the level of modeling needed for subsequent projects. The dynamic tests could include a range of changes from minor to major and in different contexts (i.e., rural versus small-town versus urban (South Lake Tahoe)) to confirm that both the magnitude and

direction of change in travel behavior is appropriate. Some potential dynamic test options to consider include, but are not limited to:

- Demographic changes
  - Effects of converting residential units from short-term rental (STR) use to resident occupied units
- Land Use changes
  - New residential units targeted at certain income levels (i.e., workforce housing) at various locations in the Tahoe Basin (e.g., North Shore, South Shore, etc.)
  - Recreational attractions, which could range from:
    - Visitor/tourist-oriented amenities (i.e., commercial or recreational businesses)
    - Winter-sports attraction
    - Summer-sports attraction
    - Passive recreation destination (i.e., hiking trails, mountain biking trails, parkland, etc.)
- Transportation changes
  - Road diet
  - New roadways/bridges
  - New bikeway

Additional Considerations

Depending on the type of analysis, the following characteristics of the model may cause some limitations related to its forecasts.

- The Tahoe AB model does not have a freight or goods movement component. Currently, freight trips are accounted for in trips associated with residents, visitors, and workers such that they cannot be isolated and are not sensitive to change over time.

- The model inputs generally produce forecasts for a "model day" that represents a unique time period, specifically, the first two weeks of June, last week of August, and middle two weeks of September when summer recreation activity and local school operations briefly overlap. This "model day" may not match the appropriate analysis period for CEQA compliance.

Comparison to Other Tools & Methods

Fehr & Peers previously completed a qualitative assessment of the California Statewide Travel Demand Model (CSTDM) and sketch planning tools that estimate project-scale VMT. Appendix A presents the results of this qualitative assessment.

The table below provides a comparative assessment of these tools and data sources, alongside the Tahoe AB model. For quick comparison, the main findings are color coded as follows:

- Green – model or tool generally meets criterion expectations
- Orange – model or tool partially meets criterion expectations
- Red – model does not meet criterion expectations

Comparative Assessment of VMT Tools for Tahoe Basin

Criteria	Comparative Assessment		
	Tahoe AB Model	CSTDM	Sketch Planning Tools
Sensitive to VMT effects across demographic, land use, and multimodal network changes	No documentation of sensitivity tests for demographic changes.	Documentation does not reflect any sensitivity tests for demographic or land use changes.	Ranges from limited sensitivity to demographic and land use changes to some sensitivity to land use changes.
	Partial – dynamic validation tests included land use and multimodal network changes.	Documentation reflects sensitivity test for some multimodal network changes.	Most have no to limited sensitivity to multimodal network changes.
Capable of producing both "project-generated VMT" and "project effect on VMT" estimates for households, home-based trips, work trips, and total trips	Project-generated VMT – Yes	Project-generated VMT – No; scale is too large for project-level applications.	Most tools produce project-generated VMT estimates. Only UrbanFootprint and MXD+ are capable of producing project-effect on VMT.
	Project effect on VMT – Yes	Project effect on VMT – No; same as note above.	
	Total VMT – Yes	Total VMT – Yes	Some tools produce Total VMT only; others do household VMT only.
	Household VMT – Yes	Household VMT – Yes	
	Home-based VMT – Possible	Home-based VMT – Yes	Home-based VMT – No
	Work VMT – Yes	Work VMT – No	Work VMT – No
	Home-based work VMT – Possible	Home-based work VMT – No	Home-based work VMT – No

Comparative Assessment of VMT Tools for Tahoe Basin

Criteria	Comparative Assessment		
	Tahoe AB Model	CSTDM	Sketch Planning Tools
Capable of producing regional, jurisdictional, and project-scale VMT estimates	Regional VMT – Yes	Regional VMT – Yes	Regional VMT – No
	Jurisdictional VMT – Likely	Jurisdictional VMT – depends on jurisdiction's size and TAZ detail	Jurisdictional VMT – Most do not, but some may be able to produce for small jurisdictions.
	Project-scale VMT – Model is capable but requires verification for each project	Project-scale VMT – No; scale is too large for project-scale VMT estimates.	Project-scale VMT – Yes
Other strengths or limitations	Most detailed and locally-calibrated tool for the Tahoe Basin	Limited detail in the Tahoe Basin given the scale of the model.	Most tools can be applied relatively quickly, producing results with fewer inputs or processes than travel demand models. Some tools are dependent on subjective input of users. Most tools are not recommended for VMT calculations but could have utility for TDM mitigation evaluation. Tools are not calibrated to the Tahoe Basin.
	Model network does not extend beyond the Tahoe Basin, and therefore does not model trips with external origins or destinations (e.g., Sacramento, San Francisco Bay Area, Reno/Carson City, etc.)	Does not cover Nevada side of the Tahoe Basin. May not reflect full trip length for trips that leave California (i.e., trips to/from Nevada).	

While the Tahoe AB model has some limitations, it generally has fewer limitations than other available tools for producing VMT estimates for projects in the Tahoe Basin. Use of the model for project-scale application should include further dynamic validation tests as explained above. When a high level of confidence is desired in the model's VMT estimates, additional reasonableness checks can be made against StreetLight Data VMT estimates, which is described in further detail below.

Supplemental VMT Data

Big data vendors, such as StreetLight Data, offer VMT-specific data products that could be used to support VMT analyses. These big data vendors use anonymized location records from smart phones and

navigation devices to evaluate mobility patterns. This has several benefits when compared to baseline VMT estimates from travel forecasting models, including:

- Reflects actual travel behavior as opposed to the simulation of travel behavior generated by travel models
- Includes distinct travel behavior data over time, allowing for a breakdown by season or aggregation into a broader summary as opposed to modeling of a specific timeframe
    - This also allows for a more precise understanding for variation or changes in VMT over time (e.g., review changes resulting from a disruptive event, like the current COVID-19 pandemic).
    - Data can also be summarized over a longer time period to create a reasonable average estimate of daily VMT.

The VMT-specific data products offered by big data vendors can be used to estimate existing VMT levels for trips that travel to, from, through, and within the Tahoe Basin. Streetlight Data, in particular, offers VMT data products that produce VMT estimates for specific user-defined geographies and timeframes. Hence, customers can request VMT for a region (i.e., entire Tahoe Basin), jurisdiction (e.g., City of South Lake Tahoe), down to a specific census block group; and for a range of timeframes. This VMT data product can also disaggregate VMT into specific trip-purposes, such as work-related trips (i.e., commute trips), household or home-based trips, and visitor trips.

Since this data provides existing or past VMT-generation information, it could be used for proposed projects if those projects are generally consistent with the existing built environment characteristics (i.e., density, mix of uses, multimodal accessibility, etc.). However, it would not be appropriate to apply to proposed projects that would dramatically alter the existing demographics, land use, or multimodal transportation network.

Recommendations

This review revealed some limitations with the Tahoe AB model that can be addressed through the following model improvements.

- Address truncation of trip lengths for external trips with intermediate stops. This could be addressed by:
    - Obtaining customized smart phone/navigation device location data through a vendor to better capture the full length of the external trip tour.
    - Expanding the model network to include larger areas of Northern California and Northern Nevada that generate travel to/from the Tahoe Basin

- Add a freight component to the model to distinguish between freight travel and passenger travel
- Clearly define the required transportation 'analysis days' in the Basin and re-estimate the model to match those days
- Conduct additional dynamic tests to verify the model produces reasonable changes in VMT based on changes in demographics, land use, and transportation inputs at the project scale in various geographic locations throughout the Basin.
- Review, and if necessary, adjust TAZ boundaries to align with jurisdictional boundaries to produce model outputs by jurisdiction.
- Conduct additional reasonableness checks of the model's VMT estimates at the regional, jurisdictional, and project-scale against StreetLight Data VMT estimates based on mobile device data.

- Similarly, VMT reduction ranges associated with each mitigation measure should be applied with care, examining evidence for the calculations and its applicability to the Tahoe Basin.
- Reductions should be applied appropriately for the mitigation. Some reductions are for trips, requiring additional calculation to estimate VMT reduction. Others apply only to certain trip types, land use contexts, seasons, etc.

Quantifying Greenhouse Gas Mitigation Measures

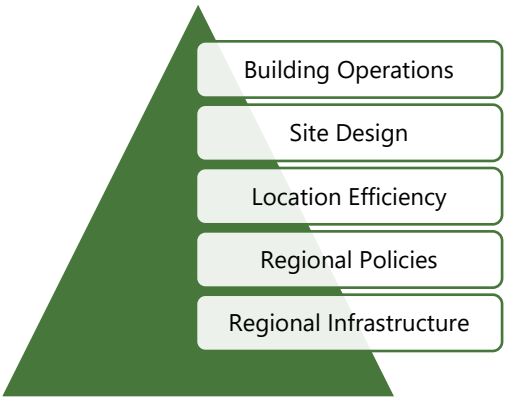
Quantifying Greenhouse Gas Mitigation Measures, released in 2010, contains many transportation demand management (TDM) strategies which may be used to reduce VMT. Fehr & Peers compiled new information published in research papers since release of the original CAPCOA report to assess the VMT effectiveness of each of these strategies. This work was documented in the Sacramento Area Council of Governments (SACOG) *Senate Bill 743 Implementation Tools* report (June 2020). Since the release of that report, Fehr & Peers has added additional research results. Attachment A lists these measures and summarizes these findings.

To demonstrate their effectiveness in an environmental analysis, TDM strategies must have sufficient evidence to quantify the level of VMT reduction that a strategy would achieve when implemented. In general, the TDM strategies can be quantified using CAPCOA calculation methodologies, but there are some important limitations for project site applications, land use context, and combining strategies as explained below.

Project Site Applications

The largest reductions in VMT (and resulting emissions) derive from regional and city-wide policies related to land use location efficiency and infrastructure investments that support transit, walking, and biking. While there are many measures related to site design and building operations that can influence VMT, they typically have smaller effects that are often dependent on building tenants. Figure 1 presents a conceptual illustration of the relative importance of scale.

Figure 1: Transportation-Related GHG Reduction Measure Effectiveness



Source: Fehr & Peers, 2020

One limitation of TDM research that stands out is whether research findings scale to individual project sites. Research that quantifies a TDM strategy's effect on VMT reduction often measures the effect at a scale that is larger than a single project or building site. Therefore, the transferability of the measured effect to a project site may be uncertain. Attachment A includes an assessment of land use project site applicability.

Land Use Context

Another important consideration is the influence of the land use context. The density and mix of surrounding land uses, plus the quality of available transit service, are all examples of land use context factors that influence vehicle trip making. Therefore, the CAPCOA methodology identifies VMT reduction maximums based on community types tied to land use context. The caps are applied at each step of the VMT reduction calculation (at the strategy scale, the combined strategy scale, and the global scale). However, these caps are not based on research related to the effectiveness of VMT reduction strategies in different land use contexts. Instead, the percentages were derived from a comparison of aggregate citywide VMT performance for Sebastopol, San Rafael, and San Mateo, where VMT performance ranged from 0 to 17 percent below the statewide VMT/capita average based on data collected prior to 2002. Results will vary in different land use contexts. Attachment A includes notes about new research relating to land use context.

Combining VMT Reduction Strategies

Each of the CAPCOA TDM strategies can be combined with others to increase the effectiveness of VMT mitigation. For example, building sidewalks and bikeways that connect neighborhoods to transit stops may increase transit use more than transit service improvements alone. However, the interaction between the various strategies is complex and sometimes counterintuitive. Generally, with each additional measure implemented, a VMT reduction is achieved, but the incremental

benefit of VMT reduction may diminish. To quantify the VMT reduction that results from combining strategies, the formula below can be applied absent additional knowledge or information:

$$Total\ VMT\ Reduction = (1 - P_a) * (1 - P_b) * (1 - P_c) * \ldots$$

where

$$P_x = percent\ reduction\ of\ each\ VMT\ reduction\ strategy$$

This adjustment methodology, commonly known as "multiplicative dampening," is not supported by research related to the actual effectiveness of combined strategies. The intent of including this formula is to provide a mechanism to minimize the potential to overstate the VMT reduction effectiveness.

Lake Tahoe Regional Transportation Plan

The *Lake Tahoe Regional Transportation Plan (RTP)* groups VMT reduction measures into two categories:

- Travel Demand Management (TDM): strategies to shift the travel choices people make away from the personal automobile to walking, biking, transit, and carpooling, and to visit and recreate in Tahoe during less busy travel times when there is more capacity on roadways and at recreation sites
- Transportation System Management (TSM): projects for transit, trails, technology, and communities to provide a reliable, safe, and convenient transportation system

These measures include a variety of policies, plans, and programs. RTP Appendix G, Table 7, Trip Reduction Impact Analysis (TRIA) Estimates, groups these measures into several strategies and provides the vehicle trip reduction estimated for each. Appendix G did not include supporting evidence such as citations to relevant academic literature to justify the vehicle trip reductions. Instead, this information is contained in a separate memo entitled *2020 TRIA Tool Methodology and Update Documentation*. Comments on the memo based on a cursory review are noted below:

- The TRIA adjustments are largely based on assumptions and not data reflecting specific trip reductions in the Lake Tahoe Basin. Many of the assumptions have no cited supporting evidence. Hence, the TRIA adjustments have limited confidence regarding their actual effect in the Lake Tahoe Basin. Under these circumstances, detailed monitoring of strategy performance is needed to ascertain actual effect sizes after implementation of specific strategies.
- Many TRIA adjustments rely on assumed transferability of a strategy's effect to the Lake Tahoe Basin without supporting evidence. For example, the adjustment for Intercept Lots is based on data from Alameda County, California where transit use is heavily tied to

commuter travel while the Intercept Lot is intended to reduce visitor trips. Another example is the Transit Information adjustment, which presumes that previous effects measured in Chicago would apply in the Lake Tahoe Basin. According to the memo, Chicago experienced a 1.8 percent to 2.2 percent increase in ridership due to real-time information and the full 2.2 percent was assumed to apply to Lake Tahoe where the land use context and transit market riders represent very different travel markets. However, the cited literature is for a study of real-time information effects in New York, Tampa, and Atlanta. There is a reference to Chicago effects that is used to point out the problems with previous studies where the study limitations contributed favorably to their study.

- How TRIA adjustments are applied to specific trips is not well documented. Most strategies influence specific origin-destination trip pairs. However, the memo contains limited details about how TRIA adjustments are applied. For example, the Intercept Lot reduction is applied to external trips taken by visitors according to the memo. Is this all external trips including day trip visitors? Is it external trips to all destinations in the Lake Tahoe Basin or only ones offering tourist accommodations? Another example is the adjustment taken for transit coordination. The memo describes the adjustment applying to Town Center trips. Is this all Town Center trips or just those between origin-destination pairs served by transit, which is a smaller sub-set of traffic analysis zones?
- The TRIA adjustments for TDM programs assume a target participation rate in voluntary trip reduction programs of 75-100 percent and a commute trip reduction of 5 percent based on a citation referencing the TRPA Code of Ordinances. No data or evidence from the Lake Tahoe Basin about actual participation rates or observed trip reductions was provided.
- The trip adjustments for Bicycle and Pedestrian indicate that each bicycle and pedestrian trip on a multi-use path results in a vehicle trip reduction; however, evidence was not cited to support this implication. A similar lack of evidence occurs for e-bike adjustments. It was simply assumed that e-bikes would become wide-spread throughout the Lake Tahoe Basin. Then it was further assumed that the longer distances typically travelled on an e-bike would lead to an increase in the bicycle mode split.

The text of the RTP also contains several measures not included in this table. Attachment B summarizes lists these strategies and additional measures.

Resort Triangle Transportation Plan

The *Resort Triangle Transportation Plan (RTTP)* includes transportation system recommendations for the Resort Triangle, generally defined as the area shaped by State Route (SR) 89, SR 267, and SR 28 in eastern Placer County and at the northern side of the Tahoe Basin. The RTTP presents

projects and programs that will provide more reliable and enjoyable ways to travel within the Resort Triangle. These recommendations are summarized as:

- Moving people along key corridors
- Managing parking
- Microtransit
- Encouraging commute choices

Many of the elements of these recommendations are strategies that may also reduce VMT. Attachment C lists these strategies.

Strategy Review

Fehr & Peers compared the CAPCOA strategies to the RTP and RTTP strategies. A cross-reference between the strategies is included in Attachments A, B, and C. Appendix D contains a summary of strategies recommended for the Tahoe Basin.

The Tahoe Basin has unique travel characteristics related to geography, tourism and visitors, external works, and seasonal factors. Furthermore, specific VMT reductions will vary based on the location of the project or mitigation; for example, reductions in a low-density single-family neighborhood may differ from those in a town center. VMT reductions from applying each strategy in the Tahoe Basin may therefore vary from estimates in the CAPCOA report and subsequent studies. Therefore, analysts should be particularly careful in applying trip reductions for any strategy where data about the effect is not directly available from the Lake Tahoe Basin. Ideally, trip reductions would only be applied under the following circumstances.

- The trip reduction is applied because the effect of the strategy is not captured in the model. Note that some effects are captured indirectly and should not be double counted.
- The trip reduction adjustment is based on data collected in the Lake Tahoe region, or can reasonably be applied to the Lake Tahoe region based on verifiable similarities between the data collection site and the Tahoe Basin (e.g., similar physical and human geography characteristics, demographics, economic conditions, regional travel behavior, etc.).
- The adjustment is appropriately applied to only the select trip types and/or purposes affected by the strategy (e.g., commute trip reduction strategies should only be applied to commute trips, not any other trip purpose or origin-destination (OD) trip pair.
- The adjustment is appropriately applied to the model day and specific time periods for the strategy.

As noted in the introduction of this memorandum, local data quantifying the effectiveness of specific VMT reduction strategies, as recommended above, may be challenging to obtain. Therefore, analysts should be aware that taking credit for the effectiveness of VMT reduction

strategies that are not supported by local data may increase the risk to an environmental analysis if challenged in court.

With these caveats, Attachment A includes an assessment for each strategy if its use is supported in the Tahoe Basin by the research assessment. This assessment is based on VMT research only; there may be other needs or reasons for implementing strategies which do not have data supporting VMT reduction quantification. As noted above, TRIA trip reduction estimates were generally not based on local studies and more local data is desired to justify trip reductions beyond those already accounted for in the TRPA model. Local estimates are generally preferable to estimates from other areas.

Attachment A also assesses the seasonal effectiveness of each strategy. Many strategies may be effective year-round. Other strategies, notably involving pedestrian and bicyclist facilities, will have diminished or no effectiveness during winter. Consistent snow removal can help maintain some effectiveness during winter. Local data may be used to determine effectiveness during winter.

Applying Strategies and Estimating Reductions

When applying strategies to a project or plan, the following factors should be considered:

- When a range of reductions is provided for a strategy, review the cited research and CAPCOA guide to determine the conditions most comparable to the project site and how to calculate reductions. Reductions may vary by the location of a project, land use context, size of the project, distance to key destinations, and/or other factors.
- If more than one reduction is being evaluated, apply the guidance above, Additionally, apply the guidance within the CAPCOA guide about combining measures within subcategories (pages 61-63), if appropriate.
- Limit total VMT reductions based on the land use context. According to the CAPCOA guide, the maximum possible reduction is 20 percent for a suburban center location or 15 percent for a suburban location (pages 60-61). However, these maximums are not tied to TDM effectiveness research and have not been evaluated for the Lake Tahoe Basin. Actual maximums in the Tahoe Basin are unknown.
- The Tahoe Basin, due to its large number of visitors, seasonality, land use, and other factors, has unique travel characteristics compared to typical suburban centers or general suburban contexts. Wherever possible, local data should be used when estimating VMT reductions. When applying VMT reductions based on studies from other areas, the possible effects of the Tahoe Basin's unique characteristics should be considered when estimating reductions.

VMT Reduction Programs

In response to the limitations of focusing exclusively on project site TDM strategies, new mitigation concepts are emerging that cover larger areas and rely on region- or jurisdiction-scale programs to achieve VMT reductions. These program-based concepts are outlined below. The RTP includes discussion of the development of such programs. As with all VMT mitigation, these programs require substantial evidence to demonstrate that the projects included in the programs would achieve the expected VMT reductions. Additionally, the discretionary action to adopt these programs may require CEQA review.

- VMT Impact Fee Program – This concept resembles a traditional impact fee program in compliance with the mitigation fee act and uses VMT as a metric. The nexus for the fee program would be a VMT reduction goal consistent with the CEQA threshold established by a lead agency for SB 743 purposes. The main difference from a fee program based on a metric such as vehicle LOS is that the VMT reduction nexus results in a capital improvement program (CIP) consisting largely of transit, bicycle, and pedestrian projects. These types of fee programs are time consuming to develop, monitor, and maintain but are recognized as an acceptable form of CEQA mitigation if they can demonstrate that the CIP projects will be fully funded and implemented. The City of Los Angeles is the first city in California to complete a nexus study for this type of program. TRPA will also update their air quality mitigation fee program to use VMT instead of trips.
- VMT Exchanges – This concept (along with VMT banks) borrows mitigation approaches from other environmental analysis such as wetlands. The concept relies on a developer agreeing to implement a predetermined VMT reducing project or proposing a new one in exchange for the ability to develop a VMT-generating project. The mitigation projects may or may not be located near the developer's project site. The concept requires a facilitating entity (such as the lead agency) to match the VMT generator (the development project) with the VMT reducing project and ensure through substantial evidence that the VMT reduction is valid. Another requirement is a determination of the necessary time to demonstrate a VMT reduction. For example, how many years of VMT reduction are required to declare a VMT impact less than significant? A final requirement is that mitigation projects would not have otherwise occurred without the exchange, which is a condition known as additionality.
- VMT Banks – This concept attempts to create a monetary value for VMT reduction (for example., credits) such that a developer could purchase VMT reduction credits. The money exchanged for credits could be applied to local, regional, or state level VMT reduction projects or actions. This program is more complicated than an exchange and would require more time and effort to set up and implement. It would include the requirements above for an exchange, such as mitigation time periods and additionality determinations, while also addressing the unique challenge of estimating how much VMT

reduction is associated with each credit and whether this value would change over time based on mitigation performance and new mitigation offerings.

Table 1 compares the pros and cons of these three programs. Although implementation of any of these programs would require an upfront cost, they have several advantages over project site TDM strategies, including but not limited to the following:

- CEQA streamlining – These programs provide a funding mechanism for project mitigation and may require less project-site monitoring to demonstrate that significant impacts are reduced to a less-than-significant level. Additionally, projects could be screened from completing a quantitative VMT analysis; or, if a quantitative VMT analysis is required, the cost would be somewhat less than the cost for analyzing LOS impacts.
- Greater VMT reduction potential – Since these programs coordinate citywide or region wide land use and transportation projects, they have the potential to result in greater VMT reduction potential than site-level TDM strategies that are applied on a project-by-project basis. Additionally, these programs expand the amount of feasible mitigation for reducing VMT impacts.
- Legal compliance – The VMT reduction programs can help build a case for a nexus between a VMT impact and funding for capital improvement programs.

However, program-based approaches also have at least one disadvantage: they may lead to increased development costs.

Table 1: VMT Mitigation Program Type Comparison

Program Type	Pros	Cons
Impact Fee Program	• Common and accepted practice • Accepted for CEQA mitigation • Adds certainty to development costs • Allows for regional scale mitigation projects • Increases potential VMT reduction compared to project site mitigation only	• Time consuming and expensive to develop and maintain • Requires clear nexus between CIP projects and VMT reduction • Increases mitigation costs for developers because it increases feasible mitigation options
Mitigation Exchange	• Limited complexity • Reduced nexus obligation • Expands mitigation to include costs for programs, operations, and maintenance • Allows for regional scale mitigation projects • Allows for mitigation projects to be in other jurisdictions • Increases potential VMT reduction compared to project site mitigation only	• Requires additionality[1] • Potential for mismatch between mitigation need (project site) and mitigation project location • Increases mitigation costs for developers because it increases feasible mitigation options • Unknown timeframe for mitigation life
Mitigation Bank	• Adds certainty to development costs • Allows for regional scale projects • Allows for mitigation projects to be in other jurisdictions • Allows regional or state transfers • Expands mitigation options to include costs for programs, operations, and maintenance • Increases potential VMT reduction compared to project site mitigation only	• Requires additionality[1] • Time consuming and expensive to develop and maintain • Requires strong nexus • Political difficulty distributing mitigation dollars/projects • Increases mitigation costs for developers because it increases feasible mitigation options • Unknown timeframe for mitigation life

Note: [1]Additionality: not required by law or regulation or otherwise considered part of the baseline.
Source: Fehr & Peers, 2020

Attachments

- Attachment A: CAPCOA Strategies, New Research Since 2010, and Tahoe RTP and RTTP Strategies
- Attachment B: *Tahoe Basin RTP* Appendix G Table 7 (TRIA Estimates) Comparison to CAPCOA Strategies
- Attachment C: *Placer County Resort Triangle Transportation Plan* Comparison to CAPCOA Strategies

- Attachment D: Summary of Recommended CAPCOA Strategies

Attachment A: CAPCOA Strategies, New Research Since 2010, and Tahoe RTP and RTTP Strategies

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						New Information Since CAPCOA Was Published in 2010			Tahoe Basin Review										
CAPCOA Category	CAPCOA #	CAPCOA Strategy	CAPCOA Reduction	Strength of Substantial Evidence for CEQA Impact Analysis?	Applicable to Individual Land Use Projects?	New information	Updated VMT reduction compared to CAPCOA (1)	Literature or Evidence Cited	Tahoe Basin RTP Strategies				Placer County RTTP Strategies			Seasonality	Does CAPCOA or additional research support Tahoe use?	Recommended and applicable to land use	Effect measureable in model
Land Use/Location	3.1.1	LUT-1 Increase Density	0.8% - 30% VMT reduction due to increase in density	Adequate	Yes - however, the project must increase residential or employment density by at least 10%.	Increasing residential density is associated with lower VMT per capita. Increased residential density in areas with high jobs access may have a greater VMT change than increases in regions with lower jobs access. The range of reductions is based on a range of elasticities from -0.04 to -0.22. The low end of the reductions represents a -0.04 elasticity of demand in response to a 10% increase in residential units or employment density and a -0.22 elasticity in response to 50% increase to residential/employment density.	0.4% -10.75%	Primary sources: Boarnet, M. and Handy, S. (2014). Impacts of Residential Density on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm Secondary source: Stevens, M. (2017). Does Compact Development Make People Drive Less? Journal of the American Planning Association, 83(1), 7-18.	Denser land use							Year-round	Yes	Yes	Yes
Land Use/Location	3.1.2	LUT-2 Increase Location Efficiency	10% - 65% VMT reduction due to increase in location efficiency	Adequate	No	Rarely feasible to change the location of an indivdiual land use project. May be applicable for land use plans at the city or larger area.	Elasticity -0.05 to -0.25 VMT percent reduction per 1 percent increase in regional accessibility	Primary source: Handy, S. et al. (2013) Impacts of Regional Accessibility Based on a Review of the Empirical Literature - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm Secondary sources: Holtzclaw, et al. 2002. "Location Efficiency: Neighborhood and Socioeconomic Characteristics Determine Auto Ownership and Use – Studies in Chicago, Los Angeles, and Chicago." Transportation Planning and Technology, Vol. 25, pp. 1–27. Ewing, et al, 2008. Growing Cooler – The Evidence on Urban Development and Climate Change. Urban Land Institute. (p.88, Figure 4-30)								Year-round	Yes, for land use plans		Yes
Land Use/ Location	3.1.3	LUT-3 Increase Diversity of Urban and Suburban Developments	9%-30% VMT reduction due to mixing land uses within a single development	Adequate	Yes	1] VMT reduction due to mix of land uses within a single development. Mixing land uses within a single development can decrease VMT (and resulting GHG emissions), since building users do not need to drive to meet all of their needs. 2] Reduction in VMT due to regional change in entropy index of diversity. Providing a mix of land uses within a single neighborhood can decrease VMT (and resulting GHG emissions), since trips between land use types are shorter and may be accommodated by non-auto modes of transport. For example when residential areas are in the same neighborhood as retail and office buildings, a resident does not need to travel outside of the neighborhood to meet his/her trip needs. At the regional level, reductions in VMT are measured in response to changes in the entropy index of land use diversity.	1] 0%-12% 2] 0.3%-4%	1] Ewing, R. and Cervero, R. (2010). Travel and the Built Environment - A Meta-Analysis. Journal of the American Planning Association,76(3),265-294. Cited in California Air Pollution Control Officers Association. (2010).Quantifying Greenhouse Gas Mitigation Measures. Retrieved from: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf Frank, L., Greenwald, M., Kavage, S. and Devlin, A. (2011). An Assessment of Urban Form and Pedestrian and Transit Improvements as an Integrated GHG Reduction Strategy. WSDOT Research Report WA-RD 765.1. Washington State Department of Transportation. Retrieved from: http://www.wsdot.wa.gov/research/reports/fullreports/765.1.pdf Nasri, A. and Zhang, L. (2012). Impact of Metropolitan-Level Built Environment on Travel Behavior. Transportation Research Record: Journal of the Transportation Research Board, 2323(1), 75-79. Sadek, A. et al. (2011). Reducing VMT through Smart Land-Use Design. New York State Energy Research and Development Authority. Retrieved from: https://www.dot.ny.gov/divisions/engineering/technical-services/trans-r-and-d-repository/C-08-29%20Final%20Report_December%202011%20%282%29.pdf Spears, S.et al. (2014). Impacts of Land-Use Mix on Passenger Vehicle Use and Greenhouse Gas Emissions- Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm 2] Zhang, Wengia et al. "Short- and Long-Term Effects of Land Use on Reducing Personal Vehicle Miles of Travel."	Mixed-use development							Year-round	Yes	Yes	Yes
Land Use/Location	3.1.4	LUT-4 Increase Destination Accessibility	6.7%-20% VMT reduction due to decrease in distance to major job center or downtown	Adequate	Yes	Reduction in VMT due to increased regional accessibility (jobs gravity). Locating new development in areas with good access to destinations reduces VMT by reducing trip lengths and making walking, biking, and transit trips more feasible. Destination accessibility is measured in terms of the number of jobs (or other attractions) reachable within a given travel time, which tends to be highest at central locations and lowest at peripheral ones. Rarely feasible to change the location of an indivdiual land use project. May be applicable for land use plans at the city or larger area.	0.5%-12%	Primary sources: Handy, S. et al. (2014). Impacts of Network Connectivity on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm Handy, S. et al. (2013). Impacts of Regional Accessibility on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm Secondary source: Holtzclaw, et al. (2002.) Location Efficiency: Neighborhood and Socioeconomic Characteristics Determine Auto Ownership and Use – Studies in Chicago, Los Angeles, and Chicago. Transportation Planning and Technology, Vol. 25, pp. 1–27.								Year-round	Yes, for land use plans		Yes

Attachment A: CAPCOA Strategies, New Research Since 2010, and Tahoe RTP and RTTP Strategies

FEHR PEERS

						New Information Since CAPCOA Was Published in 2010			Tahoe Basin Review										
CAPCOA Category	CAPCOA #	CAPCOA Strategy	CAPCOA Reduction	Strength of Substantial Evidence for CEQA Impact Analysis?	Applicable to Individual Land Use Projects?	New information	Updated VMT reduction compared to CAPCOA (1)	Literature or Evidence Cited	Tahoe Basin RTP Strategies				Placer County RTTP Strategies			Seasonality	Does CAPCOA or additional research support Tahoe use?	Recommended and applicable to land use	Effect measureable in model
Land Use/ Location	3.1.5	LUT-5 Increase Transit Accessibility	0.5%-24.6% reduce in VMT due to locating a project near high-quality transit	Adequate	Yes - the project must include the TOD design features.	1) VMT reduction when transit station is provided within 1/2 mile of development (compared to VMT for sites located outside 1/2 mile radius of transit). Locating high density development within 1/2 mile of transit will facilitate the use of transit by people traveling to or from the Project site. The use of transit results in a mode shift and therefore reduced VMT. 2) Reduction in vehicle trips due to implementing TOD. A project with a residential/commercial center designed around a rail or bus station, is called a transit-oriented development (TOD). The project description should include, at a minimum, the following design features: • A transit station/stop with high-quality, high-frequency bus service located within a 5-10 minute walk (or roughly ¼ mile from stop to edge of development), and/or • A rail station located within a 20 minute walk (or roughly ½ mile from station to edge of development) • Fast, frequent, and reliable transit service connecting to a high percentage of regional destinations • Neighborhood designed for walking and	1) 0%-5.8% 2) 0%-7.3%	1) Lund, H. et al. (2004). Travel Characteristics of Transit-Oriented Development in California. Oakland, CA: Bay Area Rapid Transit District, Metropolitan Transportation Commission, and Caltrans. Tal, G. et al. (2013). Policy Brief on the Impacts of Transit Access (Distance to Transit) Based on a Review of the Empirical Literature. California Air Resources Board. Retrieved from: https://www.arb.ca.gov/cc/sb375/policies/transitaccess/transit_access_brief120313.pdf 2) Zamir, K. R. et al. (2014). Effects of Transit-Oriented Development on Trip Generation, Distribution, and Mode Share in Washington, D.C., and Baltimore, Maryland. Transportation Research Record: Journal of the Transportation Research Board. 2413, 45–53. DOI: 10.3141/2413-05	Enhance transit access to residential neighborhoods, school, and work locations	Transit-oriented development						Year-round	Yes	Yes	Yes
Land Use/ Location	3.1.6	LUT-6 Integrate Affordable and Below Market Rate Housing	0.04%-1.20% reduction in VMT for making up to 30% of housing units BMR	Weak - Should only be used where supported by local data on affordable housing trip generation.	Potentially yes - the use of this strategy would need to be supported by local data.	Observed trip generation indicates substantial local and regional variation in trip making behavior at affordable housing sites. Recommend use of ITE rates or local data for senior housing.	N/A	"Draft Memorandum: Infill and Complete Streets Study, Task 2.1: Local Trip Generation Study." *Measuring the Miles: Developing new metrics for vehicle travel in LA.* City of Los Angeles, April 19, 2017.								Year-round	Yes	Yes	No
Land Use/ Location	3.1.7	LUT-7 - Orient Project Toward Non-Auto Corridor	NA													Summer; Diminished or no effectiveness in Winter	No (limited data)		
Land Use/ Location	3.1.8	LUT-8 Locate Project Near Bike Path/Bike Lane	NA													Summer; Diminished or no effectiveness in Winter	No (limited data)		
Land Use/ Location	3.1.9	LUT-9 Improve Design of Development	3.0% - 21.3% reduction in VMT due to increasing intersection density vs. typical ITE suburban development	Adequate	Yes	No update to CAPCOA literature; advise applying CAPCOA measure only to large developments with significant internal street structure.	Same	N/A								Year-round	Yes	Yes	No
Neighborhood Site Enhancements	3.2.1	SDT-1 Provide Pedestrian Network Improvements	0%-2% reduction in VMT for creating a connected pedestrian network within the development and connecting to nearby destinations	Adequate	No - this strategy would require a project to integrate into a larger overall network of pedestrian facilities that would require local and/or regional agency coordination to implement. Current research supports city and neighborhood level VMT reductions, but none of the literature reviewed contains and evaluation of project-specific reductions.	VMT reduction due to provision of complete pedestrian networks. Only applies if located in an area that may be prone to having a less robust sidewalk network.	0.5%-5.7%	Handy, S. et al. (2014). Impacts of Pedestrian Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm	Complete regional network of bike and pedestrian facilities (includes expanded bike parking)							Summer; Diminished or no effectiveness in Winter	Yes		No
Neighborhood Site Enhancements	3.2.2	SDT-2 Provide Traffic Calming Measures	0.25%-1% VMT reduction due to traffic calming on streets within and around the development	Adequate	Potentially yes - The requirements for the project-level definition must be met. In general, this strategy would require a project to integrate into a larger overall network of bicycle facilities that would require local and/or regional agency coordination to implement.	Reduction in VMT due to expansion of bike networks in urban areas. Strategy only applies to bicycle facilities that provide a dedicated lane for bicyclists or a completely separated right-of-way for bicycles and pedestrians. Project-level definition: Enhance bicycle network citywide (or at similar scale), such that a building entrance or bicycle parking is within 200 yards walking or bicycling distance from a bicycle network that connects to at least one of the following: at least 10 diverse uses; a school or employment center, if the project total floor area is 50% or more residential; or a bus rapid transit stop, light or heavy rail station, commuter rail station, or ferry terminal. All destinations must be 3-mile bicycling distance from project site. Include educational campaigns to encourage bicycling.	0%-1.7%	Zahabi, S. et al. (2016). Exploring the link between the neighborhood typologies, bicycle infrastructure and commuting cycling over time and the potential impact on commuter GHG emissions. Transportation Research Part D: Transport and Environment. 47, 89-103.	Complete regional network of bike and pedestrian facilities (includes expanded bike parking)	Traffic calming						Summer; Diminished or no effectiveness in Winter	Yes		No
Neighborhood Site Enhancements	3.2.3	SDT-3 Implement an NEV Network	0.5%-12.7% VMT reduction for GHG-emitting vehicles, depending on level of local NEV penetration	Weak - not recommended without supplemental data.	No - the evidence supporting this strategy is limited.	Limited evidence and highly limited applicability. Use with supplemental data only.	N/A	City of Lincoln, MHM Engineers & Surveyors, Neighborhood Electric Vehicle Transportation Program Final Report, Issued 04/05/05, and City of Lincoln, A Report to the California Legislature as required by Assembly Bill 2353, Neighborhood Electric Vehicle Transportation Plan Evaluation, January 1, 2008. Cited in: California Air Pollution Control Officers Association.								Summer; Diminished or no effectiveness in Winter	No (limited data)		
Neighborhood Site Enhancements	3.2.4	SDT-4 Urban Non-Motorized Zones	NA													Summer; Diminished or no effectiveness in Winter	No (limited data)		
Neighborhood Site Enhancements	3.2.5	SDT-5 Incorporate Bike Lane Street Design (on-site)	NA						Complete regional network of bike and pedestrian facilities (includes expanded bike parking)							Summer; Diminished or no effectiveness in Winter	No (limited data)		
Neighborhood Site Enhancements	3.2.6	SDT-6 Provide Bike Parking in Non-Residential Projects	NA						Complete regional network of bike and pedestrian facilities (includes expanded bike parking)							Summer; Diminished or no effectiveness in Winter	No (limited data)		

Attachment A: CAPCOA Strategies, New Research Since 2010, and Tahoe RTP and RTTP Strategies

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Neighborhood Site Enhancements	3.2.7	SDT-7 Provide Bike Parking in Multi-Unit Residential Projects	NA						Complete regional network of bike and pedestrian facilities (includes expanded bike parking)						Summer; Diminished or no effectiveness in Winter	No (limited data)		
Neighborhood Site Enhancements	3.2.8	SDT-8 Provide EV Parking	NA												Year-round	No (limited data)		
Neighborhood Site Enhancements	3.2.9	SDT-9 Dedicate Lane for Bike Trails	NA						Complete regional network of bike and pedestrian facilities (includes expanded bike parking)						Summer; Diminished or no effectiveness in Winter	No (limited data)		
Parking Pricing	3.3.1	PDT-1 Limit Parking Supply	5%-12.5% VMT reduction in response to reduced parking supply vs. ITE parking generation rate	Weak - not recommended. Fehr & Peers has developed new estimates for residential land use only that may be used.	Yes - evidence is only available to support taking these reduction high-transit urban areas.	CAPCOA reduction range derived from estimate of reduced vehicle ownership, not supported by observed trip or VMT reductions. Evidence is available for mode shift due to presence/absence of parking in high-transit urban areas; additional investigation ongoing	Higher	Fehr & Peers estimated a linear regression formula based on observed data from multiple locations. Resulting equation produces maximum VMT reductions for residential land use only of 30% in suburban locations and 50% in urban locations based on parking supply percentage reductions.				Regional, employee-based trip reduction program			Year-round	No (applicable only to high-transit urban areas)		
Parking Pricing	3.3.2	PDT-2 Unbundle Parking Costs from Property Cost	2.6% -13% VMT reduction due to decreased vehicle ownership rates	Adequate - conditional on the agency not requiring parking minimums and pricing/managing on-street parking (i.e., residential parking permit districts, etc.).	Yes - however, the project must be in a location that does not require parking minimums and has priced or permitting on-street parking.	Reduction in VMT, primarily for residential uses, based on range of elasticities for vehicle ownership in response to increased residential parking fees. Does not account for self-selection. Only applies if the city does not require parking minimums and if on-street parking is priced and managed (i.e., residential parking permit districts).	2%-12%	Victoria Transport Policy Institute (2009). Parking Requirement Impacts on Housing Affordability. Retrieved March 2010 from: http://www.vtpi.org/park-hou.pdf.	Parking pricing and parking management strategies including demand-responsive pricing in commercial areas with residential permits to prevent parking spillover into residential areas, changes to parking standards, shared parking arrangements, etc.			Commercial center parking management	Regional, employee-based trip reduction program		Year-round	Yes	Yes	No
Parking Pricing	3.3.3	PDT-3 Implement Market Price Public Parking	2.8%-5.5% VMT reduction due to "park once" behavior and disincentive to driving	Adequate	Yes - however, the VMT reductions would only apply to visitor or customer trips.	Implement a pricing strategy for parking by pricing all central business district/employment center/retail center on-street parking. It will be priced to encourage park once" behavior. The benefit of this measure above that of paid parking at the project only is that it deters parking spillover from project supplied parking to other public parking nearby, which undermine the vehicle miles traveled (VMT) benefits of project pricing. It may also generate sufficient area-wide mode shifts to justify increased transit service to the area. VMT reduction applies to VMT from visitor/customer trips only. Reductions higher than top end of range from CAPCOA report apply only in conditions with highly constrained on-street parking supply and lack of comparably-priced off-street parking.	2.8%-14.5%	Clinch, J.P. and Kelly, J.A. (2003). Temporal Variance Of Revealed Preference On-Street Parking Price Elasticity. Dublin: Department of Environmental Studies, University College Dublin. Retrieved from: http://www.ucd.ie/gpep/research/workingpapers/2004/04-02.pdf. Cited in Victoria Transport Policy Institute (2017). Transportation Elasticities: How Prices and Other Factors Affect Travel Behavior. Retrieved from: http://www.vtpi.org/tdm/tdm11.htm Hensher, D. and King, J. (2001). Parking Demand and Responsiveness to Supply, Price and Location in Sydney Central Business District. Transportation Research A. 35(3), 177-196. Millard-Ball, A. et al. (2013). Is the curb 80% full or 20% empty? Assessing the impacts of San Francisco's parking pricing experiment. Transportation Research Part A. 63(2014), 76-92. Shoup, D. (2011). The High Cost of Free Parking. APA Planners Press. p. 290. Cited in Pierce, G. and Shoup, D. (2013). Getting the Prices Right. Journal of the American Planning Association. 79(1), 67-81.	Parking pricing and parking management strategies including demand-responsive pricing in commercial areas with residential permits to prevent parking spillover into residential areas, changes to parking standards, shared parking arrangements, etc.			Commercial center parking management	Summer recreational parking management	Winter recreational parking management (at winter resorts)	Year-round	Yes	Yes	No
Parking Pricing	3.3.4	PDT-4 Require Residential Area Parking Permits	NA						Parking pricing and parking management strategies including demand-responsive pricing in commercial areas with residential permits to prevent parking spillover into residential areas, changes to parking standards, shared parking arrangements, etc.			Commercial center parking management			Year-round	No (limited data)		
Commute Trip Reduction	3.4.1	TRT-1 Implement CTR Program - Voluntary	1.0%-6.2% commute VMT reduction due to employer-based mode shift program	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-2 Implement CTR Program - Required Implementation/Monitoring" or with CAPCOA strategies TRT-3.4.3 through TRT-3.4.9.	Yes - however, the effectiveness of a voluntary CTR program would be building tenant specific and may require monitoring to evaluate the program's effectiveness.	Reduction in vehicle trips in response to employer-led TDM programs. The CTR program should include all of the following to apply the effectiveness reported by the literature: • Carpooling encouragement • Ride-matching assistance • Preferential carpool parking • Flexible work schedules for carpools • Half time transportation coordinator • Vanpool assistance • Bicycle end-trip facilities (parking, showers	1.0%-6.0%	Boarnet, M. et al. (2014). Impacts of Employer-Based Trip Reduction Programs and Vanpools on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm	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.)			Regional, employee-based trip reduction program			Year-round	Yes	Yes	No
Commute Trip Reduction	3.4.2	TRT-2 Implement CTR Program - Required Implementation/Monitoring	4.2%-21.0% commute VMT reduction due to employer-based mode shift program with required monitoring and reporting	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or with CAPCOA strategies TRT-3.4.3 through TRT-3.4.9.	Yes - however, the effectiveness of a CTR program would be building tenant specific and may require monitoring to evaluate the program's effectiveness.	Limited evidence available. Anecdotal evidence shows high investment produces high VMT/vehicle trip reductions at employment sites with monitoring requirements and specific targets.	Same	Nelson/Nygaard (2008). South San Francisco Mode Share and Parking Report for Genentech, Inc.(p. 8) Cited in: California Air Pollution Control Officers Association. (2010). Quantifying Greenhouse Gas Mitigation Measures. Retrieved from: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf							Year-round	Yes	Yes	No
Commute Trip Reduction	3.4.3	TRT-3 Provide Ride-Sharing Programs	1%-15% commute VMT reduction due to employer ride share coordination and facilities	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring."	Yes - however, the effectiveness of the ride-sharing programs is building tenant specific and may require monitoring to evaluate the program's effectiveness.	Commute vehicle trips reduction due to employer ride-sharing programs. Promote ride-sharing programs through a multi-faceted approach such as: • Designating a certain percentage of parking spaces for ride sharing vehicles • Designating adequate passenger loading and unloading and waiting areas for ride-sharing vehicles • Providing an app or website for coordinating rides	2.5%-8.3%	Victoria Transport Policy Institute. (2015). Ridesharing: Carpooling and Vanpooling. Online TDM Encyclopedia. Retrieved from: http://vtpi.org/tdm/tdm34.htm	Regionally implemented dynamic ridesharing (conservative implementation).			Regional, employee-based trip reduction program			Year-round	Yes	Yes	No

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Commute Trip Reduction	3.4.4	TRT-4 Implement Subsidized or Discounted Transit Program	0.3%-20% commute VMT reduction due to transit subsidy of up to $6/day	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring."	Yes - however, the effectiveness of a transit subsidy program would be building tenant specific and may require monitoring to evaluate the program's effectiveness.	1] Reduction in vehicle trips in response to reduced cost of transit use, assuming that 10 50% of new bus trips replace vehicle trips; 2] Reduction in commute trip VMT due to employee benefits that include transit 3] Reduction in all vehicle trips due to reduced transit fares system-wide, assuming 25% of new transit trips would have been vehicle trips.	1] 0.3%-14% 2] 0-16% 3] 0.1% to 6.9%	1] Victoria Transport Policy Institute. (2017). Understanding Transport Demands and Elasticities. Online TDM Encyclopedia. Retrieved from: http://www.vtpi.org/tdm/tdm11.htm 2] Carolina, P. et al. (2016). Do Employee Commuter Benefits Increase Transit Ridership? Evidence rom the NY-NJ Region. Washington, DC: Transportation Research Board, 96th Annual Meeting. 3] Handy, S. et al. (2013). Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm	Microtransit service areas				Microtransit service	Regional, employee-based trip reduction program		Year-round	Yes	Yes	No
Commute Trip Reduction	3.4.5	TRT-5 Provide End of Trip Facilities (for bicyclists)	NA										Regional, employee-based trip reduction program			Summer; Diminished or no effectiveness in Winter	No (limited data)		
Commute Trip Reduction	3.4.6	TRT-6 Encourage Telecommuting and Alternative Work Schedules	0.07%-5.5% commute VMT reduction due to reduced commute trips	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring."	Yes - however, the effectiveness of telecommuting and alternative work schedules is building tenant specific and may require monitoring to evaluate the program's effectiveness.	VMT reduction due to adoption of telecommuting. Alternative work schedules could take the form of staggered starting times, flexible schedules, or compressed work weeks.	0.2%-4.5%	Handy, S. et al. (2013). Policy Brief on the Impacts of Telecommuting Based on a Review of the Empirical Literature. California Air Resources Board. Retrieved from: https://www.arb.ca.gov/cc/sb375/policies/telecommuting/telecommuting_brief120313.pdf	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.)				Regional, employee-based trip reduction program			Year-round	Yes (may be part of CTR program)	Yes	No
Commute Trip Reduction	3.4.7	1] TRT-7 Implement CTR Marketing 2] Launch Targeted Behavioral Interventions	0.8%-4.0% commute VMT reduction due to employer marketing of alternatives	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring."	Yes - however, the effectiveness of CTR marketing and behavioral intervention programs is building tenant specific and may require monitoring to evaluate the program's effectiveness.	1] Vehicle trips reduction due to CTR marketing; 2] Reduction in VMT from institutional trips due to targeted behavioral intervention programs	1] 0.9% to 26% 2] 1%-6%	1] Pratt, Dick. Personal communication regarding the Draft of TCRP 95 Traveler Response to Transportation System Changes – Chapter 19 Employer and Institutional TDM Strategies. Transit Cooperative Research Program. Cited in California Air Pollution Control Officers Association. (2010).Quantifying Greenhouse Gas Mitigation Measures. Retrieved from: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf Dill, J. and Mohr, C. (2010). Long-Term Evaluation of Individualized Marketing Programs for Travel Demand Management. Portland, OR: Transportation Research and Education Center (TREC). Retrieved from: http://pdxscholar.library.pdx.edu/usp_fac 2] Brown, A. and Ralph, K. (2017.) "The Right Time and Place to Change Travel Behavior: An Experimental Study." Washington, DC: Transportation Research Board, 2017 Annual Meeting.	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.)							Year-round	Yes (may be part of CTR program)	Yes	No
Commute Trip Reduction	3.4.8	TRT-8 Implement Preferential Parking Permit Program	NA										Winter recreational parking management (at winter resorts)	Regional, employee-based trip reduction program		Year-round	No (limited data)		
Commute Trip Reduction	3.4.9	TRT-9 Implement Car-Sharing Program	0.4% - 0.7% VMT reduction due to lower vehicle ownership rates and general shift to non-driving modes	Adequate	No - this strategy would require local and/or regional agency coordination to implement.	Vehicle trip reduction due to car-sharing programs; reduction assumes 1%-5% penetration rate. Implementing car-sharing programs allows people to have on-demand access to a shared fleet of vehicles on an as-needed basis, as a supplement to trips made by non-SOV modes. Transit station-based programs focus on providing the "last-mile" solution and link transit with commuters' final destinations. Residential-based programs work to substitute entire household based trips. Employer-based programs provide a means for business/day trips for alternative mode commuters and provide a guaranteed ride home option. The reduction shown here assumes a 1%-5% penetration rate.	0.3%-1.6%	Lovejoy, K. et al. (2013). Impacts of Carsharing on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm *Need to verify with more recent UCD research.*					Regional, employee-based trip reduction program			Year-round	Yes		No
Commute Trip Reduction	3.4.10	TRT-10 Implement a School Pool Program	7.2%-15.8% reduction in school VMT due to school pool implementation	Adequate - School VMT only.	Applicable to school project. For residential projects, reduction to school VMT only.	Limited new evidence available, not conclusive	Same	Transportation Demand Management Institute of the Association for Commuter Transportation. TDM Case Studies and Commuter Testimonials. Prepared for the US EPA. 1997. (p. 10, 36-38) WeTeCo 2015 Annual Report. Accessed on March 13, 2017 from								Year-round	Yes		No
Commute Trip Reduction	3.4.11	TRT-11 Provide Employer-Sponsored Vanpool/ Shuttle	0.3%-13.4% commute VMT reduction due to employer-sponsored vanpool and/or shuttle service	Adequate - Effectiveness is building/tenant specific.	Yes - however, the effectiveness of the employer-sponsored vanpool/shuttle programs is dependent on the building tenant specific and the quality of the vanpool/shuttle service being provided. This reduction strategy may require monitoring to evaluate the program's effectiveness.	1] Reduction in commute vehicle trips due to implementing employer-sponsored vanpool and shuttle programs; 2] Reduction in commute vehicle trips due to vanpool incentive programs; 3] Reduction in commute vehicle trips due to employer shuttle programs	1] 0.5%-5.0% 2] 0.3%-7.4% 3] 1.4%-6.8%	1] Concas, Sisinnio, Winters, Philip, Wambalaba, Francis, (2005). Fare Pricing Elasticity, Subsidies, and Demand for Vanpool Services. Transportation Research Record: Journal of the Transportation Research Board, 1924, pp 215-223. 2] Victoria Transport Policy Institute. (2015). Ridesharing: Carpooling and Vanpooling. Online TDM Encyclopedia. Retrieved from: http://vtpi.org/tdm/tdm34.htm 3] ICF. (2014). GHG Impacts for Commuter Shuttles Pilot Program.	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.)				Regional, employee-based trip reduction program			Year-round	Yes (may be part of CTR program)	Yes	No
Commute Trip Reduction	3.4.12	TRT-12 Implement Bike-Sharing Programs	NA - Grouped Strategy Minimal impacts when implemented alone. Effectiveness is heavily dependent on the location and context. Have worked well in densely populated areas with existing infrastructure for bicycling. Should be combined with Bike Lane Street Design (SDT-5) and Improve Design of Development (LUT-9).	Adequate	No - evidence currently does not show a project-specific VMT reductions, the current studies have shown city-wide VMT reductions from changes in travel modes.	Bikeshare car trip substitution rate of 7-19% based on data from Washington DC, and Minneapolis/St. Paul. Annual VMT reduction of 151,000 and 57,000, respectively. Includes VMT for rebalancing and maintenance. VMT reduction of 0.023 miles per day per bikeshare member estimated for Bay Area bikeshare, utilizing Minneapolis/St. Paul data from study above.	57,000-151,000 annual VMT reduction, based on two large US cities. VMT reduction of 0.023 miles per day per member, based on one large US city estimate.	Fishman, E., Washington, S., & Haworth, N. (2014). Bike share's impact on car use: Evidence from the United States, Great Britain, and Australia. Transportation Research Part D: Transport and Environment, 31, 13-20. TDM Methodology: Impact of Carsharing Membership, Transit Passes, Bikesharing Membership, Unbundled Parking, and Parking Supply Reductions on Driving. Center for Neighborhood Technology, Peter Haas and Cindy Copp, with TransForm staff, May 5, 2016.	Shared micromobility service areas				Regional, employee-based trip reduction program			Summer; Diminished or no effectiveness in Winter	Yes		No

Attachment A: CAPCOA Strategies, New Research Since 2010, and Tahoe RTP and RTTP Strategies

						New Information Since CAPCOA Was Published in 2010			Tahoe Basin Review										
CAPCOA Category	CAPCOA #	CAPCOA Strategy	CAPCOA Reduction	Strength of Substantial Evidence for CEQA Impact Analysis?	Applicable to Individual Land Use Projects?	New information	Updated VMT reduction compared to CAPCOA (1)	Literature or Evidence Cited	Tahoe Basin RTP Strategies				Placer County RTTP Strategies			Seasonality	Does CAPCOA or additional research support Tahoe use?	Recommended and applicable to land use	Effect measureable in model
Commute Trip Reduction	3.4.13	TRT-13 Implement School Bus Program	38%-63% reduction in school VMT due to school bus service implementation	Adequate - School VMT only.	Applicable to school project. For residential projects, reduction to school VMT only.	VMT reduction for school trips based on data beyond a single school district. School district boundaries are also a factor to consider. VMT reduction does not appear to be a factor that was considered in a select review of CA boundaries. VMT reductions apply to school trip VMT only.	5%-30%	Wilson, E., et al. (2007). The implications of school choice on travel behavior and environmental emissions. Transportation Research Part D: Transport and Environment 12(2007), 506-518.								Year-round	Yes		Yes
Commute Trip Reduction	3.4.14	TRT-14 Price Workplace Parking	0.1%-19.7% commute VMT reduction due to mode shift	Adequate - Effectiveness is building/tenant specific.	Yes - however, the effectiveness of pricing workplace parking could be building tenant specific and may require monitoring to evaluate the program's effectiveness.	Reduction in commute vehicle trips due to priced workplace parking; effectiveness depends on availability of alternative modes. Workplace parking pricing may include: explicitly charging for parking, implementing above market rate pricing, validating parking only for invited guests, not providing employee parking and transportation allowances, and educating employees about available alternatives.	0.5%-14%	Primary sources: Concas, S. and Nayak, N. (2012), A Meta-Analysis of Parking Price Elasticity. Washington, DC: Transportation Research Board, 2012 Annual Meeting. Dale, S. et al. (2016). Evaluating the Impact of a Workplace Parking Levy on Local Traffic Congestion: The Case of Nottingham UK. Washington, DC: Transportation Research Board, 96th Annual Meeting. Secondary sources: Victoria Transport Policy Institute. (2017). Understanding Transport Demands and Elasticities. Online TDM Encyclopedia. Retrieved from: http://www.vtpi.org/tdm/tdm11.htm	Parking pricing and parking management strategies including demand-responsive pricing in commercial areas with residential permits to prevent parking spillover into residential areas, changes to parking standards, shared parking arrangements, etc.				Commercial center parking management			Year-round	Yes	Yes	No
Commute Trip Reduction	3.4.15	TRT-15 Employee Parking Cash-Out	0.6%-7.7% commute VMT reduction due to implementing employee parking cash-out	Weak - Effectiveness is building/tenant specific. Research data is over 10 years old (1997).	Yes - however, the effectiveness of employee parking cash-out could be building tenant specific and may require monitoring to evaluate the program's effectiveness.	Shoup case studies indicate a reduction in commute vehicle trips due to implementing cash-out without implementing other trip-reduction strategies.	3%-7.7%	Shoup, D. (1997). Evaluating the Effects of Cashing Out Employer-Paid Parking: Eight Case Studies. Transport Policy. California Air Resources Board. Retrieved from: https://www.arb.ca.gov/research/apr/past/93-308a.pdf. This citation was listed as an alternative literature in CAPCOA.								Year-round	No (limited data)		
Transit System	3.5.1	TST-1 Provide a Bus Rapid Transit System	0.02%-3.2% VMT reduction by converting standard bus system to BRT system	Adequate	No - the conversion of standard bus system to BRT would require local and/or regional agency coordination to implement.	No new information identified.	Same	N/A								Year-round	No (more appropriate for urban areas)		
Transit System	3.5.2	TST-2 Implement Transit Access Improvements	NA						Enhance transit access to residential neighborhoods, school, and work locations							Year-round	No (limited data)		
Transit System	3.5.3	TST-3 Expand Transit Network	0.1-8.2% VMT reduction in response to increase in transit network coverage	Adequate	No - expanding the transit network would require local and/or regional agency coordination to implement.	Reduction in vehicle trips due to increased transit service hours or coverage. Low end of reduction is typical of project-level implementation (payment of impact fees and/or localized improvements).	0.1%-10.5%	Handy, S. et al. (2013). Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm	Intra-regional transit capital projects within the Tahoe Basin; currently this only includes south shore water taxi service)	Inter-regional transit service that extends outside the Tahoe Basin.	Intercept lots at entrances to the Tahoe Basin providing frequent shuttle service into the Region.	Microtransit service areas	Microtransit service			Year-round	Yes		Yes
Transit System	3.5.4	TST-4 Increase Transit Service Frequency/ Speed	0.02%-2.5% VMT reduction due to reduced headways and increased speed and reliability	Adequate	No - increasing the quality of transit service would require local and/or regional agency coordination to implement.	Reduction in vehicle trips due to increased transit frequency/decreased headway. Low end of reduction is typical of project-level implementation (payment of impact fees and/or localized improvements).	0.3%-6.3%	Handy, S. et al. (2013). Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm	Intra-regional transit capital projects within the Tahoe Basin; currently this only includes south shore water taxi service)	Inter-regional transit service that extends outside the Tahoe Basin.	Transit priority access		Corridor improvements (for transit)			Year-round	Yes		Yes
Transit System	3.5.5	TST-5 Provide Bike Parking Near Transit	NA						Complete regional network of bike and pedestrian facilities (includes expanded bike parking)							Summer; Diminished or no effectiveness in Winter	No (limited data)		
Transit System	3.5.6	TST-6 Provide Local Shuttles	NA													Year-round	No (limited data)		
Road Pricing/ Management	3.6.1	RPT-1 Implement Area or Cordon Pricing	7.9-22.0% VMT reduction	Weak - Evidence is from other countries and does not apply to individual land use projects.	No - Only applies in central business district or urban center.	Traffic volume reductions substantiated for toll projects in the U.S. Increasing prices for VMT would likely reduce VMT.	Same	Boarnet, M. et al. (2014) Impacts of Road User Pricing on Passenger Vehicle Use and Greenhouse Gas Emissions, Policy Brief and Technical Background Report. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm Cambridge Systematics. Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions. Technical Appendices. Prepared for the Urban Land Institute. (p. B-13, B-14) http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendix%20B_Effectiveness_102209.pdf o Referencing: VTPI, Transportation Elasticities: How Prices and Other Factors Affect Travel Behavior. July 2008. www.vtpi.org								Year-round	No (limited data)		
Road Pricing/ Management	3.6.2	RPT-2 Improve Traffic Flow	0-45% reduction in GHG emissions	Weak - Research does not look at individual land use projects	No - improving traffic flow would require local and/or regional agency coordination to implement	No new information identified.										Year-round	No (limited data)		
Road Pricing/ Management	3.6.3	RPT-3 Require Project Contributions to Transportation Infrastructure Improvement Projects	NA - Grouped Strategy	Weak - Research does not look at individual land use projects	May be applicable if a larger VMT mitigation exchange or bank program has been established on a City- or region-wide level.	No new information identified.										Year-round	Yes, as part of VMT exchange or bank		
Road Pricing/ Management	3.6.4	RPT-4 Install Park-and-Ride Lots	NA													Year-round	No (limited data)		

NOTES:
NA indicates original data was too limited to recommend strategy, and no new data was found
(1) For specific VMT reduction ranges, refer to the cited literature.

Attachment B: Tahoe Basin RTP Appendix G Table 7 (TRIA Estimates) Comparison to CAPCOA Strategies

FEHR PEERS

Additional RTP strategies not listed in Table 7 also included.

Vehicle Trip Reduction Strategy	Primary Source of Reduced Vehicle Trips	Vehicle Trip Types Impacted	Employer Type	2035 Percent Reductions in Vehicle Trips	2045 Percent Reductions in Vehicle Trips	Comparable CAPCOA Strategies							VMT Reduction (1)	Comment
Active Transportation														
Complete regional network of bike and pedestrian facilities (includes expanded bike parking)	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.	Regional Trips	--	1.12%	1.19%	SDT-1 Provide Pedestrian Network Improvements	SDT-2 Provide Traffic Calming Measures	SDT-5 Incorporate Bike Lane Street Design (on-site)	SDT-6 Provide Bike Parking in Non-Residential Projects	SDT-7 Provide Bike Parking in Multi-Unit Residential Projects	SDT-9 Dedicate Lane for Bike Trails	TST-5 Provide Bike Parking Near Transit	0.5%-5.7%	
Shared micromobility service areas	Reduced vehicle trips due to use of shared micromobility devices (e.g., e-scooters or shared e-bikes)	Regional Trips	--	0.53%	0.53%	TRT-12 Implement Bike-Sharing Programs							VMT reduction of 0.023 miles per day per member	
Promotion of electric bicycle use	Reduced vehicle trips due to the widespread use of electric bicycles	Regional Trips	--	0.79%	0.79%	[none]								
Public Transit Service														
Intra-regional transit capital projects within the Tahoe Basin; currently this only includes south shore water taxi service)	Increased transit mode share, partially drawn from former vehicle trips.	Regional Trips	--	0.51%	1.64%	TST-3 Expand Transit Network	TST-4 Increase Transit Service Frequency/ Speed						0.1%-10.5% or more (1)	
Inter-regional transit service that extends outside the Tahoe Basin.	Reduced commuter and recreational trips.	External Trips	--	0.51%	1.64%	TST-3 Expand Transit Network	TST-4 Increase Transit Service Frequency/ Speed						0.1%-10.5% or more (1)	
Intercept lots at entrances to the Tahoe Basin providing frequent shuttle service into the Region.	Reduced visitor trips.	External Trips	--	2.80%	2.80%	TST-3 Expand Transit Network							0.1%-10.5%	
Microtransit service areas	Reduced trips for all types served by Microtransit service areas.	Regional Trips	--	0.28%	0.45%	TRT-4 Implement Subsidized or Discounted Transit Program	TST-3 Expand Transit Network						0-16% or more (1)	Presumed free based on RTP description
ITS Technologies														
Improved transit coordination between local and regional providers, through simplified trip planning (for example Google Transit).	Increased transit mode share for trips in the corridor/district served by the project, partially drawn from former vehicle trips.	Town Center Trips	--	0.68%	0.68%	[none]								

Attachment B: Tahoe Basin RTP Appendix G Table 7 (TRIA Estimates) Comparison to CAPCOA Strategies

FEHR PEERS

Additional RTP strategies not listed in Table 7 also included.

Vehicle Trip Reduction Strategy	Primary Source of Reduced Vehicle Trips	Vehicle Trip Types Impacted	Employer Type	2035 Percent Reductions in Vehicle Trips	2045 Percent Reductions in Vehicle Trips	Comparable CAPCOA Strategies							VMT Reduction (1)	Comment
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".	Increased transit mode share for trips in the corridor/district served by the project, partially drawn from former vehicle trips.	Town Center Trips	--	0.08%	0.10%	[none]								
Real-time arrival information at transit stops, online, and/or via web-enabled mobile devices.	Increased transit mode share for trips in the corridor/district served by the project, partially drawn from former vehicle trips.	Town Center Trips	--	0.04%	0.04%	[none]								
Enhanced transit trip planning (for example Google Transit).	Increased transit mode share for trips in the corridor/district served by the project, partially drawn from former vehicle trips.	External Trips	--	0.43%	0.42%	[none]								
Regionally implemented dynamic ridesharing (conservative implementation).	Reduced commuter and recreational trips.	External Trips	--	1.00%	1.00%	TRT-3 Provide Ride-Sharing Programs							2.5%-8.3%	
TDM Measures														
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.)	Reduced peak-hour commuter trips.	Town Center Trips	New Employers	1.86%	1.86%	TRT-1 Implement CTR Program - Voluntary	TRT-6 Encourage Telecommuting and Alternative Work Schedules	1] TRT-7 Implement CTR Marketing 2] Launch Targeted Behavioral Interventions	TRT-11 Provide Employer-Sponsored Vanpool/ Shuttle				1.0%-6.0%	
		Town Center Trips	Existing Employers	0.82%	0.82%									
Parking Management														
Parking pricing and parking management strategies including demand-responsive pricing in commercial areas with residential permits to prevent parking spillover into residential areas, changes to parking standards, shared parking arrangements, etc.	Reduced trip generation from managed on- and off-street parking spaces for trips to and from managed areas. Reduced demand due to reduced parking spaces as a result of shared parking requirements or changes to parking standards for new development.	Town Center Trips	--	1.22%	1.22%	PDT-2 Unbundle Parking Costs from Property Cost	PDT-3 Implement Market Price Public Parking	PDT-4 Require Residential Area Parking Permits	TRT-14 Price Workplace Parking				0.5%-14% or more (1)	
Additional strategies from RTP, not included in Table 7														
Enhance transit access to residential neighborhoods, school, and work locations						LUT-5 Increase Transit Accessibility	TST-2 Implement Transit Access Improvements						1] 0%-5.8% 2] 0%-7.3%	

Attachment B: Tahoe Basin RTP Appendix G Table 7 (TRIA Estimates) Comparison to CAPCOA Strategies

FEHR PEERS

Additional RTP strategies not listed in Table 7 also included.

Vehicle Trip Reduction Strategy	Primary Source of Reduced Vehicle Trips	Vehicle Trip Types Impacted	Employer Type	2035 Percent Reductions in Vehicle Trips	2045 Percent Reductions in Vehicle Trips	Comparable CAPCOA Strategies							VMT Reduction (1)	Comment
Education and encouragement programs for biking and walking						[none]								Presumed separate from commute trip reduction program
Marketing travel options for recreational travel						[none]								Presumed separate from commute trip reduction program
Transit priority access						TST-4 Increase Transit Service Frequency/ Speed							0.3%-6.3%	
Mixed-use development						LUT-3 Increase Diversity of Urban and Suburban Developments							1] 0%-12% 2] 0.3%-4%	
Transit-oriented development						LUT-5 Increase Transit Accessibility							1] 0%-5.8% 2] 0%-7.3%	
Mitigation strategies and fee programs to reduce VMT						RPT-3 Require Project Contributions to Transportation Infrastructure Improvement Projects								
Traffic calming						SDT-2 Provide Traffic Calming Measures							0%-1.7%	
Denser land use						LUT-1 Increase Density							0.4% -10.75%	

NOTE:

(1) VMT reduction ranges refer to the cited literature in Attachment A. Where multiple CAPCOA strategies apply, reductions may vary depending on implementation as noted.

Attachment C: Placer County Resort Triangle Transportation Plan Comparison to CAPCOA Strategies

FEHR PEERS

Strategy	Detail	Comparable CAPCOA Strategies											VMT Reduction (1)
Corridor improvements (for transit)	Signal priority modifications, queue jump lanes, bus-only lanes or HOV 4+/HOT lanes)	TST-4 Increase Transit Service Frequency/ Speed											0.3%-6.3%
Commercial center parking management	Includes paid parking and residential permit parking, parking flexibility in the commercial core, and unbundled parking	PDT-2 Unbundle Parking Costs from Property Cost	PDT-3 Implement Market Price Public Parking	PDT-4 Require Residential Area Parking Permits	TRT-14 Price Workplace Parking								2.8%-14.5% or more (1)
Summer recreational parking management	Paid parking at summer beach and recreational parking areas	PDT-3 Implement Market Price Public Parking											2.8%-14.5%
Winter recreational parking management (at winter resorts)	Expansion or implementation of paid parking, expansion of carpool parking capacity and/or increasing the existing 3+ carpool parking to 4+, establishing a paid parking space reservation system	PDT-3 Implement Market Price Public Parking	TRT-8 Implement Preferential Parking Permit Program										2.8%-14.5%
Microtransit service	Fare-free, on-demand	TRT-4 Implement Subsidized or Discounted Transit Program	TST-3 Expand Transit Network										0-16% or more (1)
Regional, employee-based trip reduction program	Incorporating a variety of TDM strategies	PDT-1 Limit Parking Supply	PDT-2 Unbundle Parking Costs from Property Cost	TRT-1 Implement CTR Program - Voluntary	TRT-3 Provide Ride Sharing Programs	TRT-4 Implement Subsidized or Discounted Transit Program	TRT-5 Provide End of Trip Facilities (for bicyclists)	TRT-6 Encourage Telecommuting and Alternative Work Schedules	TRT-8 Implement Preferential Parking Permit Program	TRT-9 Implement Car-Sharing Program	TRT-11 Provide Employer-Sponsored Vanpool/ Shuttle	TRT-12 Implement Bike-Sharing Programs	0.2-14% or more (1)

NOTE:

(1) VMT reduction ranges refer to the cited literature in Attachment A. Where multiple CAPCOA strategies apply, reductions may vary depending on implementation as noted. Quantifying Greenhouse Gas Mitigation Measures (CAPCOA) contains additional guidance about combining strategies within a subcategory (pages 61-63).

Attachment D: Summary of Recommended CAPCOA Strategies

FEHR PEERS

CAPCOA Strategy	Updated VMT reduction compared to CAPCOA (1)	Strength of Substantial Evidence for CEQA Impact Analysis?	Applicable to Individual Land Use Projects?	Seasonality	In RTP or RTTP strategies?
Project-Level Strategies					
LUT-1 Increase Density	0.4% -10.75%	Adequate	Yes - however, the project must increase residential or employment density by at least 10%.	Year-round	Yes
LUT-3 Increase Diversity of Urban and Suburban Developments	1] 0%-12% 2] 0.3%-4%	Adequate	Yes	Year-round	Yes
LUT-4 Increase Destination Accessibility	0.5%-12%	Adequate	Yes	Year-round	No
LUT-5 Increase Transit Accessibility	1] 0%-5.8% 2] 0%-7.3%	Adequate	Yes - the project must include the TOD design features.	Year-round	Yes
LUT-6 Integrate Affordable and Below Market Rate Housing	0.04%-1.20% reduction in VMT for making up to 30% of housing units BMR [CAPCOA]	Weak - Should only be used where supported by local data on affordable housing trip generation.	Potentially yes - the use of this strategy would need to be supported by local data.	Year-round	No
LUT-9 Improve Design of Development	3.0% - 21.3% reduction in VMT due to increasing intersection density vs. typical ITE suburban development [CAPCOA]	Adequate	Yes	Year-round	No
PDT-2 Unbundle Parking Costs from Property Cost	2.6% -13% VMT reduction due to decreased vehicle ownership rates [CAPCOA]	Adequate - conditional on the agency not requiring parking minimums and pricing/managing on-street parking (i.e., residential parking permit districts, etc.).	Yes - however, the project must be in a location that does not require parking minimums and has priced or permitting on-street parking.	Year-round	Yes
PDT-3 Implement Market Price Public Parking	2.8%-5.5% VMT reduction due to "park once" behavior and disincentive to driving [CAPCOA]	Adequate	Yes - however, the VMT reductions would only apply to visitor or customer trips.	Year-round	Yes
TRT-1 Implement CTR Program - Voluntary	1.0%-6.2% commute VMT reduction due to employer-based mode shift program [CAPCOA]	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-2 Implement CTR Program - Required Implementation/Monitoring" or with CAPCOA strategies TRT-3.4.3 through TRT-3.4.9.	Yes - however, the effectiveness of a voluntary CTR program would be building tenant specific and may require monitoring to evaluate the program's effectiveness.	Year-round	Yes
TRT-2 Implement CTR Program - Required Implementation/Monitoring	4.2%-21.0% commute VMT reduction due to employer-based mode shift program with required monitoring and reporting [CAPCOA]	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or with CAPCOA strategies TRT-3.4.3 through TRT-3.4.9.	Yes - however, the effectiveness of a CTR program would be building tenant specific and may require monitoring to evaluate the program's effectiveness.	Year-round	No
TRT-3 Provide Ride-Sharing Programs	1%-15% commute VMT reduction due to employer ride share coordination and facilities [CAPCOA]	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring."	Yes - however, the effectiveness of the ride-sharing programs is building tenant specific and may require monitoring to evaluate the program's effectiveness.	Year-round	Yes
TRT-4 Implement Subsidized or Discounted Transit Program	0.3%-20% commute VMT reduction due to transit subsidy of up to $6/day [CAPCOA]	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring."	Yes - however, the effectiveness of a transit subsidy program would be building tenant specific and may require monitoring to evaluate the program's effectiveness.	Year-round	Yes
TRT-6 Encourage Telecommuting and Alternative Work Schedules	0.07%-5.5% commute VMT reduction due to reduced commute trips [CAPCOA]	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring."	Yes - however, the effectiveness of telecommuting and alternative work schedules is building tenant specific and may require monitoring to evaluate the program's effectiveness.	Year-round	Yes
1] TRT-7 Implement CTR Marketing 2] Launch Targeted Behavioral Interventions	0.8%-4.0% commute VMT reduction due to employer marketing of alternatives [CAPCOA]	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring."	Yes - however, the effectiveness of CTR marketing and behavioral intervention programs is building tenant specific and may require monitoring to evaluate the program's effectiveness.	Year-round	No

Attachment D: Summary of Recommended CAPCOA Strategies

FEHR PEERS

CAPCOA Strategy	Updated VMT reduction compared to CAPCOA (1)	Strength of Substantial Evidence for CEQA Impact Analysis?	Applicable to Individual Land Use Projects?	Seasonality	In RTP or RTTP strategies?
TRT-11 Provide Employer-Sponsored Vanpool/Shuttle	0.3%-13.4% commute VMT reduction due to employer-sponsored vanpool and/or shuttle service [CAPCOA]	#N/A	#N/A	Year-round	Yes
TRT-14 Price Workplace Parking	0.1%-19.7% commute VMT reduction due to mode shift [CAPCOA]	Adequate - Effectiveness is building/tenant specific.	Yes - however, the effectiveness of pricing workplace parking could be building tenant specific and may require monitoring to evaluate the program's effectiveness.	Year-round	Yes
RPT-3 Require Project Contributions to Transportation Infrastructure Improvement Projects	NA - Grouped Strategy [CAPCOA]	Weak - Research does not look at individual land use projects	May be applicable if a larger VMT mitigation exchange or bank program has been established on a City- or region-wide level.	Year-round	No
SDT-2 Provide Traffic Calming Measures	0.25%-1% VMT reduction due to traffic calming on streets within and around the development [CAPCOA]	Adequate	Potentially yes - The requirements for the project-level definition must be met. In general, this strategy would require a project to integrate into a larger overall network of bicycle facilities that would require local and/or regional agency coordination to implement.	Summer; Diminished or no effectiveness in Winter	Yes
TRT-10 Implement a School Pool Program	7.2%-15.8% reduction in school VMT due to school pool implementation [CAPCOA]	Adequate - School VMT only.	Applicable to school project. For residential projects, reduction to school VMT only.	Year-round	No
TRT-13 Implement School Bus Program	5%-30%	Adequate - School VMT only.	Applicable to school project. For residential projects, reduction to school VMT only.	Year-round	No
Regional-Level Strategies					
LUT-2 Increase Location Efficiency	Elasticity -0.05 to -0.25 VMT percent reduction per 1 percent increase in regional accessibility	Adequate	No	Year-round	No
TRT-9 Implement Car-Sharing Program	0.3%-1.6%	Adequate	No - this strategy would require local and/or regional agency coordination to implement.	Year-round	Yes
TST-3 Expand Transit Network	0.1%-10.5%	Adequate	No - expanding the transit network would require local and/or regional agency coordination to implement.	Year-round	Yes
TST-4 Increase Transit Service Frequency/Speed	#N/A	#N/A	#N/A	Year-round	Yes
SDT-1 Provide Pedestrian Network Improvements	0.5%-5.7%	Adequate	No - this strategy would require a project to integrate into a larger overall network of pedestrian facilities that would require local and/or regional agency coordination to implement. Current research supports city and neighborhood level VMT reductions, but none of the literature reviewed contains and evaluation of project-specific reductions.	Summer; Diminished or no effectiveness in Winter	Yes
Bikeshare	57,000-151,000 annual VMT reduction, based on two large US cities. VMT reduction of 0.023 miles per day per member, based on one large US city estimate.	Not a current CAPCOA strategy	No - evidence currently does not show a project-specific VMT reductions, the current studies have shown city-wide VMT reductions from changes in travel modes.	Summer; Diminished or no effectiveness in Winter	Yes

NOTE:
(1) VMT reduction ranges refer to the cited literature in Attachment A. Where multiple CAPCOA strategies apply, reductions may vary depending on implementation as noted. Quantifying Greenhouse Gas Mitigation Measures (CAPCOA) contains additional guidance about combining strategies within a subcategory (pages 61-63).

Appendix 5: Residential VMT Data per Zone

Zone ID	Subregion	Zone Residential VMT per Capita	Subregional Residential VMT per Capita	Standard of Significance Residential VMT per Capita	Relationship to Standard of Significance	Percent of Standard of Significance
1	PLACER	22.73	15.42	13.11	Over 150%	1.73
2	EL DORADO	20.58	17.07	14.51	125-150%	1.42
3	EL DORADO	30.41	17.07	14.51	Over 150%	2.10
4	EL DORADO	24.27	17.07	14.51	Over 150%	1.67
5	EL DORADO	25.91	17.07	14.51	Over 150%	1.79
6	City of South Lake T	8.10	10.88	9.25	75-100%	0.88
7	EL DORADO	17.17	17.07	14.51	100-125%	1.18
8	City of South Lake T	9.63	10.88	9.25	100-125%	1.04
9	City of South Lake T	11.95	10.88	9.25	125-150%	1.29
10	City of South Lake T	11.52	10.88	9.25	100-125%	1.25
11	EL DORADO	17.43	17.07	14.51	100-125%	1.20
12	City of South Lake T	10.31	10.88	9.25	100-125%	1.12
13	City of South Lake T	10.43	10.88	9.25	100-125%	1.13
14	City of South Lake T	13.44	10.88	9.25	125-150%	1.45
15	City of South Lake T	10.76	10.88	9.25	100-125%	1.16

Zone ID	Subregion	Zone Residential VMT per Capita	Subregional Residential VMT per Capita	Standard of Significance Residential VMT per Capita	Relationship to Standard of Significance	Percent of Standard of Significance
16	EL DORADO	NA	17.07	14.51	NA	NA
17	City of South Lake T	11.24	10.88	9.25	100-125%	1.21
18	City of South Lake T	NA	10.88	9.25	NA	NA
19	City of South Lake T	10.87	10.88	9.25	100-125%	1.18
20	City of South Lake T	12.36	10.88	9.25	125-150%	1.34
21	City of South Lake T	8.66	10.88	9.25	75-100%	0.94
22	EL DORADO	12.76	17.07	14.51	75-100%	0.88
23	City of South Lake T	11.33	10.88	9.25	100-125%	1.22
24	EL DORADO	18.68	17.07	14.51	125-150%	1.29
25	EL DORADO	14.88	17.07	14.51	100-125%	1.03
26	EL DORADO	38.78	17.07	14.51	Over 150%	2.67
27	EL DORADO	15.27	17.07	14.51	100-125%	1.05
28	EL DORADO	17.57	17.07	14.51	100-125%	1.21
29	EL DORADO	NA	17.07	14.51	NA	NA
30	EL DORADO	17.67	17.07	14.51	100-125%	1.22
31	EL DORADO	NA	17.07	14.51	NA	NA
32	EL DORADO	14.93	17.07	14.51	100-125%	1.03

Zone ID	Subregion	Zone Residential VMT per Capita	Subregional Residential VMT per Capita	Standard of Significance Residential VMT per Capita	Relationship to Standard of Significance	Percent of Standard of Significance
33	EL DORADO	20.05	17.07	14.51	125-150%	1.38
34	EL DORADO	23.15	17.07	14.51	Over 150%	1.60
35	EL DORADO	NA	17.07	14.51	NA	NA
36	EL DORADO	23.78	17.07	14.51	Over 150%	1.64
37	DOUGLAS	25.56	15.39	13.08	Over 150%	1.95
38	DOUGLAS	16.31	15.39	13.08	100-125%	1.25
39	DOUGLAS	13.15	15.39	13.08	100-125%	1.01
40	DOUGLAS	16.57	15.39	13.08	125-150%	1.27
41	DOUGLAS	11.44	15.39	13.08	75-100%	0.87
42	DOUGLAS	12.32	15.39	13.08	75-100%	0.94
43	DOUGLAS	4.90	15.39	13.08	Less than 50%	0.37
44	CARSON	NA	NA	NA	NA	NA
45	PLACER	15.20	15.42	13.11	100-125%	1.16
46	PLACER	17.99	15.42	13.11	125-150%	1.37
47	PLACER	14.15	15.42	13.11	100-125%	1.08
48	PLACER	14.83	15.42	13.11	100-125%	1.13

Zone ID	Subregion	Zone Residential VMT per Capita	Subregional Residential VMT per Capita	Standard of Significance Residential VMT per Capita	Relationship to Standard of Significance	Percent of Standard of Significance
49	PLACER	13.57	15.42	13.11	100-125%	1.03
50	PLACER	16.27	15.42	13.11	100-125%	1.24
51	PLACER	16.70	15.42	13.11	125-150%	1.27
52	PLACER	17.54	15.42	13.11	125-150%	1.34
53	PLACER	16.47	15.42	13.11	125-150%	1.26
54	PLACER	15.44	15.42	13.11	100-125%	1.18
55	PLACER	12.14	15.42	13.11	75-100%	0.93
56	PLACER	11.84	15.42	13.11	75-100%	0.90
57	PLACER	20.03	15.42	13.11	Over 150%	1.53
58	PLACER	15.02	15.42	13.11	100-125%	1.15
59	PLACER	22.58	15.42	13.11	Over 150%	1.72
60	PLACER	21.03	15.42	13.11	Over 150%	1.60
61	PLACER	20.86	15.42	13.11	Over 150%	1.59
62	WASHOE	14.78	12.96	11.02	125-150%	1.34
63	WASHOE	14.23	12.96	11.02	125-150%	1.29

Zone ID	Subregion	Zone Residential VMT per Capita	Subregional Residential VMT per Capita	Standard of Significance Residential VMT per Capita	Relationship to Standard of Significance	Percent of Standard of Significance
64	WASHOE	15.48	12.96	11.02	125-150%	1.40
65	WASHOE	13.50	12.96	11.02	100-125%	1.22
66	WASHOE	17.35	12.96	11.02	Over 150%	1.57
67	WASHOE	12.24	12.96	11.02	100-125%	1.11
68	WASHOE	15.34	12.96	11.02	125-150%	1.39
69	WASHOE	9.24	12.96	11.02	75-100%	0.84
70	WASHOE	11.64	12.96	11.02	100-125%	1.06
71	WASHOE	13.71	12.96	11.02	100-125%	1.24
72	WASHOE	16.59	12.96	11.02	Over 150%	1.51
73	EL DORADO	20.33	17.07	14.51	125-150%	1.40
74	EL DORADO	20.67	17.07	14.51	125-150%	1.42
75	DOUGLAS	20.88	15.39	13.08	Over 150%	1.60
76	NA	NA	NA	NA	NA	NA
77	DOUGLAS	17.90	15.39	13.08	125-150%	1.37
78	EL DORADO	11.35	17.07	14.51	75-100%	0.78
79	EL DORADO	NA	17.07	14.51	NA	NA

Appendix 4: Trip Length Data per Zone

zone_id	Subregion	Zone Average Trip Length	Subregional Average Trip Length	Standard of Significance Trip Length	Relationship to Standard of Significance	Percent of Standard of Significance
Zone 1	PLACER	9.15	6.51	5.53	Over 150%	1.65
Zone 2	EL DORADO	9.62	6.69	5.69	Over 150%	1.69
Zone 3	EL DORADO	11.38	6.69	5.69	Over 150%	2.00
Zone 4	EL DORADO	13.90	6.69	5.69	Over 150%	2.44
Zone 5	EL DORADO	14.05	6.69	5.69	Over 150%	2.47
Zone 6	CSLT	4.97	4.26	3.62	125-150%	1.37
Zone 7	EL DORADO	11.14	6.69	5.69	Over 150%	1.96
Zone 8	CSLT	3.96	4.26	3.62	100-125%	1.09
Zone 9	CSLT	4.51	4.26	3.62	100-125%	1.24
Zone 10	CSLT	4.51	4.26	3.62	100-125%	1.24
Zone 11	EL DORADO	8.51	6.69	5.69	125-150%	1.50
Zone 12	CSLT	4.11	4.26	3.62	100-125%	1.13
Zone 13	CSLT	3.67	4.26	3.62	100-125%	1.01
Zone 14	CSLT	5.31	4.26	3.62	125-150%	1.47
Zone 15	CSLT	3.85	4.26	3.62	100-125%	1.06
Zone 16	EL DORADO	8.13	6.69	5.69	125-150%	1.43
Zone 17	CSLT	4.01	4.26	3.62	100-125%	1.11
Zone 18	CSLT	4.13	4.26	3.62	100-125%	1.14
Zone 19	CSLT	4.21	4.26	3.62	100-125%	1.16
Zone 20	CSLT	3.92	4.26	3.62	100-125%	1.08
Zone 21	CSLT	4.42	4.26	3.62	100-125%	1.22
Zone 22	EL DORADO	4.69	6.69	5.69	75-100%	0.83
Zone 23	CSLT	4.31	4.26	3.62	100-125%	1.19
Zone 24	EL DORADO	5.98	6.69	5.69	100-125%	1.05
Zone 25	EL DORADO	7.29	6.69	5.69	125-150%	1.28
Zone 26	EL DORADO	11.25	6.69	5.69	Over 150%	1.98
Zone 27	EL DORADO	6.38	6.69	5.69	100-125%	1.12
Zone 28	EL DORADO	5.80	6.69	5.69	100-125%	1.02
Zone 29	EL DORADO	NA	6.69	5.69	NA	NA
Zone 30	EL DORADO	6.42	6.69	5.69	100-125%	1.13

zone_id	Subregion	Zone Average Trip Length	Subregional Average Trip Length	Standard of Significance Trip Length	Relationship to Standard of Significance	Percent of Standard of Significance
Zone 31	EL DORADO	6.67	6.69	5.69	100-125%	1.17
Zone 32	EL DORADO	4.78	6.69	5.69	75-100%	0.84
Zone 33	EL DORADO	7.20	6.69	5.69	125-150%	1.27
Zone 34	EL DORADO	8.76	6.69	5.69	Over 150%	1.54
Zone 35	EL DORADO	NA	6.69	5.69	NA	NA
Zone 36	EL DORADO	10.26	6.69	5.69	Over 150%	1.80
Zone 37	DOUGLAS	9.90	6.37	5.41	Over 150%	1.83
Zone 38	DOUGLAS	6.53	6.37	5.41	100-125%	1.21
Zone 39	DOUGLAS	4.83	6.37	5.41	75-100%	0.89
Zone 40	DOUGLAS	7.11	6.37	5.41	125-150%	1.31
Zone 41	DOUGLAS	4.96	6.37	5.41	75-100%	0.92
Zone 42	DOUGLAS	4.78	6.37	5.41	75-100%	0.88
Zone 43	DOUGLAS	6.20	6.37	5.41	100-125%	1.14
Zone 44	CARSON	12.39	13.1	11.14	100-125%	1.11
Zone 45	PLACER	6.42	6.51	5.53	100-125%	1.16
Zone 46	PLACER	6.25	6.51	5.53	100-125%	1.13
Zone 47	PLACER	6.46	6.51	5.53	100-125%	1.17
Zone 48	PLACER	5.06	6.51	5.53	75-100%	0.91
Zone 49	PLACER	5.38	6.51	5.53	75-100%	0.97
Zone 50	PLACER	6.79	6.51	5.53	100-125%	1.23
Zone 51	PLACER	6.01	6.51	5.53	100-125%	1.09
Zone 52	PLACER	6.33	6.51	5.53	100-125%	1.14
Zone 53	PLACER	6.35	6.51	5.53	100-125%	1.15
Zone 54	PLACER	7.71	6.51	5.53	125-150%	1.39
Zone 55	PLACER	7.48	6.51	5.53	125-150%	1.35
Zone 56	PLACER	6.70	6.51	5.53	100-125%	1.21
Zone 57	PLACER	6.89	6.51	5.53	100-125%	1.25
Zone 58	PLACER	6.44	6.51	5.53	100-125%	1.16
Zone 59	PLACER	10.22	6.51	5.53	Over 150%	1.85
Zone 60	PLACER	9.31	6.51	5.53	Over 150%	1.68

zone_id	Subregion	Zone Average Trip Length	Subregional Average Trip Length	Standard of Significance Trip Length	Relationship to Standard of Significance	Percent of Standard of Significance
Zone 61	PLACER	9.03	6.51	5.53	Over 150%	1.63
Zone 62	WASHOE	5.54	5.56	4.73	100-125%	1.17
Zone 63	WASHOE	6.14	5.56	4.73	125-150%	1.30
Zone 64	WASHOE	4.65	5.56	4.73	75-100%	0.98
Zone 65	WASHOE	6.57	5.56	4.73	125-150%	1.39
Zone 66	WASHOE	4.97	5.56	4.73	100-125%	1.05
Zone 67	WASHOE	5.10	5.56	4.73	100-125%	1.08
Zone 68	WASHOE	7.26	5.56	4.73	Over 150%	1.54
Zone 69	WASHOE	4.08	5.56	4.73	75-100%	0.86
Zone 70	WASHOE	6.27	5.56	4.73	125-150%	1.33
Zone 71	WASHOE	4.79	5.56	4.73	100-125%	1.01
Zone 72	WASHOE	6.52	5.56	4.73	125-150%	1.38
Zone 73	EL DORADO	10.65	6.69	5.69	Over 150%	1.87
Zone 74	EL DORADO	9.21	6.69	5.69	Over 150%	1.62
Zone 75	DOUGLAS	8.51	6.37	5.41	Over 150%	1.57
Zone 76	PLACER	NA	6.51	5.53	NA	NA
Zone 77	DOUGLAS	6.37	6.37	5.41	100-125%	1.18
Zone 78	EL DORADO	2.95	6.69	5.69	50-75%	0.52
Zone 79	EL DORADO	5.17	6.69	5.69	75-100%	0.91