Michael Ayala
Chairman

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TUOLUMNE COUNTY TRANSPORTATION COUNCIL

January 21, 2020

City Council Members
City of Sonora
94 North Washington Street
Sonora, CA 95370

Subject: Background Presentation on the SB 743 CEQA Reform & the TCTC Vehicle Miles Traveled Study

Dear City Council Members,

The TCTC is presenting an informational study item on the California Environmental Quality Act (CEQA) reform resulting from Senate Bill 743-Vehicle Miles Traveled (VMT) and the TCTC implementation program to address CEQA reform. SB 743 requires CEQA analyze project impacts on VMT rather traffic delay (level of service) and congestion. One of our main goals for the TCTC is to establish VMT estimates by land use, traffic study methodology, thresholds of significance, and measures for mitigating VMT impacts consistent with the CEQA and Office of Planning and Research (OPR) Guidelines. While the TCTC has taken the lead on the technical aspect of the VMT Study, the implementation of CEQA reform will require the City Council to participate and make decisions so that project CEQA documents can be approved consistent with the new requirements.

We are coordinating with City staff to schedule additional presentations to the Planning Commission and future City Council Meetings. We have attached a Draft Public Presentations document, which shows the next steps in the Study. A technical Steering Committee of City, County, and Caltrans staff have been meeting to help provide feedback on the Study.

Senate Bill (SB) 743 was signed into law in September of 2013 and this law changed the way transportation impacts are analyzed. SB 743 stated that Level of Service (LOS) can no longer be used to determine the significance of transportation impacts of projects on the environment for CEQA purposes. The adopted CEQA Guidelines from OPR approved using Vehicle Miles Traveled (VMT) as the metric to evaluate transportation impacts for CEQA. Beginning July 1, 2020, all projects subject to CEQA review will be required need to use VMT metric for analyzing transportation impacts.

The CEQA guidelines encourages public agencies to establish thresholds of significance for determining VMT impacts. Public agencies have the power to establish their own thresholds. OPR guidance did not. OPR recommended Rural Agencies evaluate impacts on a case by case basis recommend any thresholds for Rural Agencies. This recommendation does not help streamline projects that reduce VMT.

Another goal of this study will be help facilitate development that helps to reduce Vehicle Miles Traveled which is the main goal in SB 743. Reducing VMT in Tuolumne County will require coordination between land use and transportation infrastructure. Some potential strategies to reduce vehicle miles traveled include focusing growth around existing downtowns, main streets, transit stops, and walkable communities. Establishing an easy, streamlined development process for projects that reduce VMT will help make it simpler for developers to build compact, mixed-use development.

This study was broken into two phases with an optional third phase available if the City Council and BOS are interested in pursuing after the conclusion of Phase II. The TCTC is using an on-call consultant, Wood Rodgers, Inc., to help produce this Study. Wood Rodgers is a consultant utilized to administer and run the Tuolumne Regional Travel Demand Model (RTDM). Wood Rodgers representatives will be presenting information on the new law, case studies on how other agencies are proceeding and a brief overview of the work completed thus far.

In Phase I, the RTDM was updated to the newest version TransCAD Model Version 5 to Version 8. We also updated the RTDM from a 3-step Model to 4-step Model with a full Mode Choice Component. This new Mode Choice Component will help our Model estimate VMT reductions for regional trails, bike/pedestrian transportation improvements, new transit services, and transit service increases. This new RTDM tool will help the TCTC better compete for statewide transportation funding by proving performance measure data often required in grant applications.

The TCTC was awarded a second Caltrans Rural Planning Assistance (RPA) Competitive Grant for Phase 1I in 2019 for $130,000. In Phase II, the Study will include a detailed SB 743 CEQA study methodology and setting of thresholds of significance and include outreach to local agency staff, elected officials, and the development community. Phase II will recommend a VMT methodology, setting of thresholds of significance, and mitigation measures which are customized for the Tuolumne County region for the City and County to consider adopting.

The first Steering Committee Meeting for SB 743 with the City, County, and Caltrans staff was held in September. We received positive feedback from staff on the first phase of the study. We will be holding our second steering committee meeting in January to review the VMT methodology for establishing thresholds of significance.

Sincerely,

Darin Grossi
Executive Director

Attachment: Final Background SB 743 Memo
Final RTDM Calibration Memo
Scope of Work – SB 743 Study
Draft List of Public Presentations

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WOOD RODGERS

TECHNICAL MEMORANDUM

To: Tuolumne County Transportation Council

Attention: Darin Grossi, Executive Director

From: *Wood Rodgers, Inc.* – Mario Tambellini, PE, TE

Date: November 11, 2019

Subject: **Background on SB 743 and Vehicle Miles Traveled**
Tuolumne County SB 743 VMT Study Phase 1

I. INTRODUCTION

This technical memorandum provides an overview of Senate Bill (SB) 743 (Steinberg, 2013), the new California Environmental Quality Act (CEQA) transportation metric of vehicle miles traveled (VMT), and the requirements set forth in the latest revised guidelines implementing CEQA (CEQA Guidelines) (Public Resources Code, § 21000 et seq.) (Government Code, § 65040, subdivisions (g), (l), (m)), adopted in December 2018. This memorandum is divided into five sections:

- 1. Introduction
- 2. State Guidance on VMT
- 3. Summary of Existing VMT Tools
- 4. Case Studies for SB 743 Implementation
- 5. SB 743 Implementation in Rural Areas

SB 743, signed by Governor Brown in September of 2013 and codified in Public Resources Code § 21099, required the amendment of CEQA Guidelines to change the way transportation impacts are analyzed. According to SB 743 and Public Resources Code § 21099, level of service (LOS)[1] can no longer (as of the adoption of the revised CEQA Guidelines in December 2018 by the Natural Resources Agency) be used to determine the significance of transportation impacts of projects on the environment, and an alternative metric must be used instead. The latest CEQA Guidelines identify VMT as the most appropriate metric to evaluate transportation impacts.

BACKGROUND

The push to analyze transportation impacts through effects on VMT was driven largely by California's air quality and climate change targets and goals. Senate Bill 32 (Pavley, 2016) requires the state of California to reduce greenhouse gas (GHG) emissions to 40 percent below 1990 levels by 2030. Executive Order B-16-12 sets a goal of 80 percent below 1990 emissions levels for the transportation sector by 2050. In order to reduce GHG emissions, the transportation sector needs

[1] Level of Service (LOS) is a qualitative measure of traffic operating conditions, whereby a letter grade "A" through "F" is assigned to a transportation facility, representing progressively worsening traffic operations. LOS is based on delay, and is a good approximation of congestion on roadways. LOS was used as the primary metric for analyzing transportation impacts of projects before SB 743 and the revised CEQA Guidelines. When LOS was used, a project's impacts were based on how much congestion it added to the surrounding roadway network.

to focus on three main strategies: increase vehicle efficiency, reduce the amount of vehicle travel, and reduce the fuel carbon content. The California Air Resources Board (CARB) in its 2016 Mobile Source Strategy provides a path to achieve emission reductions from the transportation sector while stressing the need to reduce single-occupancy vehicle activity. CARB found that it will not be possible to achieve the State's emissions goals for 2030 and beyond without reducing VMT growth and implementing significant changes to how communities and transportation systems are planned, funded, and built. CARB's 2017 Scoping Plan identifies implementing SB 743 and the associated VMT reduction strategies as a recommended action necessary to achieve California's GHG targets. CARB's 2017 Scoping Plan assumes that a reduction in statewide VMT is needed along with an increase in the percentage of zero-emissions vehicles on the road and an increase in the overall efficiency of vehicles in order for the transportation sector to meet its portion of California's GHG targets.

Recent studies also show other benefits of reducing VMT. Increases in vehicle miles traveled have a detrimental effect on the natural environment and human health.[2] Mitigation of VMT would potentially slow or alleviate the deterioration of the natural environment. Moreover, contrary to the previous belief that the economic growth of a region was facilitated by growth in VMT, recent research shows that economic growth is possible without an associated increase in VMT.[3,4]

[2] Fang et al. (2017) Cutting Greenhouse Gas Emissions Is Only the Beginning: A Literature Review of the Co-Benefits of Reducing Vehicle Miles Traveled.
[3] Haynes et al. (Sept. 2015) Congested Development: A Study of Traffic Delays, Access, and Economic Activity in Metropolitan Los Angeles
[4] Osman et al. (Mar. 2016) Not So Fast: A Study of Traffic Delays, Access, and Economic Activity in the San Francisco Bay Area

2. STATE GUIDANCE ON VMT

This section provides a summary of the current guidance the State of California has provided regarding VMT analysis.

SENATE BILL 743

SB 743, signed by Governor Brown in September of 2013 and codified in Public Resources Code § 21099, required the amendment of CEQA Guidelines to change the way transportation impacts are analyzed. The intent of SB 743 was (SB 743, § 1):

> *"(a)(2)Transportation analyses under the California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) typically study changes in automobile delay. New methodologies under the California Environmental Quality Act are needed for evaluating transportation impacts that are better able to promote the state's goals of reducing greenhouse gas emissions and traffic-related air pollution, promoting the development of a multimodal transportation system, and providing clean, efficient access to destinations."*
>
> *"(b)(1)Ensure that the environmental impacts of traffic, such as noise, air pollution, and safety concerns, continue to be properly addressed and mitigated through the California Environmental Quality Act."*
>
> *"(b)(2)More appropriately balance the needs of congestion management with statewide goals related to infill development, promotion of public health through active transportation, and reduction of greenhouse gas emissions."*

Public Resources Code § 21099 gives the following statutory direction which resulted in the revised CEQA Guidelines which were adopted in December 2018:

> *"(b)(1) The Office of Planning and Research shall prepare, develop, and transmit to the Secretary of the Natural Resources Agency for certification and adoption proposed revisions to the guidelines adopted pursuant to Section 21083 establishing criteria for determining the significance of transportation impacts of projects within transit priority areas. Those criteria shall promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses. In developing the criteria, the office shall recommend potential metrics to measure transportation impacts that may include, but are not limited to, vehicle miles traveled, vehicle miles traveled per capita, automobile trip generation rates, or automobile trips generated. The office may also establish criteria for models used to analyze transportation impacts to ensure the models are accurate, reliable, and consistent with the intent of this section."*

Also important to note from Public Resources Code § 21099:

> *"(2) Upon certification of the guidelines by the Secretary of the Natural Resources Agency pursuant to this section, automobile delay, as described solely by level of service or similar measures of vehicular capacity or traffic congestion shall not be considered a significant impact on the environment pursuant to this division, except in locations specifically identified in the guidelines, if any."*
>
> *"(4) This subdivision does not preclude the application of local general plan policies, zoning codes, conditions of approval, thresholds, or any other planning requirements pursuant to the police power or any other authority."*

Subsections (2) and (4) above imply that while LOS can no longer be used to determine significant transportation impacts in CEQA under the revised CEQA Guidelines, local agencies can still use LOS as part of general plan policies, conditions of approval, and other planning requirements. If a local agency wishes to continue using LOS standards when approving projects, placing the LOS standards in an ordinance or building standard would make them carry more weight than if they were simply listed in the general plan.

CEQA GUIDELINES

In December 2018, the California Natural Resources Agency certified and adopted the revised CEQA Guidelines, with a new section (§ 15064.3) implementing SB743, and edits to several other sections. The CEQA Guidelines identified vehicle miles traveled (VMT) as the alternative criterion to LOS (delay) analysis for evaluating a project's transportation impacts in § 15064.3(a):

> *"Generally, vehicle miles traveled is the most appropriate measure of transportation impacts. For the purposes of this section, "vehicle miles traveled" refers to the amount and distance of automobile travel attributable to a project. Other relevant considerations may include the effects of the project on transit and non-motorized travel. Except as provided in subdivision (b)(2) below (regarding roadway capacity), a project's effect on automobile delay shall not constitute a significant environmental impact."*

The revised CEQA Guidelines provided several criteria for analyzing transportation impacts, which are summarized in **Table 1**. Since these criteria are stated in the CEQA Guidelines, they can be considered to be generally applicable when performing VMT impact analysis.

Table 1. CEQA Guidelines Criteria for Analyzing Transportation Impacts

Topic	CEQA Guidelines Criteria
Land Use Projects	• VMT exceeding an applicable threshold = significant impact • Projects within ½ mile of high quality transit = less than significant impact • Projects that decrease VMT within the project area = less than significant impact
Transportation Projects	• Projects that decrease or don't change VMT = less than significant impact • For roadway capacity projects, agencies can determine the appropriate measure of transportation impact consistent with CEQA (i.e. don't have to use VMT) • Lead agencies can tier from a regional transportation plan EIR or other programmatic documents where applicable
Qualitative Analysis	• Lead agencies can analyze project VMT qualitatively when existing models or methods are not available • Qualitative analysis would include: availability of transit, proximity to other destinations, etc. • Qualitative analysis of construction traffic may be appropriate for many projects
VMT Methodology	• Lead agencies can choose the most appropriate methodology to evaluate VMT • Project effect on VMT may be considered in absolute terms, per capita, per household, or in any other measure • Models can be used to estimate a project's VMT, and model estimates can be revised to reflect professional judgement based on substantial evidence • Any assumptions used to estimate VMT or revisions to model estimates should be documented in the environmental document

The provisions of § 15064.3 of the CEQA Guidelines shall apply statewide beginning **July 1, 2020**, however, a lead agency may elect to be governed by the provisions of § 15064.3 immediately (§ 15064.3, subsection (c)).

Recommendations Regarding Thresholds

The revised CEQA Guidelines state that lead agencies may establish thresholds of significance to assist with the determination of significant impacts of a project. The revised CEQA Guidelines define a threshold of significance as:

> *"an identifiable quantitative, qualitative 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."*

When using a threshold, the lead agency should explain what compliance with the threshold means and should still consider other substantial evidence indicating that a project's environmental effects may still be significant. The revised CEQA Guidelines encourage all public agencies to develop and publish thresholds of significance. Thresholds to be used as part of a lead agency's environmental review process must be adopted by ordinance, resolution, rule, or regulation, and developed through a public review process and be supported by substantial evidence. The revised CEQA Guidelines also allow agencies to use thresholds on a case-by-case basis.

The revised CEQA Guidelines also states the following regarding thresholds (§ 15064.7, subsection (d)):

> *"(d) Using environmental standards as thresholds of significance promotes consistency in significance determinations and integrates environmental review with other environmental program planning and regulation. Any public agency may adopt or use an environmental standard as a threshold of significance. In adopting or using an environmental standard as a threshold of significance, a public agency shall explain how the particular requirements of that environmental standard reduce project impacts, including cumulative impacts, to a level that is less than significant, and why the environmental standard is relevant to the analysis of the project under consideration. For the purposes of this subdivision, an "environmental standard" is a rule of general application that is adopted by a public agency through a public review process and that is all of the following:*
>
> *(1) a quantitative, qualitative or performance requirement found in an ordinance, resolution, rule, regulation, order, plan or other environmental requirement;*
>
> *(2) adopted for the purpose of environmental protection;*
>
> *(3) addresses the environmental effect caused by the project; and,*
>
> *(4) applies to the project under review."*

OPR Technical Advisory

For assisting lead agencies with the implementation of the revised CEQA Guidelines, the California Governor's Office of Planning and Research (OPR) developed technical recommendations for the assessment of VMT, creation of thresholds of significance, and implementation mitigation measures in the *Technical Advisory on Evaluating Transportation Impacts in CEQA* (OPR Technical Advisory) (California Governor's Office of Planning and Research, December 2018). The purpose of the technical advisory is to provide advice and recommendations that professional planners, land use officials, and CEQA practitioners may use at their discretion when assessing VMT as part of a transportation impacts analysis under CEQA. The technical advisory does not alter lead agency discretion in preparing environmental documents and analysis subject to CEQA and should not be construed as legal advice.

OPR Recommendations Regarding Methodology

The OPR Technical Advisory provides the following recommendations on selecting models and methodology of analyzing VMT:

General Considerations

Vehicle Types

The OPR Technical Advisory recommends evaluating consistent vehicle types across project assessment, significance thresholds, and mitigation for a true apples-to-apples comparison. If cars, light trucks, and heavy-duty trucks are considered in one phase of an assessment (for example when determining the thresholds), those same vehicle types should be considered in all phases.

Land Use Projects and Land Use Plans

Residential and Office Projects

The OPR Technical Advisory recommends tour-based and trip-based approaches as the best methods for assessing VMT impact and mitigations for residential and office projects. Trip-based and tour-based methods are defined below:

- *Trip-based* assessment of a project's traffic calculates VMT from individual trips to and from the project. It is the most basic, and traditionally the most common, method of calculating VMT. Only trips that start or end at the project are counted. Trips are considered in isolation.
- *Tour-based* assessment of a project's traffic calculates VMT from the home-back-to-home tours that includes the project. For example, a theoretical tour for a person living in a new development (residential project) could consist of: "home > child's school > coffee shop > work > restaurant during lunch > work > child's school > home at the end of the day". The tour-based assessment accounts for intermediate trips which don't begin or end at the project, but are a part of project traffic.

According to the OPR Technical Advisory, the tour-based assessment is preferred when available because it captures travel behavior more comprehensively. However, when tour-based tools and data are not available, as is the case in Tuolumne County, a trip based assessment of VMT is considered acceptable as well.

To calculate the project VMT, a travel demand model based on either of the two approaches can be used. The OPR Technical Advisory stresses that lead agencies should use comparable models, tools, and methodologies when calculating thresholds, estimating project VMT, and estimating VMT reduction due to mitigation. Using comparable methodologies for all steps of the VMT assessment helps ensure an apples-to-apples comparison.

Lead agencies can focus on a certain subset of project trips when analyzing project VMT. When using a trip-based method to analyze a residential project, the focus can be on home-based trips. When using a trip-based method to analyze an office project, the focus can be on work-based trips.

Retail projects

The OPR Technical Advisory recommends evaluating the net effect of a retail project on the VMT of the area, as new retail projects generally divert trips from existing retail stores. The net effect can be calculated with a travel demand model by calculating the total VMT in the project area with and

without the project, and taking the difference to see if VMT increases, decreases, or remains the same.

Considerations for All Land Use Projects

The OPR Technical Advisory states that lead agencies should avoid truncation of VMT because of jurisdictional or other boundaries. CEQA requires environmental analyses to reflect "good faith effort at full disclosure." Therefore, where methodologies exist for the lead agency to estimate the full extent of vehicle travel from a project, the lead agency should do so. Short and long term project effects on VMT should also be considered where applicable.

For mixed-use projects or projects with multiple land uses, the OPR Technical Advisory recommends analyzing each use separately or focusing on the dominant land use. This recommended approach will make it possible to compare the project's VMT to corresponding thresholds. Mixed-use projects should take credit for internal capture.

Any project that includes a portion of an existing or proposed Transit Priority Area (TPA)[5] within its boundary may use VMT as the primary metric of transportation impact analysis for the entire project, consistent with Public Resources Code, § 21099, subdivisions (a)(7), (b)(1).

Cumulative Impacts

CEQA requires a project's cumulative impacts to be considered. A project's cumulative impacts are considered significant if 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.*" (Public Resources Code, § 21083, subdivision (b)(2)).

The OPR Technical Advisory give the following advice regarding analyzing cumulative VMT impacts:

- For projects analyzed using absolute VMT (i.e. project area VMT), it may be appropriate to perform a similar quantitative cumulative VMT analysis.
- For projects analyzed using efficiency based VMT, such as VMT/capita or VMT/employee, it may be assumed that 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. In other words, a finding of less than significant project impact (using adopted thresholds) would imply a less than significant cumulative impact.

Transportation Projects

According to the OPR Technical Advisory, analysis of a transportation project should address:

- Direct, indirect and cumulative effects of the transportation project (CEQA Guidelines, § 15064, subdivisions (d), (h))
- Near-term and long-term effects of the transportation project (CEQA Guidelines, §§ 15063, subdivision (a)(1), 15126.2, subdivision (a))
- The transportation project's consistency with state greenhouse gas reduction goals (Public Resources Code, § 21099)

[5] A Transit Priority Area is the area located within a half mile of existing or planned major/high-quality transit.

- The impact of the transportation project on the development of multimodal transportation networks (Public Resources Code, § 21099)
- The impact of the transportation project on the development of a diversity of land uses (Public Resources Code, § 21099)

VMT analysis for a transportation project should focus on change in total VMT of the project area. VMT analysis should be performed for the project area with and without the project, and the difference between the two scenarios would be the project effect on VMT. The full area in which driving patterns are projected to change should be considered. VMT estimation should not be truncated due to jurisdictional boundaries when possible.

An important concept regarding transportation projects is "induced vehicle travel", which is defined as any increase in vehicle travel due to a transportation project. According to the OPR Technical Advisory, any transportation project that increases vehicle travel would require a quantitative analysis and reporting of the amount of additional vehicle travel induced by the project in order to provide a full understanding of a project's environmental impacts on transportation, air quality, greenhouse gas emissions, energy, and noise. While the lead agency has the choice to use a metric other than VMT to analyze transportation impacts, changes in the amount of vehicle travel added to the roadway network should still be analyzed and reported regardless of the metric used. Generally, transportation projects likely to measurably increase vehicle travel (such as roadway widenings or new roads) would require a full induced travel analysis, while transportation projects not likely to increase vehicle travel (such as rehabilitation or safety projects) would not require a full induced travel analysis.

Transit and Active Transportation Projects

Transit and active transportation projects (including rail, bus, bicycle, and pedestrian infrastructure projects) generally reduce VMT and may be presumed to cause a less-than-significant impact on transportation without the need for analysis.

Roadway Projects

Roadway projects which reduce roadway capacity (for example by removing or repurposing a lane) generally reduce VMT and may be may be presumed to cause a less-than-significant impact on transportation without the need for analysis.

Roadway projects which increase roadway capacity (for example constructing new roadways or widening existing roadway to include more lanes) should be quantitatively analyzed for a change in VMT. The OPR Technical Advisory recommends using the "elasticity" method as a simple way of estimating the increase in VMT caused by a transportation project. The "elasticity" method relates percent change in lane miles of roadway to percent increase in VMT based on recent research.

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

The OPR Technical Advisory recommends using an elasticity of 1.0, which means that for every percent increase in lane miles there is a one percent increase in VMT. The OPR Technical Advisory notes that the "elasticity" method would not be suitable for rural (non-MPO) locations that are neither congested nor projected to become congested, or for new road projects that potentially shorten the distance between areas.

Transportation impacts of roadway projects can be analyzed at a programmatic level (for example in a regional transportation plan EIR) to streamline later project-level analysis (see CEQA Guidelines,

§ 15168). If a transportation project is analyzed in a program-level document, the analysis should account for how land use patterns would react to the changes created by all proposed transportation infrastructure improvements.

Thresholds of Significance

Lead agencies have the discretion to set or apply their own thresholds of significance. The thresholds set by the lead agencies need to be supported by substantial evidence. In developing thresholds of significance for transportation impacts, the three statutory goals established by SB743 (Public Resources Code §21099, subdivision (b)(1)) must be promoted:

a) Reduction of greenhouse gas emissions
b) Development of multimodal transportation networks
c) Diversity of land uses

This sections summarizes the OPR Technical Advisory's suggested thresholds and recommendations regarding setting thresholds. The recommendations in the OPR Technical Advisory are just recommendations and are not binding on lead agencies.

The State has clear quantitative targets for reduction of GHG emissions set forth in law. The amount of reduction in VMT needed to achieve the GHG targets has been quantified. Therefore, the OPR Technical Advisory recommends using quantitative VMT thresholds linked to GHG reduction targets when methods exist to do so. The following are examples of legislative mandates and state policies which establish quantitative GHG reduction targets:

- 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.

The OPR Technical Advisory concludes that meeting the above GHG targets will require a substantial reduction in existing VMT per capita. However, the targets for overall GHG emissions reduction do not translate directly to VMT thresholds for new projects, as GHG emissions reduction can be achieved by other means and is not expected to come from new projects alone. The OPR Technical Advisory also states that the use of an efficiency metric (e.g. VMT/capita or VMT/employee) may provide a better measure of impact than absolute numeric threshold for some land use types.

After analyzing applicable research, and based on 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**. OPR states that a fifteen percent reduction in VMT is achievable at the project level in a variety of places and is consistent in achieving the state's climate action goals for 2030 and 2050.

Screening Thresholds for Land Use Projects

OPR recommends lead agencies to use "screening thresholds" to identify land use projects that would have a less than significant impact without conducting detailed analysis.

- Small Projects Screening

  Projects that generate fewer than 110 trips per day could be assumed to cause a less than significant transportation impact. Exceptions to this criterion are projects that are inconsistent with a sustainable communities strategy or general plan, or when there is substantial evidence that the project would potentially generate a significant level of VMT.
- Low VMT Area Screening

  Lead agencies could use existing levels of VMT to determine existing areas with low VMT where future residential and office projects could be assumed to have low (or below threshold) VMT as well. The characteristics of the proposed retail or office projects would have to be considered as well (density, mix of uses, etc.).
- Transit Priority Area (TPA) Screening

  Lead agencies could presume projects falling within a half mile of an existing major transit stop[6] or an existing stop on a high-quality transit corridor[7] will have a less than significant transportation impact. This presumption might not be appropriate if the project:

[6] 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.").
[7] 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.").

- 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
- Other project specific information that indicates the project would still generate significant levels of VMT

- Affordable Residential Development Screening

  Affordable, infill housing typically improves an area's jobs-housing match, resulting in shorter average commutes and less VMT. Recent research supports a presumption of less than significant transportation impact for an infill project with 100 percent affordable housing making up the residential component. The OPR Technical Advisory encourages lead agencies to create their own parameters for what percentage of affordable, infill housing would result in a less than significant impact based on local evidence.

Recommended Thresholds for Land Use Projects

The OPR Technical Advisory recommends using numeric thresholds for residential, office, and retail projects where applicable. **Table 2** below summarizes the numeric thresholds recommended in the OPR Technical Advisory.

CEQA Guidelines, § 15125, subdivision (d) provides that lead agencies should also evaluate land use project impacts resulting from inconsistencies with regional plans, including regional transportation plans. If the lead agency finds a project to be inconsistent with the Regional Transportation Plan or Sustainable Communities Strategy (RTP/SCS), the agency needs to evaluate whether that inconsistency will result in a significant impact on transportation.

For analyzing the VMT impacts associated with land use plans, lead agencies should consider the entire area without truncation where the proposed plan might affect travel patterns. Specific plans may have the same thresholds as land use projects. A general plan, community plan or area plan may have a significant impact on transportation if the proposed land uses would in aggregate exceed their respective thresholds recommended above.

Table 2: Recommended Thresholds for Land Use Projects

Type of Project	Recommended Threshold Estimation
Residential Development	15% below existing VMT per capita Existing VMT per capita may be for the region or city. Project should be consistent with the sustainable community strategy.
Office Projects	15% below existing regional VMT per employee
Retail Projects	No net increase in total VMT in the area Local-serving retail tends to shorten trips and may be assumed to have less than significant impact. Regional-serving retail would require a quantitative analysis.
Mixed Use Projects	Compare each land use separately to the appropriate threshold values (e.g. residential and retail) or only consider the project's dominant use. The project should take credit for internal capture.
Redevelopment Projects	No net increase in total VMT in the area If the project leads to a net overall increase in VMT, then the appropriate thresholds above should apply and the project should be treated as a new development (i.e. not a redevelopment). If the project leads to a net overall increase in VMT but is a locally-serving retail project, transportation impacts from the retail portion of the project should be presumed to be less than significant.

Recommended Thresholds for Land Use Plans

Agencies should analyze the effects of land use plans on VMT over the entire area in which travel patterns are projected to change. The analysis should not truncate VMT at jurisdictional boundaries. 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 in **Table 2** above. If a lead agency tiers from a general plan EIR for a subsequent project, the lead agency would focus on any environmental impacts of the project that were not analyzed as significant impacts in the general plan EIR. The lead agency would continue to apply the thresholds recommended in **Table 2** in the tiered EIR.

Recommended Thresholds for Transportation Projects

A lead agency may adopt a threshold of significance or evaluate transportation impacts on a case-by-case impact for transportation projects. The CARB 2017 Scoping Plan and 2016 Mobile Source Strategy quantify the VMT levels required to achieve the State's GHG emissions targets. The OPR Technical Advisory recommends that transportation thresholds be established based on the CARB VMT levels and the following approach:

1. Propose a fair-share allocation of the VMT "budget" (i.e. the CARB VMT levels required to meet state targets) to the lead agency's jurisdiction (e.g., by population);
2. Determine the amount of VMT growth likely to result from background population growth, and subtract that from the lead agency's "budget";

3. Allocate the remaining lead agency jurisdiction's share between their various VMT-increasing transportation projects, using whatever criteria the lead agency prefers.

Transportation projects that would result in "induced vehicle travel" would require a VMT analysis and a comparison to the thresholds developed based on the method above. Transportation projects that would decrease or have no effect on VMT could be assumed to have a less than significant impact on transportation.

Recommended Rural Area Thresholds

OPR Technical Advisory recommends estimating VMT thresholds in rural areas on a case by case basis as fewer options may be available for reducing VMT. Rural areas may benefit from the implementation of clustered small towns or main street areas.

Impacts to Transit

Lead agencies should consider and document a project's impacts on transit, bicycle, and pedestrian facilities. Increases in transit users from projects should generally not be considered an adverse impact, as these sorts of projects generally improve the connectivity of a region. However, increased transit demand throughout a region could cause a cumulative impact by slowing overall operations and requiring improvements to infrastructure. Cumulative impacts could be addressed through a fee program for transit improvements.

Recommended Mitigations for VMT Impacts

When a significant impact is identified, the lead agency must identify feasible mitigation measures that could address the impact. The OPR Technical Advisory recommends considering the following examples of potential mitigation measures to reduce VMT:

- 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.

The OPR Technical Advisory recommends considering the following examples of potential project modifications to reduce VMT:

- 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.

CALTRANS GUIDELINES

Caltrans has addressed SB 743 in several ways. The *2015-2020 Caltrans Strategic Management Plan* (Caltrans, March 2015) redefined Caltrans' mission statement from focusing solely on improving mobility to one which stresses improvements to safety, efficiency, sustainability, livability, smart growth communities, and economy. Caltrans has set goals of reducing VMT and GHG by 15%, relative to 2010 levels, by 2020. In support of these goals, Caltrans is focusing on strategies such as increasing complete streets and multimodal features throughout their roadway network (where applicable), reducing travel times and delay for all modes of travel through Intelligent Transportation Systems (ITS), travel demand management, and better land use integration with transportation.

Caltrans has developed the California Statewide Travel Demand Model (CSTDM) to assist with preparation of VMT, trip, and trip length data throughout California. Caltrans provides CSTDM TAZ data for various land uses on its website:
https://dot.ca.gov/hq/tpp/offices/omsp/statewide_modeling/cstdm.html

CSTDM data can also be obtained by contacting Steven Vo with Caltrans Modeling. Steven Vo can be contacted at: steven.vo@dot.ca.gov.

Caltrans is currently in the process of reviewing the performance metrics it uses in evaluating operations and impacts of its transportation projects. Caltrans has not officially adopted a new metric for CEQA analysis at this time, but will likely adopt one in the near future. More information on Caltrans' implementation of SB 743 can be found here:
https://dot.ca.gov/programs/transportation-planning/office-of-smart-mobility-climate-change/sb-743

3. SUMMARY OF EXISTING VMT TOOLS

This section provides a summary of existing tools which could be used by Tuolumne County to analyze VMT. A description of each tool is provided, along with availability of the tool and applicability of the tool to the Tuolumne County area. **Table 3** provides an overall summary of the different types of tools typically used to evaluate VMT. More detail on each type of tool is provided in the following sections.

Table 3. Summary of Types of VMT Analysis Tools

Type of Tool	Examples	Strong Points	Drawbacks
Screening Tools	-Lists of Screening Criteria -Screening Maps	-Requires the least amount of effort and time -Streamlines CEQA process for certain types of projects	-Requires some set-up -Only applies to some types of projects -No project specific data
Sketch Tools	-CalEEMod -UrbanFootprint -San Jose VMT Evaluation Tool	-Requires less time and training than using a TDM -Produces efficiency metrics -Can be used to analyze mitigations	-Needs to be customized for a particular area -Only applies to some types of projects -Cannot analyze projects which affect travel patterns over a large area
Travel Demand Models (TDMs)	-California Statewide TDM -Tuolumne County TDM	-Produces absolute VMT metrics -Can analyze projects which affect travel patterns over a large area -Can analyze cumulative impacts -Can analyze transportation projects	-Requires a significant amount of time and training -Not able to model all types of mitigation measures

SCREENING LISTS AND MAPS

The OPR Technical Advisory recommends using "screening thresholds" and tools to quickly identify projects which could be determined to have less than significant impacts on transportation without conducting a full analysis (consistent with CEQA Guidelines, § 15128). The screening process can be formed with "screening lists" or "screening maps" which help speed up the review of transportation impacts on the environment by screening out projects which would likely be in line with the lead agencies VMT and GHG targets and goals.

Screening Lists

A screening list is a list of criteria that, if met, shows that a project's impacts would be less than significant. Any screening list developed by a lead agency needs to be supported by substantial evidence. Screening lists can be used for land use projects, transportation projects, land use amendments, and projects of other types. Examples of criteria that screening lists could include for land use projects include: is the number of units under a certain amount, is the quantity of square feet gross floor area under a certain amount, is it a local serving facility, is it within a transit priority area, does it include a certain percentage of affordable housing, etc. Screening lists for transportation projects could list types of projects which the lead agency assumes would reduce or cause no change in VMT and therefore would not require a detailed analysis. Certain criteria can apply to specific types of projects. The screening list can require just one or a combination of criteria to be met for a project to be screened out. A lead agency could also require a project to meet criteria in multiple screening tools (such as a screening list plus a screening map (discussed below)) to be screened out. An example of a screening list for residential and office projects is shown in **Table 4**.

Table 4. Example Screening List for Residential and Office Projects

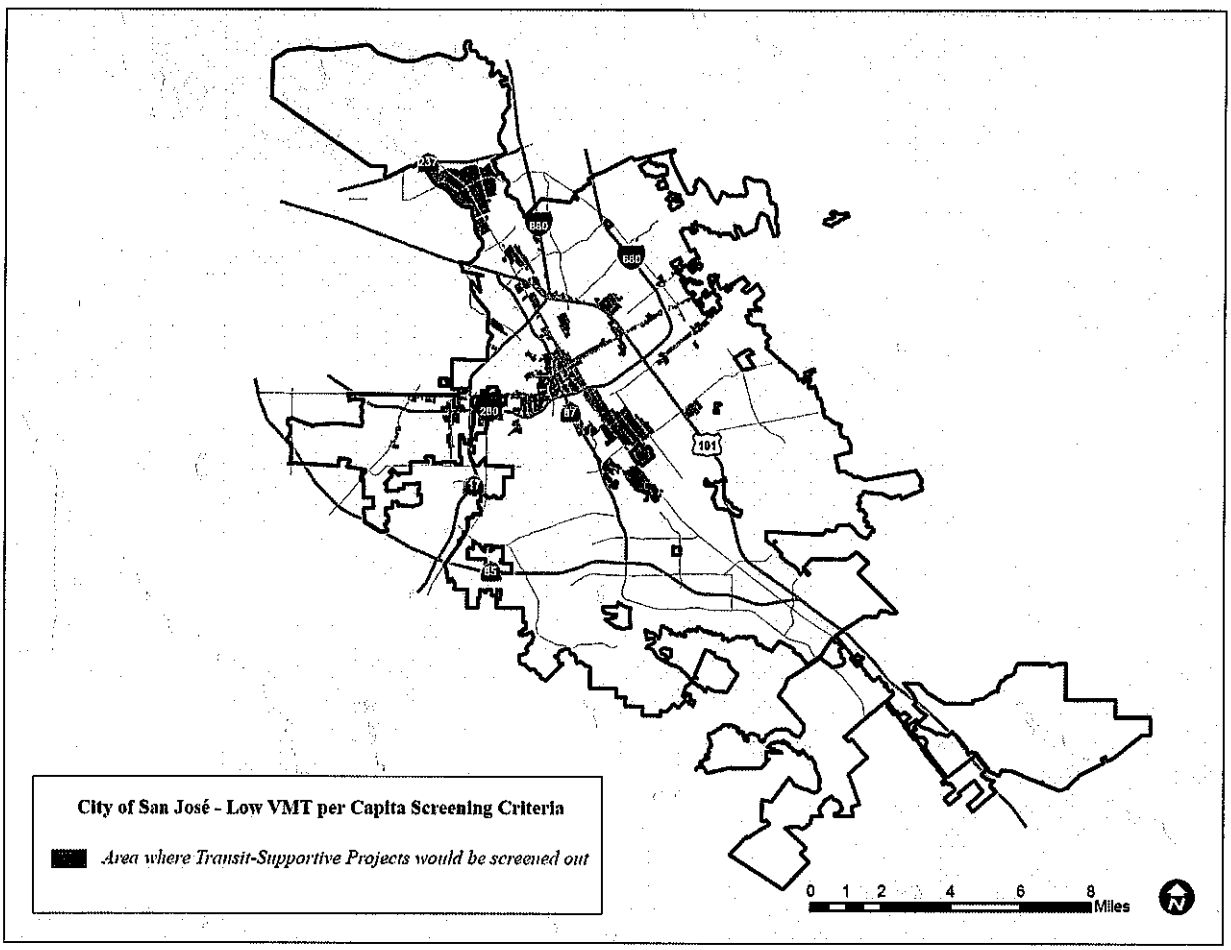
Project Type	Screening Criteria
Residential/ Office Projects or Components	• **Planned Growth Areas:** Located within a Planned Growth Area as defined in the Envision San José 2040 General Plan; AND • **High-Quality Transit:** Located within ½ a mile of an existing major transit stop(2) or an existing stop along a high-quality transit corridor(3); AND • **Low VMT:** Located in an area in which the per-capita or per-employee VMT is less than or equal to the threshold of significance for the land use; AND • **Transit-Supporting Project Density**: o Minimum Gross Floor Area Ratio (FAR) of 0.75 for office projects or components; o Minimum of 35 units per acre for residential projects or components; o If located in a Planned Growth Area that has a maximum density below 0.75 FAR or 35 units per acre, the maximum density allowed in the Planned Growth Area must be met; AND • **Parking:** o No more than the minimum number of parking spaces required(4); o If located in Urban Villages or Downtown, the number of parking spaces must be adjusted to the lowest amount allowed(5); however, if the parking is shared, publicly available, and/or "unbundled"(6), the number of parking spaces can be up to the zoned minimum; AND • **Active Transportation:** Not negatively impact transit, bike or pedestrian infrastructure.
Source: *San Jose Transportation Analysis Handbook – Table 1 (City of San Jose, April 2018).*	

Screening Maps

A screening map is a map of the lead agency's jurisdiction with areas of low VMT highlighted. If a project is proposed within a low VMT area and has similar characteristics to other land uses in the low VMT area, it can be assumed that the project's impacts on transportation would be less than significant and a full analysis would not be needed. Any screening map developed by a lead agency needs to be supported by substantial evidence. A typical way of developing a screening map would be to compare the VMT generated by each traffic analysis zone (TAZ[8]) in the jurisdictions' travel demand model against the regional or citywide average or target, and highlight those TAZs which are below the average/target. Screening maps typically work best for residential and commercial land use projects. A lead agency could require a project to meet criteria in multiple screening tools (such as a screening list plus a screening map) to be screened out. An example of a screening map for residential projects is shown in **Figure 1**.

[8] TAZs are geographic polygons similar to census block groups used to represent areas of homogenous land uses and travel behavior.

Figure 1. Example Screening Map for Residential Projects



Source: *San Jose Transportation Analysis Handbook - Figure 3 (City of San Jose, April 2018).*

TRAVEL DEMAND MODELS

Travel demand models (TDMs) (also called travel forecasting models) are computer based models which help estimate future traffic volumes based on a the assumed land use build out and infrastructure improvements included in general plans, regional transportation plans, and sustainable community strategies. TDMs typically use four basic phases for forecasting transportation: trip generation, trip distribution, mode choice, and trip assignment. Essentially, a travel demand model takes land use statistics and projections, converts those into trips, decides where the trips will go and how they will get there, and assigns those trips onto the transportation network, resulting in traffic volumes.

There are two main types of TDMs: "four-step" and "activity-based". Four-step models perform trip-based analysis by modeling trips to and from land uses individually. Activity-based models perform tour-based analysis by modeling each person's entire tour or chain of trips from home to home. Both types of TDMs are considered acceptable for analyzing VMT for CEQA review. Travel demand models are good at analyzing the absolute effect of a project on VMT of the project area. Transportation projects and some retail projects are often best analyzed in a TDM. However, project level analysis in a TDM can be time consuming. The existing TDMs which are applicable to Tuolumne County are summarized below.

California Statewide Travel Demand Model (CSTDM) – Caltrans developed CSTDM (http://www.dot.ca.gov/hq/tpp/offices/omsp/statewide_modeling/cstdm.html) using Citilabs Cube modeling software to provide an advanced tour/activity model for estimating interregional trips in California and obtaining trip volumes and trip length distribution by trip purpose. The CSTDM has scenario years of 2015, 2020, 2035, 2040, and 2050. Caltrans provides VMT and trip length data by TAZ from the CSTDM for implementing SB743 (http://www.dot.ca.gov/hq/tpp/offices/omsp/SB743.html). The model will be updated approximately every five years with new population, employment, and transportation behavior forecasts from the census, metropolitan planning organizations, regional transportation planning organizations, Caltrans, and other agencies. Since the model provides statewide travel data, it might not be suitable for estimating local project level VMT and the influence of the surrounding land use parameters. However, it can provide a reasonable forecast of regional travel characteristics for California counties.

Tuolumne County Regional Travel Demand Model (Tuolumne County TDM) – The Tuolumne County TDM was developed to assist the Tuolumne County Transportation Council (TCTC) in preparing updates to the long-range Tuolumne County Regional Transportation Plan (RTP), and is updated approximately every five years alongside the RTP updates. The Tuolumne County TDM runs in TransCAD software and was updated in August 2015 by Wood Rodgers, Inc. to include a base year scenario of 2015 and future year scenarios of 2030 and 2040. The functionality of the model is currently (June 2019) being updated by Caliper, Inc. and Wood Rodgers, Inc. to work in the latest version of TransCAD (8.0), and include a full mode choice component, transit network, new interface, and additional reporting tools to assist with VMT analysis. The Tuolumne County TDM is also being validated against AirSage cell phone data.

The updated Tuolumne County TDM will be a four-step model and can be used to estimate daily, trip-based VMT in Tuolumne County. The Tuolumne County TDM could be used for project analysis and setting VMT thresholds. One limitation of the Tuolumne County TDM is that it cannot estimate the full length of trips that go beyond the County borders.

EXISTING SKETCH PLANNING TOOLS FOR ESTIMATING VMT

In transportation planning, a "sketch planning tool" or "sketch tool" is generally a simple spreadsheet or calculation based tool that uses a set of data and assumptions to quickly model the effects of a project. Sketch planning tools produce general order-of-magnitude estimates of travel demand and characteristics. Common outputs include trip generation, trip lengths, mode split, and VMT. These simple and low-cost tools can streamline the transportation analysis of specific projects or alternatives. Typically, sketch tools only require input of a handful of variables to produce results.

While many generic sketch planning tools exist, they typically have to be customized for a specific area to produce reasonable results. This can be done by obtaining area-specific trip data from a TDM or collected data, and editing the sketch tool to include these custom assumptions and variables. This area-specific customization would only need to be performed once to create an area-specific version of the tool. Sketch tools are best used to estimate the VMT impacts of land use projects that can be analyzed with an efficiency metric such as VMT per capita or VMT per employee. Residential, office, industrial, and some retail projects can typically be analyzed with sketch tools.

Existing sketch tools related to VMT have been identified below. All of these sketch tools have various positives and drawbacks. Not all tools listed below may be appropriate for VMT analysis in Tuolumne County.

GIS and/or Model-based Tools

Bay Area Simplified Simulation of Travel, Energy and Greenhouse Gases (BASSTEGG) (ftp://ftp.abag.ca.gov/pub/mtc/planning/forecast/BASSTEGG/) – A free GIS-based sketch tool developed by Bay Area Metropolitan Transportation Commission for predicting household VMT and GHG emissions. Specific to the Bay Area. Available online.

CalEEMod (http://www.caleemod.com/) – A free statewide land use emissions computer model to calculate potential criteria pollutant and greenhouse gas emission associated with construction and operations from a land use project. The model also estimates VMT from the trip generation and trip lengths associated with land use projects. The outputs for this tool are highly dependent on the specified land use setting (urban or rural) and the amount of "VMT" mitigation is capped for different project settings[9]. Widely used by air districts throughout California. Can be customized to a specific area. Available online.

Envision Tomorrow (https://alex-steinberger-zhkx.squarespace.com/downloads/) – A free scenario planning package developed for the US Department of Housing and Urban Development to project the effects of a community's current growth pattern and future decisions that will impact growth. The tool can be analyzed at three different levels: city/regional, district, and site. Available online.

GreenTrip Connect (https://connect.greentrip.org/) – A free web-based tool that provides a statistically based analysis of VMT reduction for residential projects only and is based on TDM reduction strategies of GreenTrip Certification[10]. Available online.

H+T (Housing and Transportation) Affordability Index (https://htaindex.cnt.org/) – A free web-based tool developed by Center for Neighborhood Technology that uses nationally available

[9] Lee, A., Fang, K., & Handy, S. (2017). Evaluation of Sketch- Level VMT Quantification Tools (Rep.). doi: August 2017
[10] GreenTrip Certification program by TransForm encourages planning and design for reducing GHG emissions.

data such as census to estimate auto ownership, auto use (VMT), and transit use for calculating transportation costs and GHG emissions. Only applies to residential projects. Available online.

Induced Travel Calculator (https://blinktag.com/induced-travel-calculator/index.html) – A free tool developed by the National Center for Sustainable Transportation to address traffic congestion caused by increasing roadway capacity for roadways managed by Caltrans. The analysis is focused on the highway types of 37 Metropolitan Statistical Areas (MSA). Only applies to transportation projects which increase roadway capacity. Available online.

Local Sustainability Planning Tool (http://rtpscs.scag.ca.gov/Pages/Local-Sustainability-Planning-Tool.aspx) – A free GIS tool developed by the Southern California Association of Governments (SCAG) for modeling the effects of land use scenarios on VMT, mode share, and GHG emissions. May be obtained from SCAG. Contact information on their website.

Low-carb Land Tool – A proprietary web tool developed by Sonoma Technology, Inc. for examining VMT and GHG under different growth and land use scenarios. Used by Washington State Department of Transportation.

MXD+ – A proprietary model developed by Fehr & Peers that adjusts Institute of Transportation Engineers (ITE) trip generation rates based on built environment characteristics. The MXD+ tool accounts for more variables than the MXD spreadsheet tool (discussed in the Spreadsheet Tools section below). The trip lengths obtained from the California Statewide Travel Demand Model can input into the sketch tool and multiplied by the trip generation rates to obtain VMT.

TDM+ – A proprietary tool developed by Fehr & Peers to use the California Air Pollution Control Officers Association (CAPCOA) Quantifying GHG Mitigations Report for modeling possible reductions. Only does travel demand management reductions, not VMT generation.

Urban Footprint (https://urbanfootprint.com/) – A proprietary scenario planning model developed by Calthorpe Analytics that relies on the MXD spreadsheet tool (discussed in the Spreadsheet Tools section below) trip generation methodology to produce VMT. Can be customized for specific areas. Very detailed and sensitive to changes in land uses adjacent to a project. California has acquired licenses which can be used by all California cities, counties, and agencies.

VMT+ (https://www.fehrandpeers.com/vmt/) – A free, educational tool developed by Fehr & Peers to estimate VMT and GHG emissions to and from a project/plan area and the off-site VMT generated by project/plan area. Limited applications. Available online.

Spreadsheet Tools

California Smart Growth Trip Generation (http://ultrans.its.ucdavis.edu/projects/smart-growth-trip-generation) – A free spreadsheet tool developed by University of California, Davis to estimate multi-modal trip generation rates for land use projects implementing principles of smart growth[11]. Only calculates trips. Would have to manually convert trips to VMT. Available online.

MXD (https://www.epa.gov/smartgrowth/mixed-use-trip-generation-model) – A free spreadsheet tool developed by Fehr & Peers for the Environmental Protection Agency that adjusts ITE trip generation rates based on built environment characteristics. The trip lengths obtained from the

[11] "Smart growth" land use projects refer to the 10 principles established by the Smart Growth Network and US Environmental Protection Agency (https://smartgrowth.org/smart-growth-principles/)

California Statewide Travel Demand Model can be input into the sketch tool and multiplied by the trip generation rates to obtain VMT. Available online.

Rapid Fire Tool – A proprietary spreadsheet based tool developed by Calthorpe Analytics to produce transportation metrics such as Light Duty Vehicle (LDV) Vehicle Miles Traveled, fuel use and cost, GHG and criteria pollutant emissions.

Sketch 7 (http://ultrans.its.ucdavis.edu/projects/improved-data-and-tools-integrated-land-use-transportation-planning-california.html) – A free spreadsheet-based tool developed by University of California, Davis that calculates the change in VMT resulting from the addition of the project to the surrounding land uses. The tool estimates VMT based on seven land use and transportation characteristics: density, diversity, distance, design, destination, demographics, and development scale. The tool is part of the package for Improved Data and Tools for Integrated Land Use-Transportation Planning in California, which also includes a GIS sketch planning tool and a travel demand forecasting model post-processor. Available online.

TRIMMS (Trip Reduction Impacts of Mobility Management Strategies) (http://trimms.com/) – A free visual basic (VB) spreadsheet application developed by the National Center for Transit Research and the Center for Urban Transportation research at the University of Florida for estimating the impact of transportation demand initiatives through mode share and VMT changes. The Environmental Protection Agency, Federal Highway Administration, San Diego Association of Governments, and San Juaquin Council of Governments have used TRIMMS for various planning purposes. Available online.

VMT Impact Tool/Salon (https://ww3.arb.ca.gov/research/apr/past/vmt_impact_tool_may292014_09-343.xlsx) – A free spreadsheet tool developed by Deborah Salon for UC Davis to estimate the effects of land use and transport system characteristics on VMT and average VMT of neighborhoods and different trip types. Available online.

A summary of the sketch tools discussed in this section of the memo, including their primary attributes and applicability to Tuolumne County, is included in **Table 5**.

Table 5. Summary of VMT Sketch Planning Tools

Tool	Output	Developer	Availability	Key Variables for VMT Calculation	Attributes	Applicability
BASSTEGG	VMT	Bay Area Metropolitan Transportation Commission	Free Online Download	Bay Area Travel Survey 2000 – Income group, Density level, Workers in Household, Vehicles in Household	-Specific to the Bay Area	Not Recommended
CA Smart Growth Trip Generation Tool	Trips	UC Davis ULTRANS Year – 2012	Free Online Download	Smart growth factors such as location, population, urban form, parking, and transit-related characteristics	-Simple but limited functionality -Does not directly produce VMT	Not Recommended
CalEEMod	VMT	California Air Pollution Control Officers Association (CAPCOA) Year - 2013	Free Online Download	Variables from CAPCOA Quantifying GHG Mitigations Report	-Widely used for air quality -Many variables -Customizable	Could be used in Tuolumne County if customized
Envision Tomorrow	VMT	Fregonese Associates Year – 2013	Free Online Download	Multiple characteristics based on land use, transportation, demographics, and employment.	-Many parameters -Complex to use	Not Recommended
GreenTrip Connect	VMT; % Change in VMT	Center for Neighborhood Technology Year – 2016	Free Web-Based Tool	Land use and transportation characteristics, Presence of affordable housing, parking spaces, effects of transit passes/carshare/bikeshare	-Residential VMT only -Complex to use	Not Recommended
H+T (Housing and Transportation) Affordability Index	VMT	Center for Neighborhood Technology	Free Web-Based Tool	11 variables – median income, per capita income, average household size, average commuters per household, residential density, gross density, average block size, intersection density, transit connectivity, transit access shed, employment access.	-Residential VMT -May not apply in rural areas	Not Recommended
Induced Travel Calculator	VMT	National Center for Sustainable transportation	Free Online Download	Type of highway facility and MSA (Only for roadway capacity projects)	-Does not have data for Tuolumne -Mainly for highway projects	Not Recommended

Table 5. Summary of VMT Sketch Planning Tools

Tool	Output	Developer	Availability	Key Variables for VMT Calculation	Attributes	Applicability
Local Sustainability Planning Tool	VMT	Southern California Association of Governments (SCAG)	Free Upon Request	Multiples measures for capturing site development characteristics.	-Specific to Southern California	Not Recommended
Low-carb Land Tool	VMT	Sonoma Technology, Inc.	Proprietary Web-Based Tool	D-Variables (Density, Diversity, Destination, Distance, Design)	-Specific to Washington State	Not Recommended
MXD	Trips	Fehr & Peers	Free Online Download	Multiples measures for capturing site development and surrounding development.	-Primarily a trip generation tool -Relies on CSTDM data to estimate VMT	Not Recommended
MXD+	Trips	Fehr & Peers	Proprietary	Multiples measures for capturing site development and surrounding development.	-Primarily a trip generation tool -Requires a lot of data from outside sources	Not Recommended
Rapid Fire Tool	VMT	Calthorpe Analytics	Proprietary	Demographic projections, Land Use options	-Light-duty VMT only -Complex to use	Not Recommended
Sketch 7	% Change in VMT	UC Davis ULTRANS Year – 2012	Free Online Download	7 D's of land use and transportation characteristics: density, diversity, distance, design, destination, demographics, and development scale.	-Residential VMT only -Customizable	Could be used in Tuolumne County to analyze residential mitigations. May not be applicable in rural areas.
TDM+	% Change in VMT	Fehr & Peers	Proprietary	Trip characteristics and proposed travel demand management measures.	-Only analyzes mitigations, not projects	Not Recommended

Table 5. Summary of VMT Sketch Planning Tools

Tool	Output	Developer	Availability	Key Variables for VMT Calculation	Attributes	Applicability
TRIMMS	VMT	Center for Urban Transportation Research	Free Online Download	Mode Share, Type of employer-based commuter program, Land use	-Only analyzes mitigations for employment based land uses	Could be used in Tuolumne County to analyze employment mitigations. May not be applicable in rural areas.
Urban Footprint	VMT	Calthorpe Analytics Year – 2012	Proprietary California has purchased a license that can be used by all public agencies in the state	Demographic and economic data, transit, land use, and road network data.	-Complex to Use -Customizable -Sensitive to land use changes adjacent to a project	Could be used in Tuolumne County if customized.
VMT Impact Tool/Salon	VMT	Deborah Salon	Free Online Download	Land use and transportation variables (% transit and non-motorized commuters, gas prices, % single-family-homes, road density, regional and local job access, activity mix	-Residential VMT only -Not a project-level tool	Not Recommended
VMT+	Trips and VMT	Fehr & Peers	Free Web-Based Tool	On-site trips/Pass-by Trips	-Limited functionality	Not Recommended

4. CASE STUDIES FOR SB 743 IMPLEMENTATION

To better understand the implementation of CEQA guidelines in California, five regions that have already gone through, or are currently going through, the process of setting VMT thresholds and guidelines for analysis were selected as case studies. The five regions selected as case studies are:

- City of Oakland
- City of Pasadena
- City of San Francisco
- City of San Jose
- Western Riverside Council of Governments

Detailed summaries of the VMT processes, tools, thresholds, and mitigations used by each of the case study regions are provided in this section. An overall summary of the five case study regions' adopted significance thresholds and recommended VMT analysis tools is included in **Table 6**.

The City of Los Angeles has also recently adopted VMT thresholds and guidelines, but was not selected as a case study in this memorandum as they were still completing their guidelines while this memorandum was being prepared. Additional details on the City of Los Angeles' VMT Guidelines and thresholds can be found here:

https://ladot.lacity.org/what-we-do/planning-development-review/transportation-planning-policy/modernizing-transportation-analysis

Table 6. Summary of Other Agencies' VMT Thresholds and Tools

Region	Significance Thresholds for Common Project Types				VMT Tools
	Residential	**Office**	**Retail**	**Transportation**	
City of Oakland	A project TAZ(s) exceeding both the existing average City household VMT per capita minus 15 percent and existing average regional household VMT per capita minus 15 percent	Project TAZ(s) exceeding the existing average regional VMT per employee minus 15 percent	Net increase in total VMT may indicate a significant transportation impact	Substantially induce additional automobile travel by increasing physical roadway capacity in congested areas (i.e., by adding new mixed-flow lanes) or by adding new roadways to the network	-Screening Criteria -Screening Maps -Travel Demand Model chosen on a project-by-project basis
City of Pasadena	VMT in the City of Pasadena per service population (population + jobs)	Vehicle Trips in the City of Pasadena per service population (population + jobs)	Vehicle Trips in the City of Pasadena per service population (population + jobs)	None	-Screening Criteria -Pasadena Travel Demand Forecasting Model
City of San Francisco	Regional Household VMT per capita minus 15 percent	Regional VMT per employee minus 15 percent	Regional VMT per retail employee minus 15 percent	2,075,220 VMT per year (fair share VMT budget remaining for transportation projects)	-Screening Criteria -San Francisco County Transportation Authority's San Francisco Chained Activity Modeling Process (SF-CHAMP)
City of San Jose	Project VMT exceeds existing citywide average VMT per capita minus 15 percent OR existing regional average VMT per capita minus 15 percent, whichever is lower	Project VMT per employee exceeds existing regional average VMT per employee minus 15 percent	Net increase in existing regional total VMT	0.3% increase in total VMT for every percent increase in lane-miles for roadways (applies to roadways in Sphere of Influence and roadways in Santa Clara County, but separately)	-Screening Criteria -Screening Maps -San Jose VMT Evaluation Tool (custom sketch tool) -San Jose Travel Demand Model
Western Riverside Council of Governments (WRCOG)	Four recommended options for setting thresholds (none adopted yet): 1. Thresholds consistent with the OPR Technical Advisory 2. Thresholds consistent with Lead Agency air quality, GHG reduction, and energy goals 3. Thresholds consistent with RTP/SCS future year VMT projections by jurisdiction or sub-region 4. Thresholds based on baseline VMT performance by jurisdiction or sub-region				-Web-based Map Screening Tool -Riverside County Transportation Analysis Model (RIVTAM) for detailed VMT analysis -Sketch Tools for testing mitigations

CITY OF OAKLAND

Background

The City of Oakland began the process of adopting SB743 by conducting an extensive review of current transportation impact review (TIR) best practices in California and in other states to determine alternatives to Level of Service analysis. During this review process, the City of Oakland considered a number of possible metrics which could be used for transportation analysis, including VMT, VMT plus modified LOS, trip generation, development size, proximity and quality of local bike and pedestrian networks, and parking thresholds, among others. The City of Oakland's review culminated in an update to their CEQA Thresholds and TIR Guidelines to utilize VMT per capita as their primary metric for analysis of transportation impacts. The majority of information from this section is from the *City of Oakland Transportation Impact Review Guidelines: Land Use Development Projects* (Oakland TIR Guidelines) (City of Oakland, April 14, 2017).

Process

As the transportation analysis process is influenced by the City of Oakland's plans and policies, the transportation component of a proposed project needs to follow the city's general plan and overall vision. The transportation components of Oakland's plan and policies focus on "achieving an effective, sustainable, multimodal transportation system". The typical City of Oakland scope of work for an evaluation of a project's impacts on transportation under CEQA is outlined in **Table 7**.

Table 7. City of Oakland Typical Transportation Impact Review Scope of Work

Topic	Subtopics	Passes CEQA Screen <50 Vehicle Trips During Peak Hour	Passes CEQA Screen >50 Vehicle Trips During Peak Hour	Does Not Pass CEQA Screen	TRG Section (Transportation Review Guidelines Section)
I. Project Summary	Project Description	X	X	X	2.1
	Study Area Description	X	X	X	2.2
II. Travel Analysis	Trip Generation Letter	X	X	X	3.1
	Transportation Counts		X	X	3.2
	Collision History & Analysis		X	X	3.3
III. Transportation	TDM Plan		X	X	4.1
	TDM Compliance		X	X	4.2
Demand Management					
VI. CEQA Analysis	Consistency With Plans		X	X	5.3
	Detailed VMT Analysis			X	5.5
	Mitigations (if applicable)			X	5.6
V. Conditions of Approval	Conditions of Approval	X	X	X	6

Source: *City of Oakland Transportation Impact Review Guidelines – Table 1 (City of Oakland, April 14, 2017)*

Tools

Screening Criteria

The City of Oakland has three key screening criteria. If a project or components of the project meet any of the below screening criteria, then it is presumed VMT impacts would be less than significant for the project or component of the project and a detailed VMT analysis is not required.

*"**5.4.1 Presumption of Less Than Significant Impact for Small Projects***

Absent substantial evidence indicating that a project would generate a potentially significant level of vehicle miles traveled (VMT), projects that generate fewer than 100 vehicle trips per day generally may be assumed to cause a less-than-significant transportation impact.

5.4.2 Presumption of Less Than Significant Impact for Residential, Retail, and/or Office Projects in Low-VMT Areas

Residential, locally-serving retail[17], and office projects that locate in areas with low VMT[18], and that incorporate similar features (i.e., density, mix of uses, low parking ratios[19], transit accessibility) will tend to exhibit similarly low VMT. Therefore, use maps or tables illustrating areas that exhibit below-threshold VMT to screen out residential, office, and retail projects which may not require a detailed VMT analysis.[20] For projects that include residential, office, and retail components, each map should be used to screen the respective portion of the project. Information regarding the VMT per supply metric for the project transportation analysis zone (TAZ) and citywide average may be presented in a table or in a series of maps. Either method should include the source data, including name of travel model, version, and year of analysis.

***Regional-serving retail.** A 2007 market analysis[21] showed that Oakland was severely under-served in comparison goods type retail, a category that includes products sold in stores offering apparel (clothing, accessories, shoes), home furnishings and appliances, specialty goods (gifts, jewelry, books, stationery and cards, sporting goods, etc.), and department and other general merchandise stores. As a result, nearly two-thirds of Oakland's potential sales in this category is lost to other Bay Area communities. This means that even typical regional-scale "big box" retail may reduce trip length for Oakland residents who choose to shop there, and would have otherwise traveled farther. At the same time, a highway-oriented, regional-scale outlet mall could be a generator of new trips from outside of Oakland. For these reasons, regional-scale retail should be evaluated on a case-by-case basis, focusing on the details of the form and type of retail.*

5.4.3 Presumption of Less Than Significant Impact Near Transit Stations

Presume that residential, retail, and office projects, as well as mixed use projects which are a mix of these uses, proposed within ½ mile of an existing major transit stop or an existing stop along a high-quality transit corridor[22] 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 an overall Floor Area Ratio (FAR) of less than 0.75,*
- *Includes more parking for use by residents, customers, or employees of the project than required (if parking minimums pertain to the site) or allowed without a conditional use permit (if minimums and/or maximums pertain to the site)*
- *Is inconsistent with Plan Bay Area, the applicable Sustainable Communities Strategy (as determined by the lead agency, with input from the Metropolitan Transportation Commission),[23] or*
- *Has a retail component that is greater than 80,000 sf."*

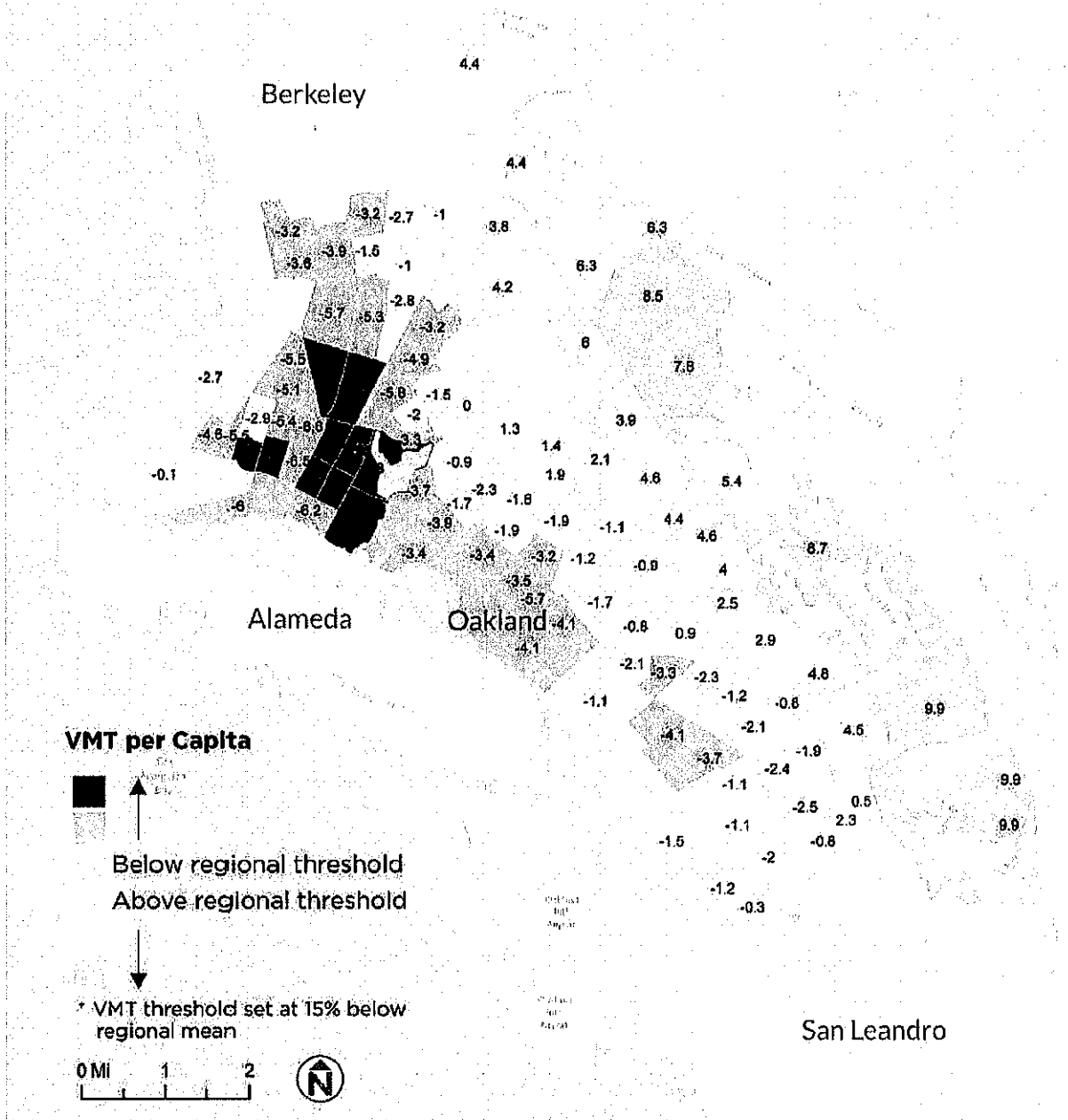
The City of Oakland has the following screening criteria for other land uses:

> ***"5.4.4 Screening and Thresholds for Other Land Uses***
>
> *The Oakland Planning and Building Department has provided screening criteria and thresholds of significance to determine if land uses similar in function to residential, office, and retail would result in significant impacts as it relates to VMT.*[24]
>
> *The Oakland Planning & Building Department expands the Revised Proposal Map-*
>
> *Based Screening and Proximity to Transit Station screening criteria to the following types of land uses:*
>
> - *Tourist hotels, student housing, single room occupancy hotels, and group housing land uses should be treated as residential for screening and analysis.*
> - *Childcare, K-12 schools, post-secondary institutional (non-student housing), Medical, and production, distribution, and repair (PDR) land uses should be treated as office for screening and analysis.*
> - *Grocery stores, local-serving entertainment venues, religious institutions, parks, and athletic clubs land uses should be treated as retail for screening and analysis.*
>
> *The following identifies screening criteria and thresholds of significance used to determine if other types of land uses occasionally reviewed by the Oakland Planning and Building Department would result in significant impacts as it relates to VMT.*
>
> - **Public services** *(e.g., police, fire stations, public utilities) do not generally generate VMT. Instead, these land uses are often built in response to development from other land uses (e.g., office and residential). Therefore, these land uses can be presumed to have less-than-significant impacts on VMT. However, this presumption would not apply if the project is sited in a location that would require employees or visitors to travel substantial distances and the project is not located within ½ mile of a major transit stop or does not meet the small project screening criterion.*
> - ***Event Centers and Regional-Serving Entertainment Venues.*** *Trips associated with these land uses are typically discretionary trips made by individuals, which may be substitute or new trips. For these land uses, a detailed VMT analysis would most likely be required as outlined below. Therefore, no screening criterion is provided. For these land uses, a VMT efficiency metric would also be used. A project would cause substantial additional VMT if it exceeds the existing regional VMT per retail employee minus 15 percent.*
>
> *The land uses in this and the preceding sub-section are not intended to be inclusive of every land use reviewed by the Oakland Planning & Building Department for projects subject to CEQA. For these other land uses, the analysis should be consistent with one of the screening criteria and thresholds of significance described above"*

Screening Maps

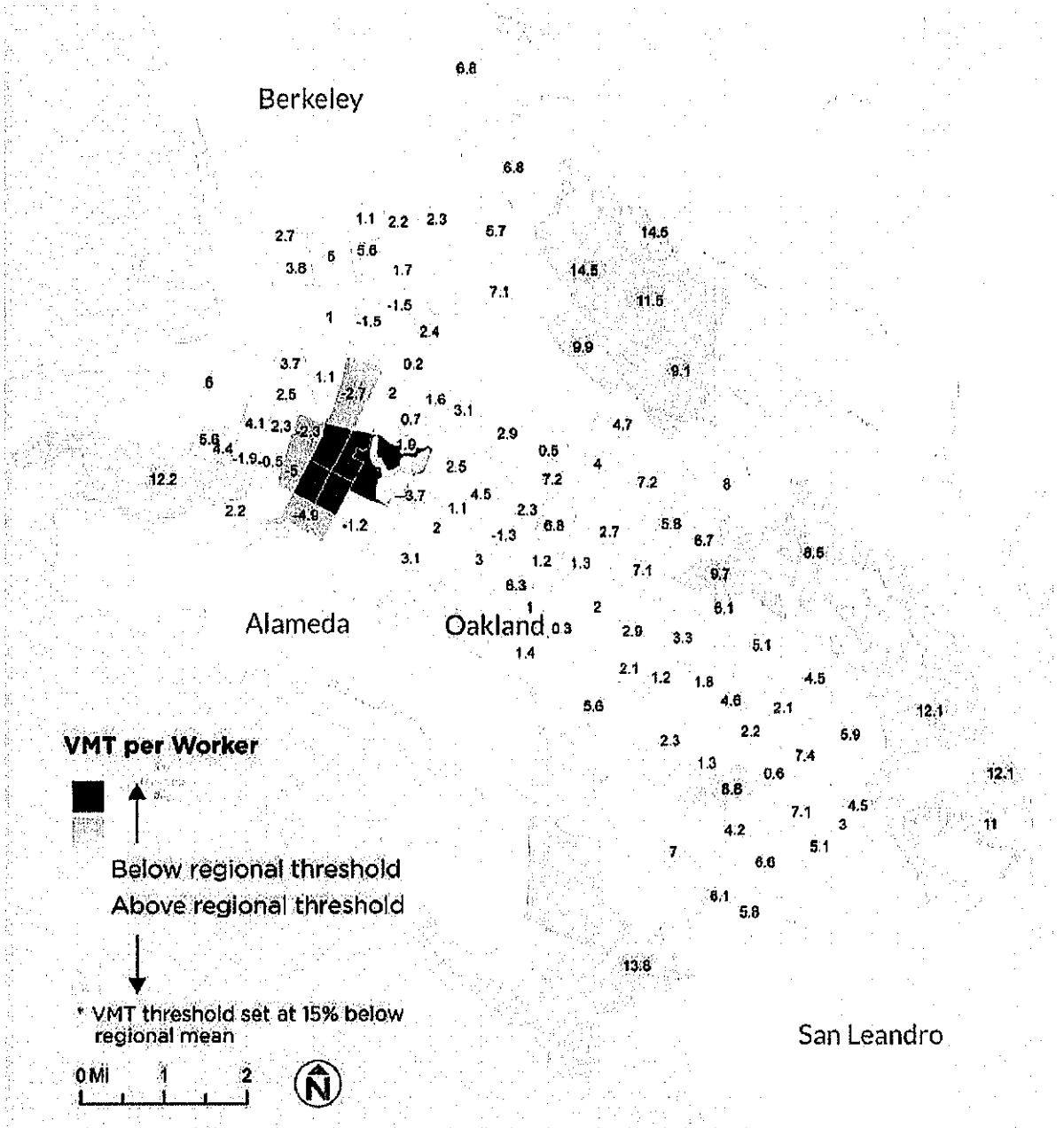
The City of Oakland has calculated VMT per capita and VMT per worker of all the TAZs in Oakland, and compared the TAZ-level VMTs to the regional average using a model developed for regional climate action planning and maintained by the Metropolitan Transportation Commission. This TAZ-level VMT data was then used to develop the screening maps shown in **Figure 2** and **Figure 3** below. The screening maps are tools to help determine when projects meet the City of Oakland's screening criteria outlined in the section above.

Figure 2. City of Oakland VMT per Capita Screening Map



Source: *Task 7A&B Define Thresholds of Significance and Impact Analysis Tools – Figure 1 (Nelson\Nygaard, September 9, 2016)*

Figure 3. City of Oakland VMT per Worker Screening Map



Source: *Task 7A&B Define Thresholds of Significance and Impact Analysis Tools – Figure 1 (Nelson\Nygaard, September 9, 2016)*

Travel Demand Models

The City of Oakland requires any detailed VMT analysis to be performed with a travel demand model. The City of Oakland allows the project sponsor and/or their consultant to determine which travel demand model should be used. A travel demand model VMT analysis must be supplemented with a separate analysis of reduction in VMT experienced due to transportation demand management measures included in the project, based on data and research.

Significance Thresholds

The thresholds of significance set by the City of Oakland are in line with the OPR Technical Advisory recommendations, and are shown in **Table 8**.

Table 8. City of Oakland Thresholds

Land Use Development Type	Significance Threshold
Residential	A project TAZ(s) exceeding both the existing average City household VMT per capita minus 15 percent and existing average regional household VMT per capita minus 15 percent
Office	A project TAZ(s) exceeding the existing average regional VMT per employee minus 15 percent
Retail and other project types[5]	A net increase in total VMT may indicate a significant transportation impact (because new retail typically redistributes trips, rather than generating additional trips, locally serving retail may reduce VMT; additional considerations and analysis details are provided within the TIS Guidelines)
Mixed Use	Evaluate each component of a mixed-use project independently, and apply the significance threshold for each project type included: ▪ Existing regional average household VMT per capita minus 15 percent ▪ Existing regional average VMT per employee minus 15 percent

Source: *Task 7A&B Define Thresholds of Significance and Impact Analysis Tools – Table 1 (Nelson\Nygaard, September 9, 2016)*

The City of Oakland also has the following general significance criteria for projects (Section 5.1 of the Oakland TIR Guidelines):

"The project would have a significant effect on the environment if it would:

- *Conflict with a plan, ordinance, or policy addressing the safety or performance of the circulation system, including transit, roadways, bicycle lanes, and pedestrian paths (except for automobile level of service or other measures of vehicle delay); or*
- *Cause substantial additional VMT per capita, per service population, or other appropriate efficiency measure; or*
- *Substantially induce additional automobile travel by increasing physical roadway capacity in congested areas (i.e., by adding new mixed-flow lanes) or by adding new roadways to the network"*

Mitigation Strategies

Projects with potentially significant transportation impacts and that are located within an "above regional threshold" TAZ in the threshold maps may mitigate transportation impacts by using the travel demand management and/or project alternatives strategies in **Table 9**.

Table 9. City of Oakland Recommended Mitigation Measures

Potential measures to **reduce vehicle miles traveled** include, but are not limited to:	• Improve or increasing 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 eliminating parking supply. • Unbundle parking costs. • Provide parking or roadway pricing or cash-out programs. • Implement or provide access to a commute reduction program. • Provide car-sharing, bike sharing, and ride-sharing programs. • Provide transit passes
Potential measures to address **transportation safety** include but are not limited to:	• Intersection improvements (visibility improvements, shortening corner radii, pedestrian safety islands, accounting for pedestrian desire lines • Signal changes (reducing signal cycle lengths to less than 90 seconds to avoid pedestrian crossings against the signal, providing a leading pedestrian interval, provide a "scramble" signal phase where appropriate) • Roadway improvements (Add curb extensions or bulb-outs, add bicycle facilities (On higher speed roads, add protected bicycle facilities), reduce travel lane width below 10.8 feet (but not below 9.2 feet) , add traffic calming measures, add landscaping features) • Network improvements (Provide shorter blocks, provide mid-block crossings) • Reduce VMT (Increase density and/or diversity of land uses, provide travel demand management measures, provide transit, provide pedestrian facilities, provide bicycle facilities
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 vehicle miles traveled. • 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 (e.g. pricing, vehicle occupancy requirements) on roadways or roadway lanes.

Source: *Task 7A&B Define Thresholds of Significance and Impact Analysis Tools – Table 2 (Nelson\Nygaard, September 9, 2016)*

CITY OF PASADENA

Background

The City of Pasadena was the first city in California to implement the provisions of SB 743 by establishing VMT as the metric to analyze transportation impacts of projects and adopting corresponding significance thresholds. Prior to shifting to VMT, the City of Pasadena conducted an extensive research, outreach, and education effort over a five-year period. The culmination of Pasadena's effort was the *Pasadena Transportation Impact Analysis: Current Practice Guidelines* (Pasadena TIA Guidelines) (Pasadena Department of Transportation, 09/25/2015).

Process

City of Pasadena's transportation review process is as follows:

Upon receipt of initial Project Plan Review (PPR) from the Department of Planning and Community Development, the City of Pasadena Department of Transportation (PasDOT) will determine whether a transportation review is required relative to CEQA guidelines and City policies. Each type of project is compared against the screening criteria summarized in the Tools section below. Depending on which criteria the project meets, a different level of review will be required. If a review is required, upon authorization to proceed and payment of fees, PasDOT will commence the analysis.

Tools

Screening Criteria

The Pasadena Planning and Community Development Department has two processes for project review. Which process Pasadena uses for a given project is based on the project size. Pasadena divides projects into the following two categories:

1. Below or equal to communitywide significance thresholds
2. Above communitywide significance thresholds

Here, communitywide significance thresholds are defined as 50,000 square feet of new commercial use, 50 residential units, or any combination of the two. Communitywide significance thresholds only determine what level of analysis is required, if any, not significance of impacts. **Table 10** summarizes the communitywide significance thresholds.

Table 10. City of Pasadena Screening Criteria

TYPE OF PROJECT	EXEMPTION	Category 1: BELOW COMMUNITYWIDE SIGNIFICANCE	Category 2: COMMUNITYWIDE SIGNIFICANCE
Residential (Net # of units)	10 units or less	11 – 49 units	50+ units
Non-Residential Use (Net)	10,000 Sq Ft or less than 300 daily trips	10,001 to 49,999 Sq Ft	50,000+ Sq Ft

Source: *Pasadena Transportation Impact Analysis: Current Practice Guidelines – Table 1 (Pasadena Department of Transportation, 09/25/2015)*

Projects falling under Category 2 in **Table 10** need to conduct street segment analysis and LOS analysis in addition to a typical transportation impact analysis.

Travel Demand Model

The City of Pasadena's Travel Demand Forecasting model is the primary tool used for detailed VMT analysis. To estimate VMT per capita, the project's incremental influence/contribution on citywide VMT per capita is compared to the adopted CEQA threshold to determine significant impact. The project's incremental VMT per capita is determined by dividing the change in citywide VMT (with and without project) by the change in citywide service population (with and without the project) using the City of Pasadena's Travel Demand Forecasting model. The model uses the TransCAD Transportation GIS software, which is consistent with the form and function of models used by local jurisdictions in California. For further details on the travel demand forecasting model, refer to the *Pasadena Travel Demand Forecasting Model Development Report* (Fehr & Peers, April 2011).

Significance Thresholds

For projects requiring an environmental review in accordance with CEQA, the thresholds contained in **Table 11** below determine a project's expected level of impact.

Table 11. City of Pasadena Significance Thresholds

	METRIC	DESCRIPTION	CEQA IMPACT THRESHOLD
1.	VMT Per Capita	Vehicle Miles Traveled (VMT) in the City of Pasadena per service population (population + jobs).	22.6 VMT/Capita
2.	VT Per Capita	Vehicle Trips (VT) in the City of Pasadena per service population (population + jobs).	2.8 VMT/Capita
3.	Proximity and Quality of Bicycle Network	Percent of service population (population + jobs) within a quarter mile of bicycle facility types.	31.7% Any decrease in existing citywide of service population (population + jobs) within a quarter mile of levels 1 & 2 bike facilities.
4.	Proximity and Quality of Transit Network	Percent of service population (population + jobs) located within a quarter mile of transit facility types.	66.6% Any decrease in existing citywide service population (population + jobs) within a quarter mile of levels 1 & 2 transit facilities.
5.	Pedestrian Accessibility	The Pedestrian Accessibility Score uses the mix of destinations, and a network-based walk shed to evaluate walkability	Any decrease in the Citywide Pedestrian Accessibility Score

Source: *Pasadena Transportation Impact Analysis: Current Practice Guidelines – Table 2 (Pasadena Department of Transportation, 09/25/2015)*

Mitigation Strategies

City of Pasadena provides no recommendations on potential mitigations to significant impacts.

CITY OF SAN FRANCISCO

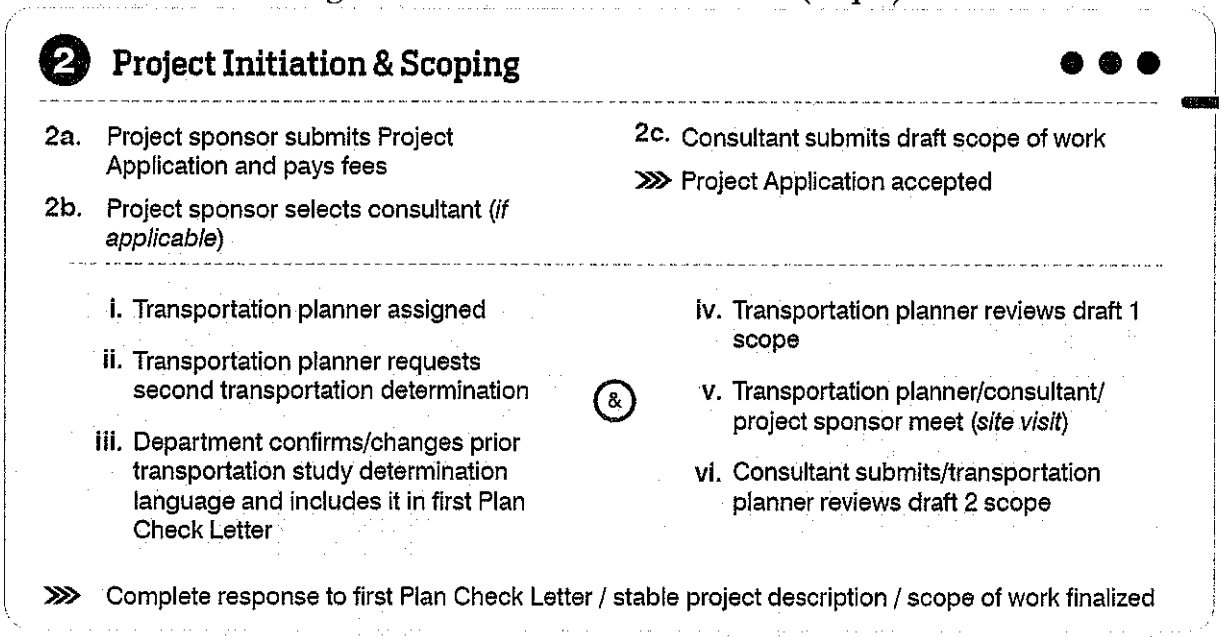
Background

In March 2016, the San Francisco Planning Commission adopted a resolution to modify their environmental review process by replacing automobile delay with VMT as a measure to assess the significance of transportation impacts on the environment in accordance with the revised CEQA guidelines. The City of San Francisco began by conducting research on existing VMT and travel behavior, and the tools that are currently available for calculating VMT. The City of San Francisco's review process culminated in the *Vehicle Miles Traveled/ Induced Automobile Travel Memorandum* (San Francisco Planning Department, February 14, 2019), and the revised *San Francisco Transportation Impact Analysis Guidelines* (San Francisco TIA Guidelines) (San Francisco Planning Department, February 2019).

Process

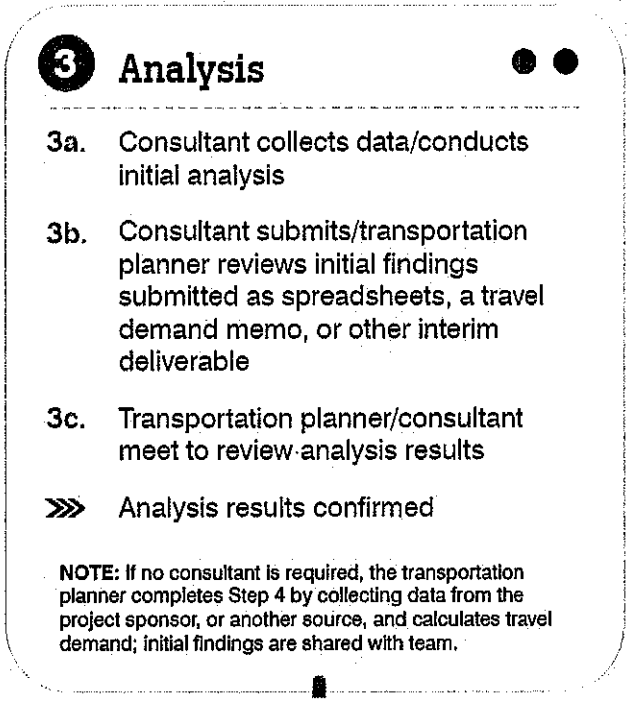
The San Francisco TIA Guidelines have the following general process for preparing transportation analysis for a project:

Figure 4. San Francisco TIA Process (Step 2)



Source: *San Francisco Transportation Impact Analysis Guidelines (San Francisco Planning Department, February 2019)*

Figure 5. San Francisco TIA Process (Step 3)



Source: *San Francisco Transportation Impact Analysis Guidelines (San Francisco Planning Department, February 2019)*

The VMT portion of the transportation determination, listed in **Figure 4**, involves comparing the project against criteria in the City of San Francisco's Screening Criteria Checklist, shown in the Tools section below.

Tools

Screening Criteria Checklist

The City of San Francisco uses the following checklist, consistent with the CEQA Guidelines and OPR Technical Advisory, to screen out projects that would not result in significant transportation impacts under the VMT metric. If a project would generate VMT, but meets the screening criteria in Part 1 and 2, or falls within the types of transportation projects listed in Part 3, then a detailed VMT analysis is not required for the project.

Table 12. San Francisco VMT Screening Criteria - Part 1

Vehicle Miles Traveled Analysis – Screening Criterion If a project meets the screening criterion listed below, then a detailed VMT analysis is not required. See Attachment A-1 for definitions and other terms.	
☒	**Criterion 1. Is the proposed project site located within the *"map-based screening"* area?** [Identify regional, and transportation analysis zone (TAZ) VMT per efficiency metric. Consult with transportation planner if project does not meet this screening criterion.]

Note: Projects with a substantial amount of parking may not meet screening criterion.

Source: *Vehicle Miles Traveled/Induced Automobile Travel Memorandum* (San Francisco Planning Department, February 14, 2019)

Table 13. San Francisco VMT Screening Criteria - Part 2

	Vehicle Miles Traveled Analysis – Additional Screening Criteria Identify whether a project meets any of the additional screening criteria. See Attachment A-1 for definitions and other terms.
☒	**Criterion 1. Does the proposed project qualify as a *"small project"*? or** [Identify number of daily vehicle trips from whole of the project – show your work]
	Criterion 2. Proximity to Transit Stations (must meet all four sub-criteria)
	Is the proposed project site located within a half mile of an existing major transit stop; and [NOTE: this is definition is different than transit priority area, as it does not include planned major transit stops. Add transit stop headway/schedule, or other applicable qualifying information such as nearby rail transit station or multi-modal ferry terminal.]
	Would the proposed project have a floor area ratio of greater than or equal to 0.75, and
☒	Would the project result in an amount of parking that is less than or equal to that required or allowed by the Planning Code without a conditional use authorization, and
	Is the proposed project consistent with the Sustainable Communities Strategy? [NOTE: if project site is located in priority development area, reference that. Refer to Attachment 1 of 2013 staff report for San Francisco's priority development areas: http://www.sf-planning.org/ftp/files/plans-and-programs/emerging_issues/scs/Plan-Bay-Area-Memo-5_02_13.pdf.) As noted by footnote, however, a project site does not need to be within a priority development area to be consistent. All land within San Francisco, except for parks and open spaces was considered for development in Plan Bay Area.]

Source: *Vehicle Miles Traveled/ Induced Automobile Travel Memorandum (San Francisco Planning Department, February 14, 2019)*

Table 14. San Francisco VMT Screening Criteria - Part 3

	Induce Automobile Travel Analysis If a project contains transportation elements and fits within the general types of projects described below, then a detailed VMT analysis is not required. See Attachment A-1 for definitions and other terms.
☒	**Project Type 1. Does the proposed project qualify as an *"active transportation, rightsizing (aka Road Diet) and Transit Project"*? or** [Specify how project meets this criterion – state n/a if no transportation elements]
☒	**Project Type 2. Does the proposed project qualify as an *"other minor transportation project"*?** [Specify how project meets this criterion – state n/a if no transportation elements]

Source: *Vehicle Miles Traveled/ Induced Automobile Travel Memorandum (San Francisco Planning Department, February 14, 2019)*

The City of San Francisco has created a web-based tool to visualize VMT for projects by TAZ. The tool is used to identify types and locations of land use projects that meet Screening Criterion 1 shown in **Table 12** above. The inputs required for the tool are project location and land use characteristics. The tool can be accessed on the City of San Francisco's website here: https://sftraveldemand.sfcta.org/

The City of San Francisco provides the following definitions:

Active transportation, rightsizing (aka road diet) and transit project means any of the following:

- Reduction in number of through lanes
- Infrastructure projects, including safety and accessibility improvements, for people walking or bicycling
- Installation or reconfiguration of traffic calming devices
- Creation of new or expansion of existing transit service
- Creation of new or conversion of existing general purpose lanes (including vehicle ramps) to transit lanes
- Creation of new or addition of roadway capacity on local or collector streets, provided the project also substantially improves conditions for people walking, bicycling, and, if applicable, riding transit (e.g., by improving neighborhood connectivity or improving safety)

Other minor transportation project means any of the following:

- Rehabilitation, maintenance, replacement and repair projects designed to improve the condition of existing transportation assets (e.g., highways, roadways, bridges, culverts, tunnels, transit systems, and bicycle and pedestrian facilities) and that do not add additional motor vehicle capacity
- Installation, removal, or reconfiguration of traffic lanes that are not for through traffic, such as left, right, and U-turn pockets, or emergency breakdown lanes that are not used as through lanes
- Conversion of existing general purpose lanes (including vehicle ramps) to managed lanes (e.g., HOV, HOT, or trucks) or transit 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
- Traffic metering systems
- Timing of signals to optimize vehicle, bicycle or pedestrian flow on local or collector streets
- Installation of roundabouts
- Adoption of or increase in tolls
- Conversion of streets from one-way to two-way operation with no net increase in number of traffic lanes
- Addition of transportation wayfinding signage
- Removal of off- or on-street parking spaces
- Adoption, removal, or modification of on-street parking or loading restrictions (including meters, time limits, accessible spaces, and preferential/reserved parking permit programs)

Travel Demand Model

The City of San Francisco requires use of the San Francisco County Transportation Authority's San Francisco Chained Activity Modeling Process (SF-CHAMP), which is a travel demand modeling tool that calculates VMT of private automobiles and for-hire vehicles, to analyze VMT. The City of San Francisco recommends the following types of VMT analyses using the SF-CHAMP tool for different types of projects:

- Residential-type Projects: A tour-based analysis that estimates existing and existing plus project VMT per capita.
- Office-type Projects: A tour-based analysis that estimates existing and existing plus project VMT per employee.
- Retail-type Projects: A trip-base analysis that estimates existing and existing plus project VMT per retail employee. The methodology must also present existing regional VMT minus 15 percent.
- Cumulative Projects: Same as above but for future and future plus project VMT.
- Area Plans: Estimate daily VMT for all included land uses using corresponding methods outlined above.
- Transportation Project: Estimate existing and existing plus project VMT. A qualitative analysis is permitted for some transportation projects.

Elasticity Formula

The City of San Francisco recommends estimating VMT induced by a capacity increasing transportation project using a standard elasticity formula, consistent with the OPR Technical Advisory, with an elasticity value of 1.0.

Significance Thresholds

For projects requiring an environmental review in accordance with CEQA, the thresholds contained in **Table 15** determine a project's expected level of impact.

Table 15. City of San Francisco Significance Thresholds

Project Type	Threshold
Residential Projects	Regional Household VMT per capita minus 15 percent
Office Projects	Regional VMT per employee minus 15 percent
Retail Projects	Regional VMT per retail employee minus 15 percent
Mixed-use Projects	Each land use will be evaluated independently based on the above thresholds
Area Plans	Consistency with the Sustainable Community Strategy (Plan Bay Area)
Transportation Projects	2,075,220 VMT per year

The significance threshold for transportation projects of 2,075,220 VMT per year is based on the fair share VMT allocated to transportation projects required to achieve California's long-term greenhouse gas emissions reduction goal of 40 percent below 1990 levels by 2030.

The City of San Francisco also has the following significance thresholds to determine cumulative impacts, summarized in **Table 16**.

Table 16. City of San Francisco Cumulative Significance Thresholds

Project Type	Threshold
All Projects	The region would meet its Sustainable Communities Strategy long-range greenhouse gas reduction goals or VMT reduction goals (if applicable)
Residential Projects	Future city household VMT per capita minus 15 percent and the future regional household VMT per capita minus 15 percent
Office Projects	Future regional VMT per employee minus 15 percent
Retail Projects	Future regional VMT per retail employee minus 15 percent
Mixed-use Projects	Each land use will be evaluated independently based on the above thresholds

Mitigation Strategies

The City of San Francisco recommends the following transportation demand management measures to reduce VMT:

- Provide streetscape improvements to encourage walking (ACTIVE-1)
- Provide secure bicycle parking, more spaces given more points (ACTIVE-2)
- Provide on-site showers and lockers (ACTIVE-3)
- Provide a bike share membership to residents and employees for one point, another point given for each project within the bike share network (ACTIVE-4)
- Provide on-site bicycle repair station (ACTIVE-5A)
- Provide on-site bicycle maintenance services (ACTIVE-5B)
- Provide fleet of bicycles (ACTIVE-6)
- Provide bicycle valet parking (ACTIVE-7)
- Offer car-share parking and membership (CSHARE-1)
- Provide delivery supportive amenities (DELIVERY-1)
- Provide delivery services (DELIVERY-2)
- Offer family TDM amenities (FAMILY-1)
- Provide on-site childcare (FAMILY-2)
- Provide Family TDM package (FAMILY-3)
- Provide contributions or incentives for sustainable transportation (HOV-1)
- Provide shuttle bus service (HOV-2)
- Offer vanpool programs (HOV-3)
- Provide multimodal wayfinding signage (INFO-1)
- Provide real time transportation information display (INFO-2)
- Provide tailored transportation marketing services (INFO-3)
- Provide healthy food retail in underserved area (LU-1)

- Provide on-site affordable housing (LU-2)
- Offer unbundled parking (PKG-1)
- Offer short term daily parking provision (PKG-2)
- Offer parking cash out: non-residential tenants (PKG-3)
- Reduce parking supply (PKG-4)

CITY OF SAN JOSE

Background

In April 2018, to align with the new CEQA guidelines and SB743, City of San Jose updated their *San Jose Transportation Impact Analysis Handbook* (City of San Jose, April 2018). The handbook is a guide to determine the need for a transportation impact analysis, the scope, and necessary steps to conduct the analysis. The guide was also updated to be in line with the goals and policies of the City of San Jose General Plan and the new Transportation Analysis Policy (Council Policy 5-1).

General Plan Goals and Policies

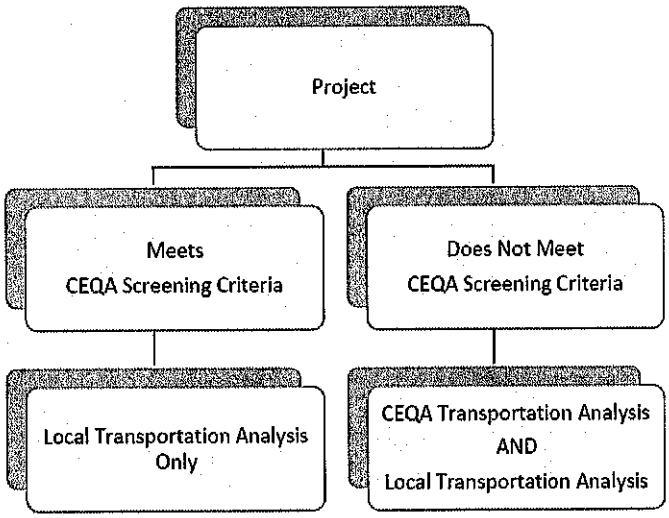
The San Jose 2040 General Plan focuses on the following access strategies to guide their transportation policies:

- Proximity- Clustering growth in the City's Planned Growth Areas (PGAs) that are located around existing and planned transit.
- Mobility- Build an environmentally sustainable transport system where 60 percent of the trips are by walking, biking, transit, or carpool.

Process

The City of San Jose Department of Public Works determines the need for a transportation analysis (TA) for development projects aligning with the CEQA guidelines and City policies. The TA report includes two types of analysis: CEQA transportation analysis and Local Transportation Analysis (LTA). The type of analysis required for the TA report depends on whether the project meets the CEQA screening criteria, discussed in the Tools section below.

Figure 6. City of San Jose TA Process



Source: *San Jose Transportation Impact Analysis Handbook (City of San Jose, April 2018)*

Tools

Screening Criteria

The San Jose Department of Public Works uses map-based screening criteria and list-based screening criteria to determine which projects require a detailed CEQA transportation analysis. List based screening criteria are for projects that are expected to result in less than significant VMT

impacts based on the project description and characteristics. Residential and office projects located near high-quality transit in planned growth areas with low VMT would not require a detailed CEQA transportation analysis. If a residential, office, or affordable housing project is located in a highlighted area in the corresponding screening maps (shown in **Figure 7**, **Figure 8**, and **Figure 9**, respectively) and meets the other screening criteria specified in **Table 17**, then the project would be assumed to have less than significant transportation impacts and would not require a detailed analysis.

Table 17. City of San Jose Land Use Projects Screening Criteria

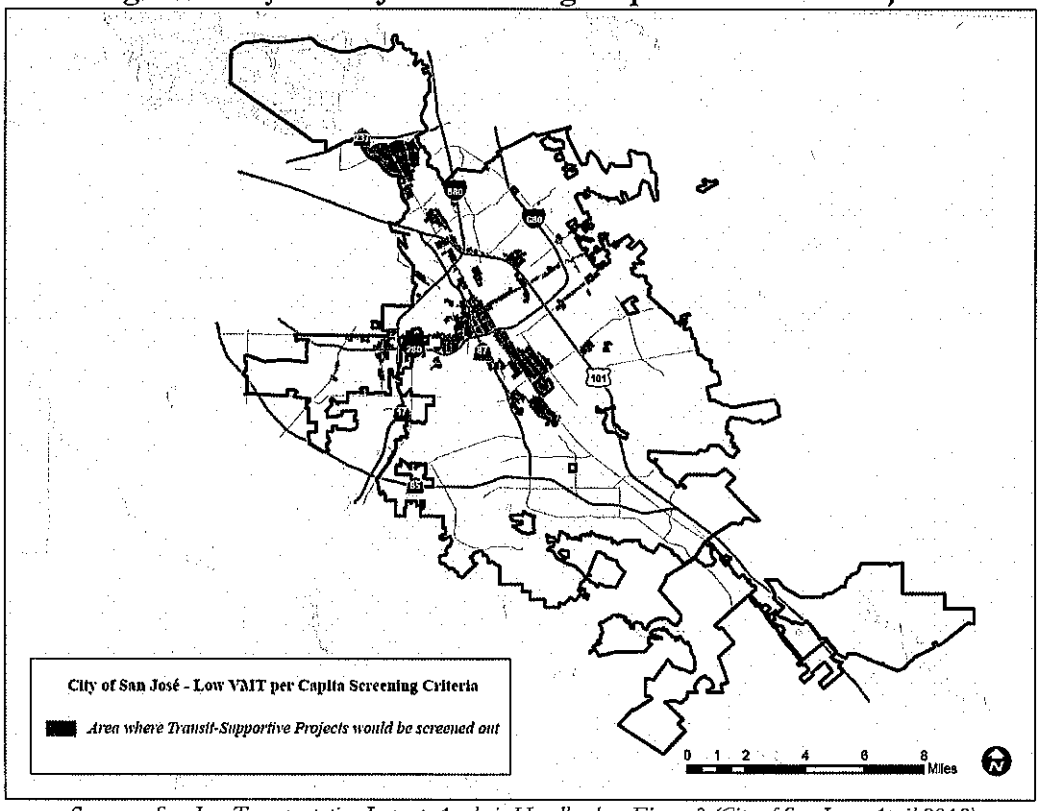
Type	Screening Criteria
Small Infill Projects	• Single-family detached housing of 15 units or less; OR • Single-family attached or multi-family housing of 25 units or less; OR • Office of 10,000 square feet of gross floor area or less; OR • Industrial of 30,000 square feet of gross floor area or less
Local-Serving Retail	• 100,000 square feet of total gross floor area or less without drive-through operations[1]
Local-Serving Public Facilities	• Local-serving public facilities
Residential/ Office Projects or Components	• **Planned Growth Areas:** Located within a Planned Growth Area as defined in the Envision San José 2040 General Plan; AND • **High-Quality Transit:** Located within ½ a mile of an existing major transit stop[2] or an existing stop along a high-quality transit corridor[3]; AND • **Low VMT:** Located in an area in which the per-capita or per-employee VMT is less than or equal to the threshold of significance for the land use; AND • **Transit-Supporting Project Density:** o Minimum Gross Floor Area Ratio (FAR) of 0.75 for office projects or components; o Minimum of 35 units per acre for residential projects or components; o If located in a Planned Growth Area that has a maximum density below 0.75 FAR or 35 units per acre, the maximum density allowed in the Planned Growth Area must be met; AND • **Parking:** o No more than the minimum number of parking spaces required[4]; o If located in Urban Villages or Downtown, the number of parking spaces must be adjusted to the lowest amount allowed[5]; however, if the parking is shared, publicly available, and/or "unbundled"[6], the number of parking spaces can be up to the zoned minimum; AND • **Active Transportation:** Not negatively impact transit, bike or pedestrian infrastructure[7].
Restricted Affordable Residential Projects or Components	• **Affordability:** 100% restricted affordable units[8], excluding unrestricted manager units; affordability must extend for a minimum of 55 years for rental homes or 45 years for for-sale homes; AND • **Planned Growth Areas:** Located within a Planned Growth Area as defined in the Envision San José 2040 General Plan; AND

Table 17. City of San Jose Land Use Projects Screening Criteria

	• **High Quality Transit:** Located within ½ a mile of an existing major transit stop or an existing stop along a high quality transit corridor; AND
	• **Transit-Supporting Project Density:**
	  o Minimum of 35 units per acre for residential projects or components;
	  o If located in a Planned Growth Area that has a maximum density below 35 units per acre, the maximum density allowed in the Planned Growth Area must be met; AND
	• **Transportation Demand Management (TDM):** If located in an area in which the per capita VMT is higher than the CEQA significance threshold, a robust TDM plan must be included; AND
	• **Parking:**
	  o No more than the minimum number of parking spaces required;
	  o If located in Urban Villages or Downtown, the number of parking spaces must be adjusted to the lowest amount allowed; however, if the parking is shared, publicly available, and/or "unbundled", the number of parking spaces can be up to the zoned minimum; AND
	• **Active Transportation:** Not negatively impact transit, bike or pedestrian infrastructure.

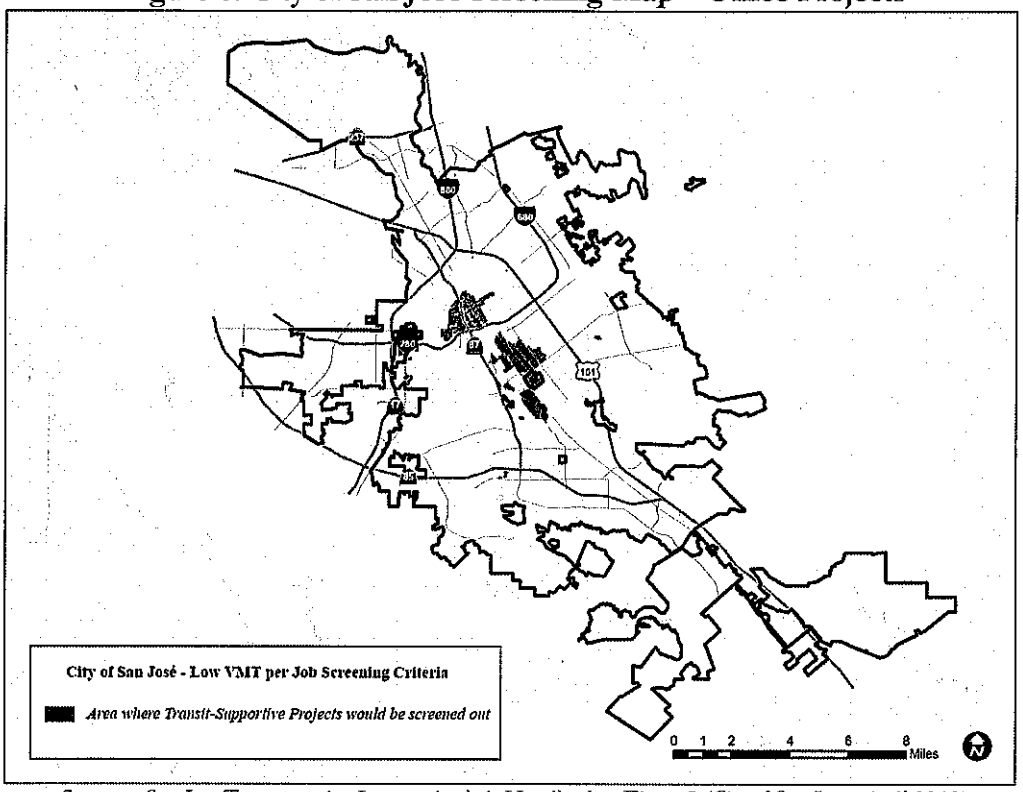
Source: *San Jose Transportation Impact Analysis Handbook – Table 1 (City of San Jose, April 2018)*

Figure 7. City of San Jose Screening Map – Residential Projects



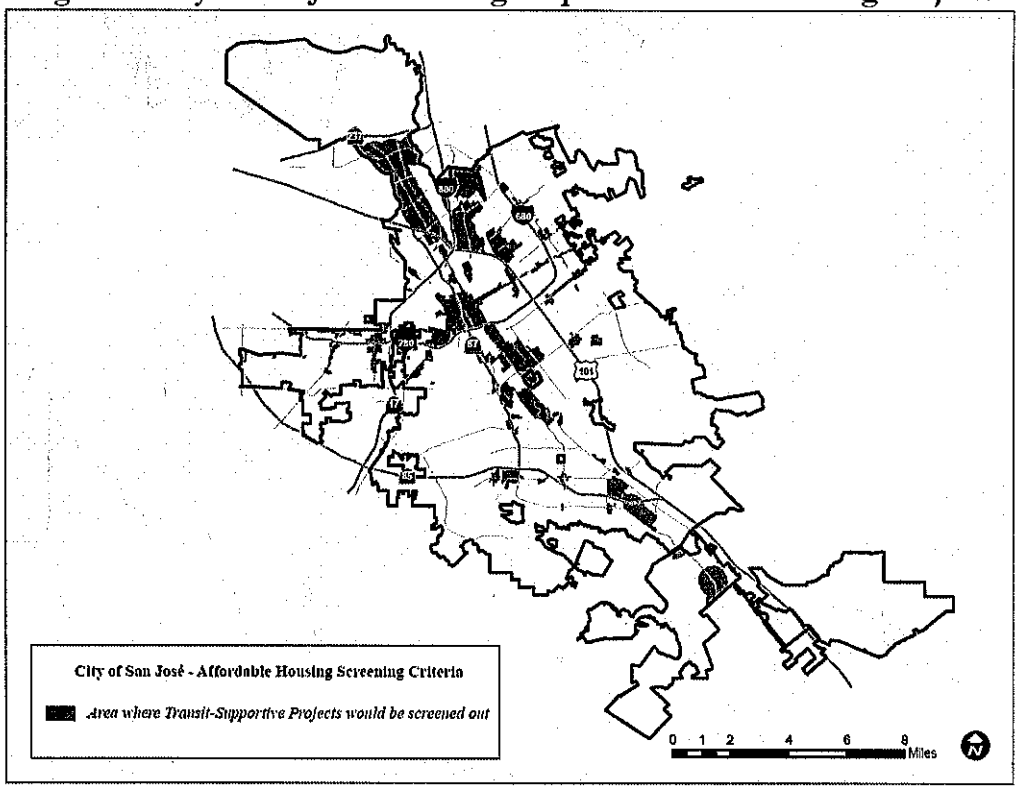
Source: *San Jose Transportation Impact Analysis Handbook – Figure 3 (City of San Jose, April 2018)*

Figure 8. City of San Jose Screening Map – Office Projects



Source: *San Jose Transportation Impact Analysis Handbook – Figure 5 (City of San Jose, April 2018)*

Figure 9. City of San Jose Screening Map – Affordable Housing Projects



Source: *San Jose Transportation Impact Analysis Handbook – Figure 4 (City of San Jose, April 2018)*

The City of San Jose also has screening criteria for transportation projects. If a transportation project meets the corresponding criteria in **Table 18**, then the project would be assumed to have less than significant transportation impacts and would not require a detailed analysis.

Table 18. City of San Jose Transportation Projects Screening Criteria

Project Type	Description
Maintenance	• Rehabilitation, maintenance, replacement, and repair projects designed to improve condition of existing transportation assets (e.g. roadways, bridges, culverts, tunnels, transit systems, and assets that serve bicycle and pedestrian facilities) that do not add additional motor vehicle capacity.
Roadway Shoulder	• Roadway shoulder enhancements to provide "breakdown space" (dedicated space for use only by transit vehicles) to provide bicycle access or to improve safety, but which will not be used as motor vehicle travel lanes.
Non-through Lanes	• Installation, removal, reconfiguration of travel lanes that are not for through traffic, such as left-turn, right-turn and U-turn pockets (excluding trap lanes), two-way left-turn-lanes, or emergency breakdown lanes that are not utilized as through lanes.
Through Lanes	• Addition of roadway capacity on local or collector streets provided the project substantially improves conditions for pedestrians, cyclists, and/or transit, including but not limited to: ❖ Protected and separated Class IV bikeway ❖ Pedestrian refuges, bulb-outs, and elements that shorten pedestrian crossing distances ❖ Consistency with the *San José Complete Streets Design Standards and Guidelines* and/or other applicable design guidelines; OR • Addition of a new lane that is permanently restricted to use only by transit vehicles; OR • Reduction in the number of through lanes; OR • Conversion of roadways from one-way to two-way operations with no net increase in the number of travel lanes.
Traffic Control Devices	• Installation, removal, or reconfiguration of traffic control devices, including Transit Signal Priority features; OR • Timing of signals to optimize vehicle, bicycle, or pedestrian flow.

Table 18. City of San Jose Transportation Projects Screening Criteria

Traffic Circles	• Installation of roundabouts or traffic circles.
Traffic Calming Devices	• Installation, enhancement, or reconfiguration of traffic calming devices.
Parking	• Removal or relocation of on-street or off-street parking spaces; OR • Adoption or modification of on-street parking or loading restrictions (including meters, time limits, accessible spaces, and preferential/reserved parking permit programs)
Traffic Wayfinding	• Addition of traffic wayfinding signage
Active Transportation	• Addition of new or enhanced bike or pedestrian facilities on existing streets/highways or within existing public rights-of-way; OR • Addition of Class I bike paths, trails, multi-use paths, or other off-road facilities that serve non-motorized travel; OR
Fuel/Charging Infrastructure	• Installation of publicly available alternative fuel or charging infrastructure.

Source: *San Jose Transportation Impact Analysis Handbook – Table 9 (City of San Jose, April 2018)*

Sketch Tool

San Jose has developed their own sketch tool, called the San Jose VMT Evaluation Tool, for calculating VMT using the project's location, description, and other attributes. This tool can be used for most residential, office, and industrial projects. The tool inputs the project assessor's parcel number, land use characteristics, and proposed VMT reduction strategies. The San Jose VMT Evaluation Tool can produce VMT per capita and VMT per employee for residential, office, industrial, and mixed-use projects.

The tool also includes four VMT mitigation strategy tiers that can be applied to the project: project characteristics, multimodal network improvements, parking, and travel demand management. Some of the travel demand management measures used in the tool are: increasing development density, increasing the diversity of uses, integrating affordable and below market rate housing, providing pedestrian network improvements for active transportation, and providing traffic calming measures. The tool quantifies the reduction in VMT expected from mitigation strategies applied to the project.

Travel Demand Model

For large regional serving retail projects, transportation projects, land use plans, cumulative projects, and other projects that can potentially shift travel patterns, the San Jose Travel Demand Model can be used to perform a detailed VMT analysis. The San Jose Travel Demand Model can produce net change in total VMT for these types of projects.

Significance Thresholds

For projects that do not meet the screening criteria discussed in the Tools section, a detailed analysis of the project's VMT will be compared against the thresholds of significance presented in **Table 19** and **Table 20**.

Table 19. City of San Jose Land Use Projects Significance Thresholds

Project Types	Significance Criteria	Current Level	Threshold
Residential Uses	Project VMT per capita exceeds existing citywide average VMT per capita minus 15 percent OR existing regional average VMT per capita minus 15 percent, whichever is lower.	11.91 VMT per capita (Citywide Average)	10.12 VMT per capita
General Employment Uses	Project VMT per employee exceeds existing regional average VMT per employee minus 15 percent	14.37 VMT per employee (Regional Average)	12.21 VMT per employee
Industrial Employment Uses	Project VMT per employee exceeds existing regional average VMT per employee	14.37 VMT per employee (Regional Average)	14.37 VMT per employee
Retail/ Hotel/ School Uses	Net increase in existing regional total VMT	Regional Total VMT	Net Increase
Public/Quasi-Public Uses	In accordance with the most appropriate type(s) as determined by Public Works Director	Appropriate levels listed above	Appropriate thresholds listed above
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	Appropriate levels listed above	Appropriate thresholds listed above
Change of Use/ Additions to Existing Development	Evaluate the full site with the change of use or additions to existing development, and apply the threshold of significance for each project type included	Appropriate levels listed above	Appropriate thresholds listed above
Area Plans	Evaluate each land use component of the area plan independently, and apply the threshold of significance for each land use type included	Appropriate levels listed above	Appropriate thresholds listed above

Source: *San Jose Transportation Impact Analysis Handbook – Table 2 (City of San Jose, April 2018)*

Table 20. City of San Jose Transportation Projects Significance Thresholds

Significance Criteria	Threshold
Percent increase in total VMT for roadways within Sphere of Influence	0.3% for every percent increase in lane-miles for roadways within Sphere of Influence
Percent increase in total VMT for roadways within the Santa Clara County	0.3% for every percent increase in lane-miles for roadways within Santa Clara County

Source: *San Jose Transportation Impact Analysis Handbook – Table 10 (City of San Jose, April 2018)*

Mitigation Strategies

The City of San Jose recommends the following lists of mitigation measures in order to reduce VMT for projects with a significant impact.

Table 21. City of San Jose Tier 1, 2, and 3 Mitigations

Strategy (Tier)	Measures	Description
Project Characteristics (Tier 1)	**Increase Development Density**	Where consistent with the *Envision San José 2040 General Plan* and where in compliance with the *San José Municipal Code*, design the Project to be denser than existing conditions in the surrounding area. Increased densities affect the distances people travel and provide more options for the mode of travel they choose. **Application:** Residential and employment uses
	Increase Diversity of Uses	Where consistent with the *Envision San José 2040 General Plan* and in compliance with the *San José Municipal Code*, increase the amount of space dedicated to mixed employment and high-density residential uses in the area surrounding the project (defined as a ½-mile buffer from the Project). Different types of uses near one another can reduce VMT because trips between use types are shorter and may be accommodated more easily by non-personal motorized vehicle modes of travel. **Application:** Residential and employment uses.
	Integrate Affordable and Below Market Rate Housing	Develop on-site deed-restricted affordable, below-market rate (BMR) housing, for low-income households to reside in the project. At the same site, households with incomes at or below 80% of the regional median income generally make fewer trips by personal motorized vehicles than

Table 21. City of San Jose Tier 1, 2, and 3 Mitigations

		households with higher incomes, resulting in reduced VMT. BMR housing provides greater opportunity for families to live closer to transit. **Application:** Residential uses only.
Multimodal Network Improvements (Tier 2)	**Expand the Reach of Bike Access with Investment in Infrastructure[1]**	Implement bicycle facilities that close gaps in the bicycle network and/or improve the existing bicycle network (e.g. construct barrier or buffer for an existing bike lane). Improving bike access to the project promotes biking as an alternative to driving, and reduces VMT. VMT reductions are based on a reduction of the distance between the project frontage and a bicycle facility. This measure only applies to bicycle facilities that provide a dedicated lane for bicyclists or a completely separated right-of-way for bicycles and pedestrians. These facilities include Class I, Class II, and Class IV bikeways. This measure would not be applicable if the resulting gap between the project and the external bikeway exceeds 1/3 mile. **Application:** Residential and employment uses.
	Provide Pedestrian Network Improvements for Active Transportation[1]	Implement pedestrian improvements both on-site and in the surrounding neighborhood. Improving the pedestrian connections encourages people to walk instead of drive and reduces VMT. Pedestrian improvements include but are not limited to: sidewalks; marked or signalized pedestrian crossings at intersections; lighting; and curb ramps. Some proposed pedestrian improvements require additional study and conceptual City approval. **Application:** Residential and employment uses.
	Provide Traffic Calming Measures[1]	Implement pedestrian/bicycle safety and traffic calming measures both on-site and in the surrounding neighborhood. Providing traffic calming measures promotes walking and biking as an alternative to driving. VMT reductions are based on proposed median refuges, bulb-outs, and/or other pedestrian crossing enhancements beyond the project frontage. Proposed traffic calming features such as speed bumps require further study and conceptual City approval. **Application:** Residential and employment uses.

Table 21. City of San Jose Tier 1, 2, and 3 Mitigations

	Increase Transit Accessibility to Improve Last-Mile Transit Connections[1]	Improve transit accessibility for the project to shorten last-mile connections for pedestrians and bicyclists. Enhancing access to transit will facilitates the use of transit by people traveling to/from the project site, resulting in mode shift. **Application:** Residential and employment uses.
	Improve Network Connectivity/ Design to Make Destinations and Low-Carbon Travel Modes Accessible[1]	Build new street connections and/or connect cul-de-sacs to provide pedestrian and bicycle access. This measure enhances neighborhood walkability, connectivity, and accessibility. VMT reductions are based on the change in intersection density within ½ a mile of the project. Proposed improvements require conceptual approval by the City. **Application:** Residential and employment uses.
Parking (Tier 3)	**Limit Parking Supply[1]**	Decrease project parking supply at the project site to rates lower than the standard parking minimums where allowable in the *San José Municipal Code*. Decreasing parking supply encourages employees to choose an alternative transportation mode for their commutes. **Application:** Employment uses only.
	Provide Bike Parking/ End of Trip Bike Facilities	Provide and maintain facilities for active transportation users on the project. Examples of end-of- trip facilities include bike parking, bicycle lockers, showers, and personal lockers. The extent of VMT reduction is based on the project provision of secure bike parking or secure bike parking and additional facilities. **Application:** Residential and employment uses.

Table 22. City of San Jose Tier 4 Mitigations

TDM (Tier 4)	Description
Implement a School Car Pool Program[1]	Establish a program that coordinates carpools amongst parents in the development who transport students to and from schools. The school carpool program should be open to all residents in the development. School carpools reduce the total number of personal motorized vehicle-trips traveling to and from schools. Requires coordination with the City and schools. **Application:** Residential uses only.
Implement Bike Sharing Program[1]	Dedicate land for or provide subsidies to a bike sharing system, such as Ford GoBike. Bike share trips replace some driving trips. Bike share also provides a first/last-mile connection for transit users. Requires coordination with the City and the bike share provider. **Application:** Residential and employment uses
Implement Car Sharing Program[1]	Provide subsidies and promotions, as well as dedicated parking spaces, for car-sharing services such as ZipCar, Car2Go, and GetAround, etc. Supporting a car-sharing program gives people on-demand access to shared fleets of vehicles. Car-sharing reduces personal motorized vehicle dependence, which supports more walking, biking, carpooling, and transit use. Subject to negotiations with the City and possible negotiations with Car Share companies. **Application:** Residential and employment uses
Implement Commute Trip Reduction Marketing/ Educational Campaign	Implement marketing/educational campaigns that promote the use of transit, shared rides, and travel through active modes. Strategies may include incorporation of alternative commute options into new employee orientations, event promotions, and publications. **Application:** Employment uses only
Implement Commute Trip Reduction Program	Provide a comprehensive program to reduce the number of drive-alone commute trips to and from the project. Such a program should assist employees in using alternative transportation modes. Tools that may be incorporated into the program include flexible/alternative work schedules, ride-share assistance, vanpool assistance, and bicycle end-of-trip facilities. **Application:** Employment uses only

Table 22. City of San Jose Tier 4 Mitigations

Implement Employee Parking "Cash-Out"	Require Project employers to offer parking "cash-out." Providing a "cash-out" incentives gives employees the choice to forgo subsidized/free parking for a cash payment equivalent to the cost that the employer would otherwise pay for the parking space. Providing an alternative to subsidized/free parking encourages commuters to travel by walking, biking, carpooling, and transit. **Application:** Employment uses only
Implement Subsidized or Discounted Transit Program	Provide either partially or fully subsidized/discounted transit passes (i.e. employees, residents, and visitors). Providing subsidies for transit use encourages people to use transit rather than driving. This measure differs from the "Subsidize Public Transit Service Upgrades" below in that subsidies are provided to employees, not the public transit agency. **Application:** Residential and employment uses
Implement Telecommuting and Alternative Work Schedules	Encourage employees to telecommute, shift work schedules, or commute outside of peak congestion periods. This measure reduces commute vehicle-trips. **Application:** Employment land uses only
Operate a Free Direct Shuttle Service[1]	Provide shuttle service between the project site and areas with high concentrations of employed residents. This measure reduces drive-alone commute trips. **Application:** Employment uses only
Price On-Site Workplace Parking	Require commuters to pay for parking on-site. This measure provides a disincentive to driving and promotes use of alternative transportation modes. **Application:** Employment uses only
Access to Neighborhood Schools[1]	Contribute to the development of a neighborhood school that would serve families living in the development. Neighborhood schools primarily serve the neighborhoods immediately surrounding the school and allow students to walk or bike to school. Requires coordination with City and school district. **Application:** Residential uses only
Provide Ride-Sharing Programs	Organize a program to match individuals interested in carpooling who have similar commutes. This measure promotes the use of carpooling and reduces the number of drive-alone trips. **Application:** Employment uses only

Table 22. City of San Jose Tier 4 Mitigations

Subsidize Public Transit Service Upgrades[1]	Subsidize transit service through contributions to the transit provider to improve transit service to the project (e.g. frequency and number of routes). This measure differs from the "Subsidized or Discounted Transit Program" in that subsidies are provided to the public transit agency, not the employees. Subject to negotiation with the City and transit provider (primarily VTA). **Application:** Residential and employment uses only
Unbundle On-Site Parking Costs	Provide the cost of parking spaces unbundled from the rental costs of occupied space (in other words, residents must rent parking spaces). Surrounding streets should have parking restrictions, such as metered parking, time limits, restricted overnight parking, and/or residential parking permits (RPP). **Application:** Residential uses only
Subsidize Vanpool	Subsidize individuals forming new vanpools for their commutes. This encourages the use of vanpools. **Application:** Employment uses only
Voluntary Travel Behavior Change Program	Provide a program that targets individual attitudes and behaviors towards travel, and provide tools for individuals to analyze and alter their travel behavior. Voluntary Travel Behavior Change programs include mass communication campaigns and travel feedback programs, such as travel diaries or feedback on calories burned from activities and travel. **Application:** Residential and employment uses
Trip Cap	Establishes a maximum number of daily personal motorized vehicle-trips allowed to be generated by a project. Requires annual monitoring and reporting and requires penalties for nonconformance. Refer to **Section 3.8**. **Application:** Residential and employment uses

WRCOG

Background

Following direction from the OPR Technical Advisory, Western Riverside Council of Governments (WRCOG) is working on an SB743 Implementation Pathway Project that focuses on helping member agencies understand the specific questions that need to be addressed for analyzing transportation impacts under CEQA. The study looks at the methodology for forecasting project generated VMT, thresholds that would be available for each jurisdiction, and mitigation measures that should be feasible for a VMT impact in relation the region's land use and transportation context.

The study aims to answer the following questions:

1. Methodology – what methodology should be used to forecast 'projected generated VMT' and the 'project's effect on VMT' under baseline and cumulative conditions and how does the selection of a threshold influence the methodology decision?
2. Thresholds – what threshold options are available to each jurisdiction and what substantial evidence exists to support the selecting a specific VMT threshold?
3. Mitigation – what would constitute feasible mitigation measures for a VMT impact given the land use and transportation context of the WRCOG region?

The current results of WRCOG's SB 743 project are summarized in the *WRCOG SB 743 Implementation Pathway Document Package* (Fehr & Peers, March 2019). WRCOG has not established any final guidelines or thresholds at this point in time.

Process

If a project does not pass an initial screening test (described in the Tools section below), then a full impact analysis is warranted. In all, the VMT impact analysis process may include up to four steps as outlined below.

Step 1 – Transit Priority Area Screening

Step 2 – Low VMT Area Screening

Step 3 – Project Type Screening

Step 4 – VMT analysis using a travel demand model

Projects not screened in steps 1, 2, or 3 should complete a detailed VMT analysis and forecasting to determine if the project has a significant VMT impact.

Tools

Screening Criteria

Lead agencies in WRCOG may choose to use an impact screening method to streamline land use project review for VMT impacts. WRCOG has created a web-based screening tool for this purpose available at http://gis.fehrandpeers.com/WRCOGVMT/. This tools acts as a web/GIS based screening map for all areas of WRCOG. An example of a screening map from the WRCOG web-based screening tool is shown in **Figure 10**.

Figure 10. WRCOG Screening Map for Residential Home Based VMT per Capita

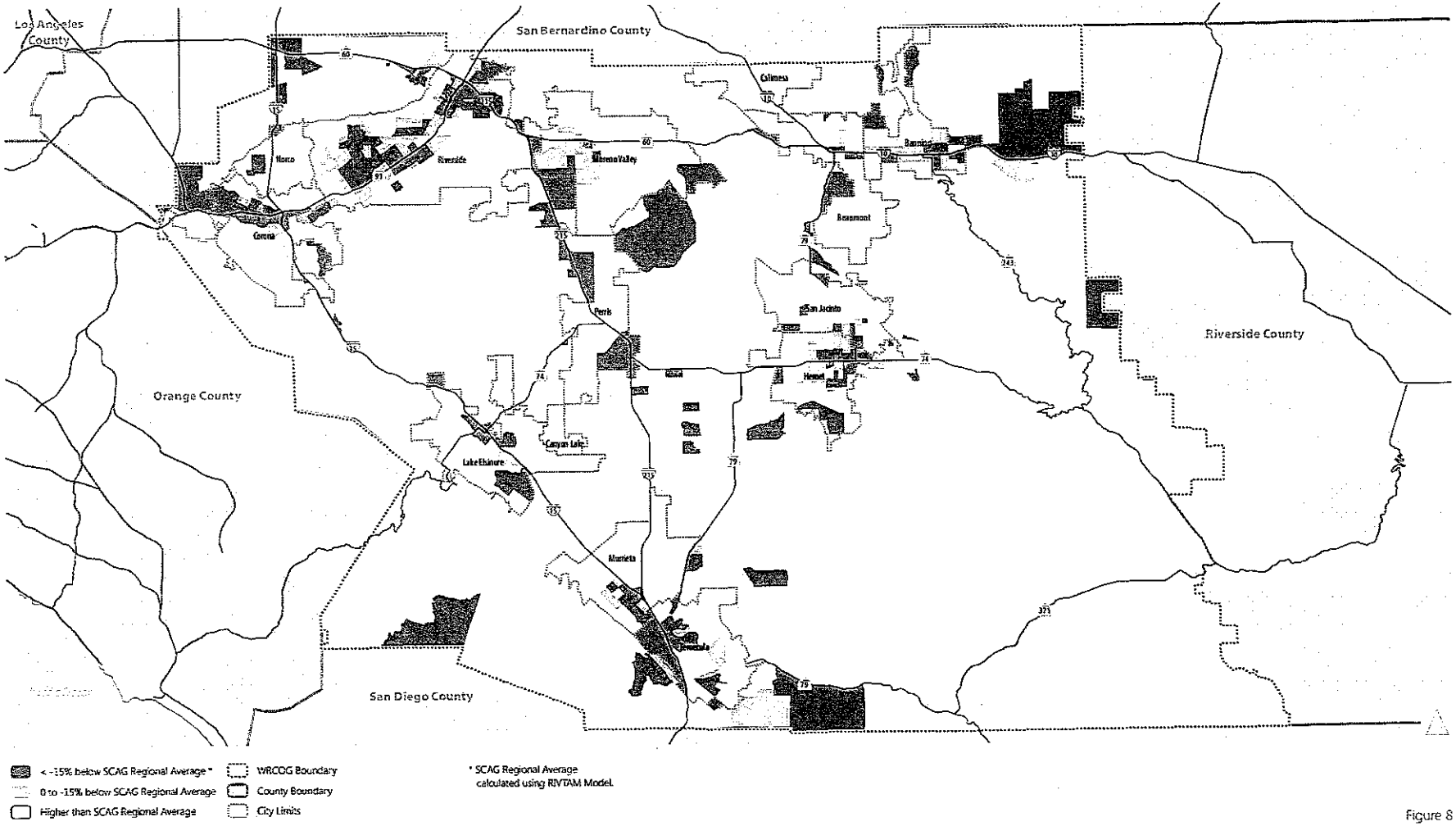


Figure 8

To calculate base year total VMT per service population (i.e., population plus employment), home-based VMT per capita, and home-based work VMT per worker for input into the WRCOG web-based screening tool, outputs from the Riverside County Transportation Analysis Model (RIVTAM) were used. Data from the California Household Travel Survey (CHTS) was used to compare model-derived estimates of Home-Based VMT with those based on survey observations. Baseline conditions for CEQA purposes would be specific to the release date of a project's notice of preparation (NOP). The WRCOG web-based screening tool would be periodically updated with current data.

Sketch Tools

WRCOG evaluated 11 existing sketch model tools to determine their strengths and weaknesses in calculating VMT. CalEEMod, GreenTRIP Connect, and TDM+ were found to be the most effective. It was also found that sketch tools were best for evaluating and quantifying mitigations.

Travel Demand Model

WRCOG recommends that all detailed project VMT analysis be performed with the Riverside County Transportation Analysis Model (RIVTAM). The analysis should include 'project generated VMT' and 'project effect on VMT' estimates for the project TAZ under the following scenarios:

- Baseline conditions - This data is already available in the WRCOG web-based tool.
- Baseline plus project - The project land use would be added to the project TAZ or a separate TAZ would be created to contain the project land uses. A full RIVTAM model run would be performed and VMT changes would be isolated for the project TAZ and across the full model network. The model output must include reasonableness checks of the production and attraction balancing to ensure the project effect is accurately captured. If this scenario results in a less-than-significant impact, then additional cumulative scenario analysis may not be required.
- Cumulative no project - This data is available from WRCOG.
- Cumulative plus project - The project land use would either be added to the project TAZ or a separate TAZ would be created to contain the project land uses. The addition of project land uses should be accompanied by a reallocation of a similar amount of land use from other TAZs. Land use projects will generally not change the cumulative no project control totals for population and employment growth. Instead, they will influence the land use supply through changes in general plan, land use designations, and zoning. If project land uses are simply added to the cumulative no project scenario, then the analysis should reflect this limitation in the methodology and acknowledge that the analysis may overestimate the project's effect on VMT.

Significance Thresholds

Four threshold estimation options were recommended for consideration by lead agencies:

1. Thresholds consistent with OPR's Technical Advisory, recommending that proposed developments generate VMT per person that is 15% below existing VMT per capita,
2. Thresholds consistent with Lead Agency air quality, GHG reduction, and energy conservation goals,
3. Thresholds consistent with RTP/SCS future year VMT projections by jurisdiction or sub-region, and
4. Thresholds based on baseline VMT performance by jurisdiction or sub-region.

No significance thresholds have been adopted by WRCOG or member agencies at this time.

Mitigation Strategies

As WRCOG has a rural/suburban land use context, the following key strategies were determined to be particularly relevant:

- Diversifying land use
- Improving pedestrian networks
- Implementing traffic calming infrastructure
- Building low-street bicycle network improvements
- Encouraging telecommuting and alternative work schedules
- Providing ride-share programs

5. SB 743 IMPLEMENTATION IN RURAL AREAS

RURAL SMART GROWTH

To enable the successful implementation of SB743 in rural California, coordinated planning between regional transportation planning agencies and local jurisdictions is required. Also, due to the presence of different methodologies for setting VMT thresholds, it will be important for rural agencies to ensure that the thresholds are consistent with their general plan goals. Additionally, the possibility of establishing possible sub-regional threshold maps should be considered as rural areas tend to have geographically dispersed population centers with different traffic sheds and VMT characteristics. [12]

International City/County Management Association's (ICMA) report on *Putting Smart Growth to Work in Rural Communities* (2010) outlines the goals and strategies, presented in **Table 23**, **Table 24**, **Table 25**, and **Table 26**, to help rural communities adopt techniques of smart growth.

Table 23. Goals, Strategies, and Policy Tools for Rural Smart Growth

Goal 1	Goal 2	Goal 3
Support the Rural Landscape *Create an economic climate that enhances the viability of working lands and conserves natural lands.*	**Help Existing Places Thrive** *Take care of assets and investments such as downtowns, Main Streets, existing infrastructure, and places that the community values.*	**Create Great New Places** *Build vibrant, enduring neighborhoods and communities that people, especially young people, don't want to leave.*
1.a. Ensure the viability of the resource economy in the region	2.a. Invest public and private funds in existing places	3.a. Update strategic and policy documents to accommodate new growth through compact and contiguous development
1.b. Cultivate economic development strategies that rely on traditional rural landscapes	2.b. Encourage private sector investment	3.b. Reform policies to make it easy for developers to build compact, walkable, mixed-use places
1.c. Promote rural products in urban areas and support other urban-rural links	2.c. Build on past community investments	3.c. Recognize and reward developers that build great places using smart growth and green building approaches
1.d. Link rural land preservation strategies to great neighborhoods	2.d. Foster economic development in existing downtowns	

Source: *Putting Smart Growth to Work in Rural Communities (International City/County Management Association, 2010)*

[12] SB 743 Implementation Considerations in Rural Counties. (2017). Presentation.

Table 24. Goal 1: Support the Rural Landscape

Strategy	Tools & Policies	
1.a. Ensure the viability of the resource economy in the region	• Use value taxation • Tax credits for conservation • Right to farm policies	• Renewable energy development • Value-added farm and forest products processing • Ecosystem services markets
1.b. Cultivate economic development strategies that rely on traditional rural landscapes	• Purchase of development rights • Conservation easements	• Fee simple acquisition • Agritourism and ecotourism
1.c. Promote rural products in urban areas and support other urban-rural links	• Direct marketing to consumers • Government purchase of local products	• "Buy local" campaigns
1.d. Link rural land preservation strategies to great neighborhoods	• Transfer of development rights • Priority funding areas	• Agricultural, ranching, or forestry zoning • Rural home clustering

Source: *Putting Smart Growth to Work in Rural Communities (International City/ County Management Association, 2010)*

Table 25. Goal 2: Help Existing Places Thrive

Strategy	Tools & Policies	
2.a. Invest public and private funds in existing places	• Fix-it-first • Historic Preservation and the Main Street Approach • Parks and natural resource areas as destinations	• Streets and streetscape improvements • Targeted new development
2.b. Encourage private sector investment	• Infill development incentives • Overcoming barriers to infill	• Redevelopment readiness certification • Split-rate tax
2.c. Build on past community investments	• Adaptive reuse	• School rehabilitation
2.d. Foster economic development in existing downtowns	• Local business survey	• Business recognition program

Source: *Putting Smart Growth to Work in Rural Communities (International City/ County Management Association, 2010)*

Table 26. Goal 3: Create Great New Places

Strategy	Tools & Policies	
3.a. Update strategic and policy documents to accommodate new growth through compact and contiguous development	• Visioning • Places worth preserving • Designated growth areas	• Infrastructure grid and transportation options • Distinctive local character
3.b. Reform policies to make it easy for developers to build compact, walkable, mixed-use places	• Policy alignment • Walkability • Parks and open space • Traditional neighborhood development • Form-Based Codes	• Context-sensitive design • Green street design • Low-impact development
3.c. Recognize and reward developers that build great places using smart growth and green building approaches	• Smart growth recognition programs	• Green building

Source: *Putting Smart Growth to Work in Rural Communities (International City/ County Management Association, 2010)*

POTENTIAL VMT MITIGATION MEASURES FOR DIFFERENT TYPES OF RURAL AREAS

According to a recent study, *Mitigating Vehicle-Miles Traveled (VMT) in Rural Development* (Miller & Ganson, 2015), rural communities can be classified into three types (productive, development, and edge) to develop VMT mitigation strategies based on their common characteristics[13]. Discussion of these three rural community types and appropriate mitigation strategies for each, as outlined in *Mitigating Vehicle-Miles Traveled (VMT) in Rural Development*, is provided below.

Productive Areas

Low population density and growth, with economic reliance on extractive and agricultural (non-transferable), uses of the land itself.

Mitigation Strategies

Strategies outside Productive town centers

- Develop new residential units at a density of 10 acres per unit or less.
- Commit farmland, timber reserves, or other open spaces under a conservation easement or land trust. Many states offer reduced property taxes for land under easement, such as the Williamson Act in California.
- Eschew new growth-inducing infrastructure, and limit new development to septic service and well water.
- Reduce the need to travel for information by providing high quality, high-speed broadband Internet service.

Strategies inside Productive town centers

- Like the urban context, smaller lot sizes and higher density development make trip-chaining and active transportation more feasible.
- Adapt the transportation network to accommodate active transportation, including sidewalks, buildings at a pedestrian-oriented scale, street-fronting buildings, bicycle lanes, and bicycle parking.
- Enhance the small block grid system
- Develop affordable housing that balances the jobs-housing mix at each income level.
- Construct a variety of building types and sizes, to support a mixture of uses, and reduce the need to travel long distances for basic goods and services.
- Operate and subsidize vanpool programs to connect worker housing and related jobs.
- Operate and subsidize on-demand shuttles for more infrequent trips, such as between seniors and medical care.

Destinations

A large supply of seasonably occupied housing, high median household incomes, and essentially a population split between the local staff and wealthier visitors.

[13] Miller, R. Beyond "Urban Planning": An Overview of Challenges Unique to Planning Rural California, 2013. *University of California, Berkeley Masters Thesis.* http://www.scribd.com/doc/129955232/Beyond-Urban-Planning-An-Overview-of-Challenges-Unique-to-Planning-Rural-California.

Mitigation Strategies

- Focus new development intensity around the existing town center.
- Diversify new development types to mix land uses and reduce trip lengths for goods and services (such as childcare).
- Diversify residential housing types to accommodate a range of users, such as families (multiple bedrooms) and seniors (smaller units with small yards for easy maintenance).
- Develop quality affordable housing.
- Follow principles of form-based codes to improve walkability and embrace the Destination's existing marketable charm.
- Implement pedestrian and bicycle way-finding signage to encourage visitors to explore without an automobile.
- When local transit is available:
    - Orient new development to facilitate pedestrian and bicycle access to transit stops.
    - Subsidize connecting service to new development.
    - Provide free or subsidized transit passes to employees, residents, or guests.
- When regional transit is available:
    - Focus new development around the regional transit connection.
    - Provide bike-rentals or bike-sharing facilities at the transit station.
    - Attract car-sharing services to the transit connection.
    - Operate a shuttle between the transit connection and major destinations.
- Operate or contribute to a shuttle from nearby urban areas to the major destination (such as a ski shuttle, or to a casino/hotel).
- Operate or contribute to a local shuttle between workers and job centers or between local attractions for visitors.
- Purchase and dedicate land on the outskirts of the destination's developed area to a land bank or trust, reducing the risk of future high-VMT development.
- Commit to using local products and services in construction and operations.

Edge Communities

Communities that are located on the periphery of a city or metropolitan area and less populous than urban centers. As the infrastructure of these communities tends to support automobile-dependent and low-density development, introducing VMT-efficient development can be challenging.

Mitigation Strategies

Strategies for Edge Communities

- Cluster new development compactly, including on infill sites when possible.
- Improve the mix of uses, adding destinations that allow shorter trips.
- Build a network of trails that offer active transportation options between the development and major destinations, such as other neighborhoods, schools, shopping, and recreation.
- Provide sidewalk and street treatments that facilitate active mode transportation, such as illuminated crosswalks, bulb-outs, pedestrian refuge islands, bike lanes, and protected cycle tracks.

- Facilitate, promote, and subsidize the implementation and use of car sharing facilities or peer-to-peer car sharing among residents.
- Commit undeveloped lands to a land trust, the Williamson Act or a Transferable Development Rights program.
- Redevelop and intensify low-intensity development along major corridors. Sufficient intensification along such corridors can make transit feasible.
- Unbundle parking from residential units, and offer car share vehicles on site.
- Include or contribute to development that mitigates the community's VMT, such as a centrally located neighborhood center or library.
- Promote and/or provide schoolpooling options for parents, such as organized meeting places or ridesharing tools.

Strategies for Developers/Employers in Edge Communities

- Offer a parking cash-out option to employees.
- Charge employees the daily market rate for parking, rather than subsidizing parking or charging a monthly fee.
- Provide incentives to employees to carpool, bike, walk, or take transit.
- Fund a Guaranteed Ride Home Program or Emergency Ride Home, which distributes vouchers for some number of free cab rides to commuters for emergencies when their carpool or transit options become untenable.
- Provide bike lockers, changing areas, and showers on site.
- Encourage telecommuting.

WOOD RODGERS

TECHNICAL MEMORANDUM

To: Tuolumne County Transportation Council

Attention: Darin Grossi, Executive Director

From: *Wood Rodgers, Inc.* – Mario Tambellini, PE, TE

Date: November 11, 2019

Subject: **Regional Travel Demand Model Update and Calibration**
Tuolumne County SB 743 VMT Study Phase 1

INTRODUCTION

The Tuolumne County Regional Travel Demand Model (RTDM) was originally developed in 1997 in order to assist the Tuolumne County Transportation Council's (TCTC) long-range Regional Transportation Plan (RTP) efforts and to help establish a funding mechanism to finance future transportation infrastructure. The RTDM was last updated in 2015 as part of the 2016 RTP Update. The 2015 update to the RTDM consisted of the following:

- Update to the model's Traffic Analysis Zone (TAZ) structure and centroid connection scheme consistent with updated base-year (2015) and anticipated future year land use and consistent with the County General Plan Update and circulation conditions.
- Validation of the model's zonal trip generation rates with the latest field-counted trip generation rate studies.
- Re-calibration and validation of the existing (Base Year) annual average traffic model to 2015 travel/traffic conditions.

The year 2015 version of the RTDM has a base year scenario of 2015 and future forecast scenarios of 2030 and 2040 based on Tuolumne County's (County) UPlan land use forecasts and a financially constrained list of regional transportation improvement projects. The 2015 version of the RTDM runs on TransCAD 5.0 software. Additional details on the 2015 update to the RTDM can be found in the *Tuolumne County Regional Travel Demand Update Final Report* (Wood Rodgers, August 2015).

MODEL UPDATE

Tuolumne County and TCTC are currently studying the County's existing vehicle miles traveled (VMT) patterns and updating their California Environmental Quality Act (CEQA) environmental review process to be in compliance with California's Senate Bill (SB) 743. As part of this VMT study, TCTC has determined that the County needs to update their current traffic analysis tools, including the County's RTDM, to have better capabilities when assessing VMT. Wood Rodgers, Inc. (Wood Rodgers) and Caliper Corporation (Caliper) have been contracted by TCTC to update the RTDM with additional functionality. The RTDM functionality update includes the following tasks:

- Update the RTDM from TransCAD 5.0 to latest available TransCAD 8.0
  - Update the model interface to a flowchart-based interface

  - Update all model scripts with latest state of the practice code that will increase model efficiency and reliability
  - Clean out unused placeholder model variables and condense model inputs where possible to improve ease of use of the RTDM
- Create a mode choice sub-model in the RTDM, as well as bicycle, pedestrian, and transit routes and networks that will produce multi-modal trip assignments
- Add a select-link and select-node component to the RTDM
- Add additional reporting features to the RTDM, including statistics on trip generation/distribution, mode choice, and VMT
- Calibrate RTDM trip generation and distribution
- Calibrate RTDM trip Origins and Destinations
- Calibrate RTDM average trip lengths and trip length frequency
- Calibrate RTDM roadway network via changes to speeds, capacities, etc. to better match existing conditions

The updated RTDM will be a four-step, trip-based model, which are commonly used by many public agencies in California, and considered acceptable for VMT analysis by the California Governor's Office of Planning and Research. The updated RTDM will have the capability to assist the County with analyzing current and future VMT trends and patterns, which will be important for selecting VMT significance thresholds for the County's updated CEQA environmental review process. The updated RTDM will also be capable of estimating VMT generated by proposed land use projects, and the effects multi-modal transportation improvements will have on VMT in the County.

ORIGIN DESTINATION CALIBRATION

Vehicular Origin Destination (OD) data was obtained for the Tuolumne County region from AirSage. AirSage produces OD trips matrices using proprietary algorithms and software to analyze samples of anonymized and encrypted GPS sightings (location traces) generated by communication devices (smartphones, tables, etc.) in the study area. The AirSage OD data was obtained for Tuolumne County over the May 2018 time period for typical average weekday conditions (Tuesday through Thursday). Data was categorized by one of three trip purposes: Home Based Work (HBW), Home Based Other (HBO), and Non-Home Based (NHB). Trips were categorized into approximately 200 high-level zones within Tuolumne County and the surrounding areas based on the RTDM TAZs. OD trip pairs were developed for the approximately 200 zones. The estimated average number of daily trips between each OD pair was reported from the AirSage data.

All collected AirSage trips were anonymous and aggregated at a high level, so no single trip could be traced back to a specific time, person, route, or address. The collected AirSage data is a representative sample of vehicle trips in Tuolumne County during May 2018 which has been extrapolated to estimate total average weekday daily trips during that time period. After review and comparison against other available data (including California Household Travel Survey data, American Community Survey Commuting Characteristics data, California Statewide Travel Demand Model data, and recent manual traffic counts performed in Tuolumne County), the sample of data produced by AirSage appears to be a reasonable approximation of general travel patterns and quantity of trips in Tuolumne County. Additional details on the collected AirSage data can be found in the *Summary of Tuolumne County AirSage Data Memorandum* (Wood Rodgers, August 2, 2019).

OD trip data from AirSage was summarized for the overall County as well as the following six (6) County subareas, which are based on the trip generation subareas used in the RTDM:

1. Towns
2. Suburbs
3. Rural
4. Southwest
5. Western Suburbs
6. Groveland

The six (6) County subareas are shown in Figure 1. OD trip data from the latest RTDM was also summarized for the overall County and the six (6) County subareas. RTDM OD trip data was compared against AirSage data to validate the trip generation and distribution of the RTDM. Iterative refinements were made to the RTDM daily trip production and attraction rates contained in the CrossClassPA.bin model file to calibrate the RTDM generated trips. The production and attraction rates of each RTDM subarea were adjusted separately until the RTDM replicated the AirSage reported travel patterns to an acceptable level. All adjusted daily trip production and attraction rates were compared against typical Institute of Transportation Engineers rates to check for reasonableness. Table 1 shows calibrated RTDM daily trips by subarea compared against AirSage reported trips.

Table 1. Calibrated RTDM vs. AirSage Daily Trips by Subarea

Subarea	All Trips		HBW		HBO		NHB		IXXI	
	AirSage	RTDM	AirSage	RTDM	AirSage	RTDM	AirSage	RTDM	AirSage	RTDM
Overall County	184,649	184,579	36,047	36,051	79,894	79,821	37,078	37,076	31,630	31,630
1	24,945	24,907	5,019	5,019	10,823	10,800	5,286	5,285	3,816	3,803
2	103,987	103,979	19,682	19,685	49,455	49,416	21,959	21,958	12,891	12,920
3	13,754	13,766	3,810	3,811	4,410	4,407	2,535	2,536	2,999	3,013
4	14,802	14,767	1,855	1,856	2,372	2,370	3,333	3,333	7,242	7,208
5	16,736	16,731	3,691	3,691	8,171	8,164	1,792	1,792	3,081	3,083
6	10,427	10,429	1,989	1,990	4,663	4,664	2,173	2,172	1,601	1,603

Notes:
Subarea definitions: 1 = Towns, 2 = Suburbs, 3 = Rural, 4 = Southwest, 5 = Western Suburbs, 6 = Groveland.
HBW= Home Based Work, HBO = Home Based Other, NHB = Non-Home Based, IXXI = Internal-External and External-Internal,
RTDM = Tuolumne County Regional Travel Demand Model

TRIP LENGTH CALIBRATION

Existing trip lengths between the AirSage OD zone pairs were estimated using a combination of the RTDM's GIS based roadway network and high-level location information provided in the AirSage data. The estimated trip lengths between the OD zone pairs were used with the average number of daily trips between each OD pair, reported from the AirSage data, in order to estimate the existing average trip lengths of different types of trips in the overall County as well as the six (6) subareas.

Average trip lengths from the latest RTDM were also summarized for the overall County and the six (6) County subareas and compared against AirSage data. Iterative refinements were made to the RTDM's friction factors to calibrate the RTDM estimated trip lengths. Per recommendations in *NCHRP Report 365 – Travel Estimation Techniques for Urban Planning* (Transportation Research Board,

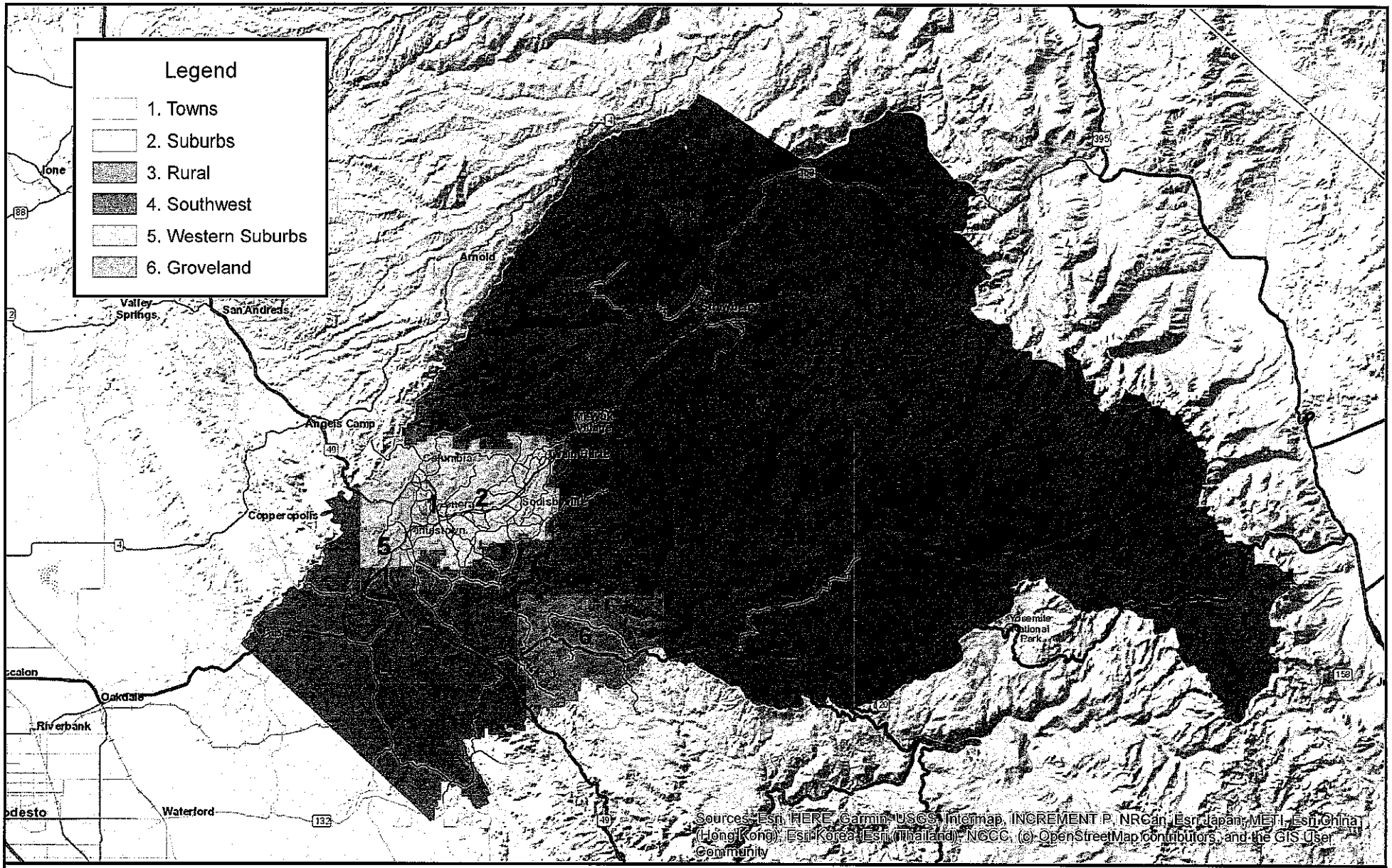


FIGURE 1

TUOLUMNE COUNTY TRIPGEN SUBAREAS

SB 743 STUDY PHASE 1

TUOLUMNE COUNTY, CA

NOVEMBER 2019

0 2.5 5 10

Miles

NORTH

WOOD RODGERS

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1998), gamma functions were used to approximate frequency of trip lengths by trip purpose. Gamma function coefficients were adjusted for each RTDM trip purpose until an equation was found that adequately replicated the observed trip lengths. Table 2 shows the calibrated RTDM trip lengths by purpose and subarea compared against AirSage data.

Table 2. Calibrated RTDM vs. AirSage Average Trip Lengths (in miles) by Subarea

Subarea	All Trips		HBW		HBO		NHB		IXXI	
	AirSage	RTDM	AirSage	RTDM	AirSage	RTDM	AirSage	RTDM	AirSage	RTDM
Overall County	8.80	9.51	6.44	6.40	4.95	5.14	7.02	7.16	21.11	26.81
1	5.99	6.32	4.35	4.23	3.41	3.40	4.20	5.21	16.48	18.95
2	7.58	8.36	6.39	5.90	4.87	5.06	6.07	5.66	20.62	29.31
3	17.32	20.30	10.07	11.45	7.44	9.98	12.71	13.33	39.79	52.44
4	14.93	15.94	11.23	12.84	11.49	10.76	11.95	12.60	17.84	19.99
5	6.90	6.89	3.32	4.38	3.64	4.01	6.36	7.58	16.72	17.13
6	10.28	9.41	6.65	4.96	5.92	4.58	9.63	11.25	24.27	26.52

Notes:
Subarea definitions: 1 = Towns, 2 = Suburbs, 3 = Rural, 4 = Southwest, 5 = Western Suburbs, 6 = Groveland.
HBW= Home Based Work, HBO = Home Based Other, NHB = Non-Home Based, IXXI = Internal-External and External-Internal,
RTDM = Tuolumne County Regional Travel Demand Model

Daily trip length frequency is the number of trips of certain lengths made each day. Figure 2, Figure 3, Figure 4, and Figure 5 show plots of the AirSage reported trip length frequency vs. the calibrated RTDM trip length frequency for the different trip purposes. As shown in Figure 2, Figure 3, Figure 4, and Figure 5, the calibrated RTDM matches the general trends of the AirSage trip length frequencies reasonably well, and therefore produces a reasonable distribution of trip lengths.

Figure 2. Calibrated RTDM vs. AirSage Home Based Work Trip Length Frequency

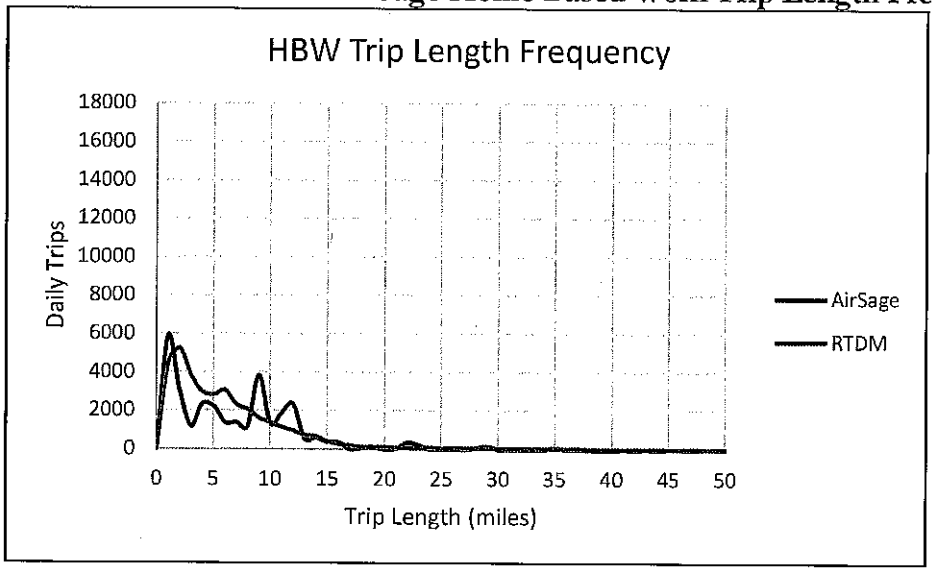


Figure 3. Updated RTDM vs. AirSage Home Based Other Trip Length Frequency

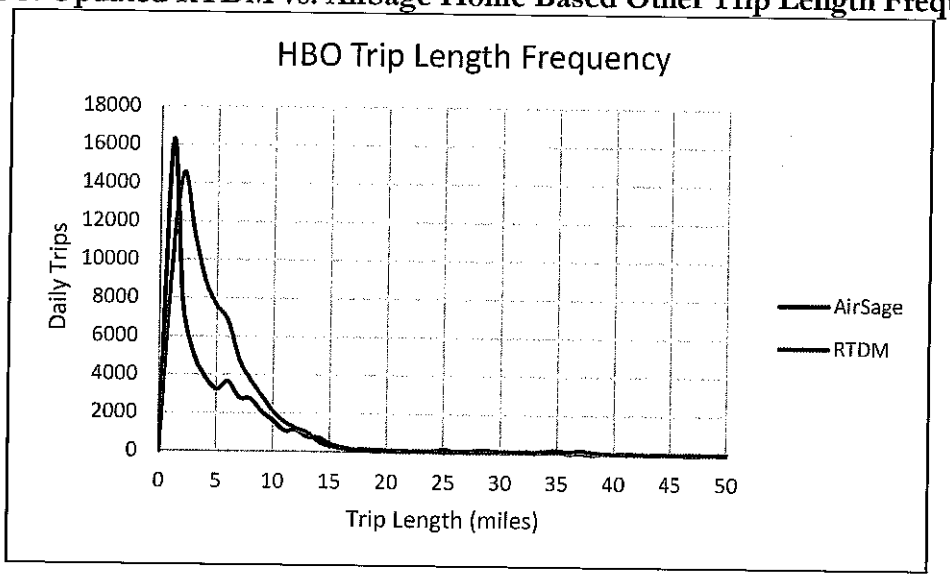


Figure 4. Updated RTDM vs. AirSage Non-Home Based Trip Length Frequency

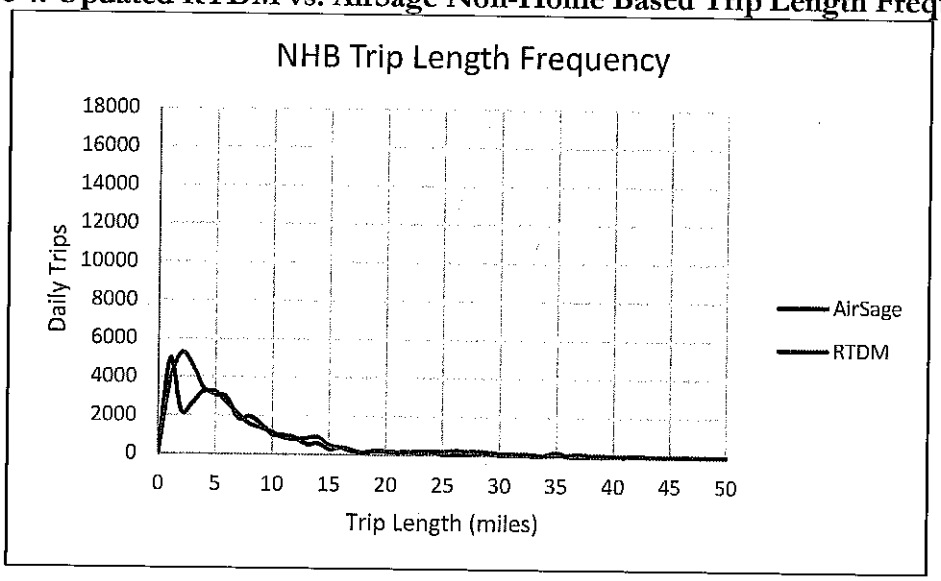
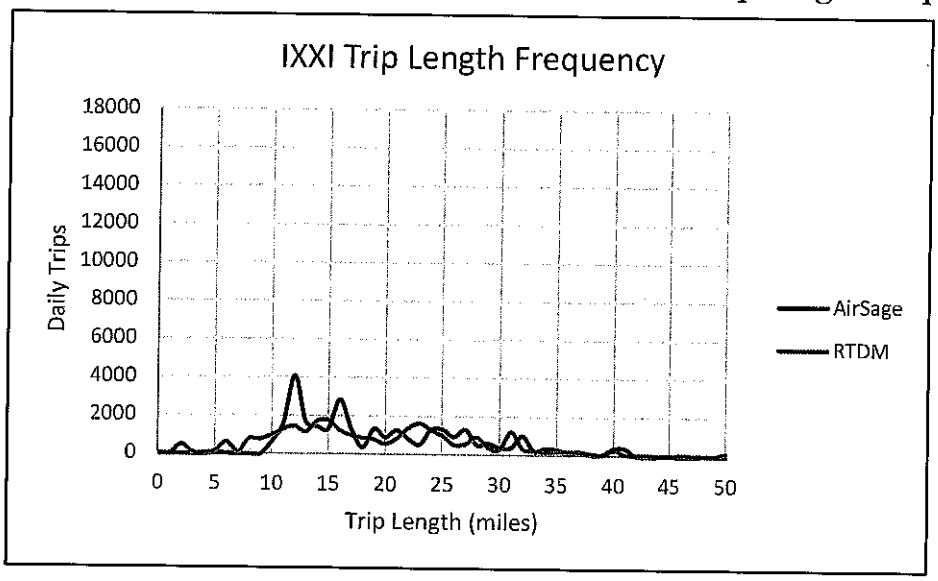


Figure 5. Updated RTDM vs. AirSage Internal-External Trip Length Frequency



MODEL VALIDATION

Wood Rodgers and Caliper have completed the initial update of the RTDM. As some of the updates to the RTDM modify the way the RTDM estimates traffic volume forecasts, the updated RTDM was validated to ensure it produced results consistent with available traffic counts and the prior version of the model. Typical "static validation" procedures were applied as described below.

"Static validation" is the term used to describe the model's performance as it relates to how well the model's estimate of roadway segment traffic volumes for the Base Year (i.e., 2015) matches existing field-observed traffic counts. Caltrans has identified certain guidelines regarding acceptability for forecasting future year traffic. Described below is a summary of the model's performance, validated per guidelines specified in the *Caltrans Travel Forecasting Guidelines* (Caltrans, November 1992).

VALIDATION COMPARISON TECHNIQUES

The Base Year (2015) RTDM accuracy was tested using the comparison techniques listed below.

- The volume-to-count ratio is computed by dividing the total volume assigned by the model on selected individual roadways and the total traffic count volume for those selected individual roadways.
- The *Deviation* is the difference between the model volume and the actual count divided by the actual count.
- The *Correlation Coefficient* estimates the correlation between the actual traffic counts and the estimated traffic volumes from the model.
- The *Coefficient of Determination* (R^2) is the proportion of variability between the actual traffic counts and the estimated traffic volumes from the model.
- The percent *Root Mean Square Error* (RMSE) is the square-root of the model volume minus the actual count squared divided by the number of counts. It is a measure similar to standard deviation in that it assesses the accuracy of the entire model.

MODEL VALIDATION STANDARDS

For a model to be considered reasonably accurate and appropriate for use in traffic forecasting, it must replicate actual conditions within a certain level of allowable variability. Since it would be practically impossible for any model to precisely replicate all counts, validation guidelines have been established. Key validation targets established for this RTDM update, based on *Caltrans Travel Forecasting Guidelines* and typical industry validation standards, are summarized below.

- A minimum of 75 percent of the roadway links should be within their maximum desirable deviation, which ranges from approximately 20 to 68 percent depending on total volume (Caltrans guideline)
- The model-wide correlation coefficient should be greater than 0.88 (Caltrans guideline)
- The model-wide coefficient of determination (R^2) should be greater than 0.88 (typical industry standard)
- The maximum acceptable RMSE should not exceed 40 percent (typical industry standard)
- The total deviation by functional classification should not exceed the following percentages (Caltrans guideline):
  - Freeways/Highways: 7 percent
  - Arterial-HiCap: 10 percent
  - Arterial-LoCap: 15 percent
  - Collectors: 25 percent
  - Frontage/Local Roads: 25 percent

Table 3 summaries the allowable deviation in daily traffic volumes on roadway links that were derived from the *Caltrans Travel Forecasting Guidelines* document. As stated in the first bullet above, the allowable deviation in daily traffic volumes on an individual roadway link ranges from approximately 20 to 68 percent depending on the total volume. This allowable deviation is based on the potential deviation in a single traffic count from one day to other days, which can range from 0 to 20 percent depending on the traffic volume. As shown in Table 3, the allowable deviation is based on the amount of traffic volume on an individual roadway segment. A higher deviation is allowed on lower volume links where higher variability can occur, and a lower deviation is allowed on higher volume links where more consistent traffic volumes occur on a day-to-day basis.

Table 3. Caltrans Allowable Percent Deviation for TDMs

Daily Base Year Traffic Count	Maximum Percent Deviation	Daily Base Year Traffic Count	Maximum Percent Deviation
0-1,249	68%	15,000-16,249	30%
1,250-2,499	63%	16,250-18,749	29%
2,500-3,749	58%	18,750-21,249	28%
3,750-4,999	52%	21,250-23,749	27%
5,000-6,249	48%	23,750-26,249	26%
6,250-7,499	44%	26,250-28,749	25%
7,500-8,749	41%	28,750-34,999	24%
8,750-9,999	38%	35,000-37,499	23%
10,000-11,249	36%	37,500-42,499	22%
11,250-12,499	34%	42,500-47,499	21%
12,500-13,749	33%	47,500 or Greater	20%
13,750-14,999	31%		

MODEL VALIDATION RESULTS

Minor iterative refinements that include adjustments of network link speeds and capacities were performed to achieve acceptable levels of validation between traffic counts and RTDM estimated traffic volumes under annualized average weekday travel conditions.

The Base Year (2015) RTDM daily conditions were validated for link volumes on 154 directional roadway segments. The resulting validation statistics are summarized in Table 4 and Table 5.

Table 4. Link Validation Results for the Base Year (2015) RTDM

Validation Statistic (Total Number of Directional Links =154)	Link Validation Target	Validated Daily Model Actual Results	Met Validation Criteria?
Volume to Count Percent Error	< -/+5%	1%	YES
Percent of Directional Links Within Allowable Maximum Deviation	> 75%	83%	YES
Correlation Coefficient	> 88%	96%	YES
Coefficient of Determination (R-Squared Value)	> 0.88	0.91	YES
Overall Percent RMSE	< 40%	28%	YES

Table 5. Functional Classification Validation Results for the Base Year (2015) RTDM

Roadway Functional Classification	% Error Target	Total Count Volume	Total Model Volume	Daily Model % Error	Met FC Target?
Freeways/Highways	< -/+7%	507,040	534,541	5%	YES
Arterial – High Capacity	< -/+10%	322,904	301,072	-7%	YES
Arterial – Low Capacity	< -/+15%	114,256	115,737	1%	YES
Collectors	< -/+25%	37,735	39,959	6%	YES
Frontage/Local Roads	< -/+25%	51,167	49,277	-4%	YES
Total:		**1,033,102**	**1,040,587**	**1%**	-

As shown in Table 4 and Table 5, the Base Year (2015) RTDM generates results that meet/exceed the model validation criteria (as described in the previous section) under average weekday conditions. The validation statistics shown in Table 4 and Table 5 are also reasonably consistent with the statistics generated by the prior version of the model (shown in the August 2015 *Tuolumne County Regional Travel Demand Update Final Report*). Detailed validation statistics are shown in Appendix A.

The model also completes a PM peak hour trip assignment module that outputs a PM peak hour volume file *(Volume_PM.bin)*. It is important to note however that the traffic model is calibrated primarily at a daily traffic forecasts level and secondarily at a PM peak hour traffic forecasts level. Since the model does not use actual PM peak hour trip generation rates by land use type to derive the PM peak hour traffic forecasts, the model should be technically regarded as an ADT model only. However, based on comparison of the year 2015 PM peak hour model volumes to available 2014 PM Peak hour ground counts, the PM peak hour model volumes are observed to be within approximately 5% of the ground counts.

MODEL STATISTICS

The updated and calibrated RTDM produces the following statistics related to trip generation, mode choice, and trip assignment.

Table 6. RTDM Daily Trip Generation Statistics

Trip Purpose	Production (trips)	Attraction (trips)
Home-Based Work (HBW)	37,244	35,903
Home-Based Other (HBO)	70,674	71,115
Home-Based School (HBS)	17,128	17,019
Home-Based Recreation (NHR)	40	42
Home-Based Casino (HBC)	692	628
Non-Home-Based (NHB)	39,359	40,372
Home-Based Work Internal-External (HBW I-E)	4,602	5,070
Home-Based Other Internal-External (HBO I-E)	5,901	5,628
Non-Home-Based Internal-External (NHB I-E)	5,688	4,743

Table 7. RTDM Daily Mode Choice Statistics

Mode	Home-Based Work		Home-Based Other		Home-Based School		Non-Home-Based	
	Trips	Share	Trips	Share	Trips	Share	Trips	Share
Drive	36,051	96.8%	68,377	96.8%	10,774	63.3%	37,076	94.2%
Bus	193	0.5%	366	0.5%	5,316	31.2%[1]	199	0.5%
Walk	824	2.2%	1,592	2.3%	454	2. 7%	1,695	4.3%
Bike	176	0.5%	339	0.5%	475	2.8%	389	1.0%

Notes:
1. School Bus Trips

Table 8. RTDM Daily Trip Assignment Statistics

FC #[1]	Functional Classification	Count	Average Congested Speed (mph)	Vehicle Miles Traveled	Vehicle Hours Traveled	Delay (vehicle-hours)
1	Freeway	18	45.3	54,152	1,215	234
2	Highway – High Capacity	268	48.5	753,227	15,421	1,335
3	Highway – Low Capacity	144	44.2	386,405	7,875	439
4	Arterial – High Capacity	287	41.9	296,266	6,883	474
5	Arterial – Low Capacity	184	30.8	99,715	3,367	381
6	Collector	318	31.8	99,738	3,268	77
7	Main Street	128	23.1	46,887	2,124	390
9	Local Street	252	25.9	74,901	3,071	119

Notes:
1. Roadway Functional Classification Number

As shown in Table 6, the updated and calibrated RTDM produces productions and attractions which balance reasonably well. The RTDM mode share percentages shown in Table 7 were calibrated to reasonably match mode share data from the latest (2013-2017) US Census American Community Survey and multi-modal traffic counts collected in Tuolumne County in the last several years. Table 8 shows general RTDM produced statistics by roadway functional classification.

MODEL VMT ESTIMATES

The updated and calibrated RTDM is intended to be a tool that can estimate VMT within Tuolumne County. Therefore, once the calibration and updates to the RTDM were complete, VMT statistics were calculated using the updated RTDM and compared against statistics calculated with AirSage data to check the accuracy of the RTDM when calculating VMT. Table 9 shows the resulting VMT statistics.

Table 9. Calibrated RTDM vs. AirSage VMT by Trip Purpose

Subarea	VMT / Service Population (All Trips)		VMT / Employee (HBW Trips)		VMT / Capita (HB Trips)		VMT / Service Population (NHB Trips)		VMT / Service Population (IXXI Trips)	
	AirSage	RTDM	AirSage	RTDM	AirSage	RTDM	AirSage	RTDM	AirSage	RTDM
Overall County	22.5	24.3	11.8	11.7	11.5	12.2	3.6	3.7	9.3	11.8
1	20.2	21.2	7.9	7.7	12.1	12.4	3.0	3.7	8.5	9.7
2	18.0	19.8	9.9	9.2	11.3	11.8	3.0	2.8	6.1	8.6
3	34.9	40.9	25.6	29.2	12.6	16.4	4.7	4.9	17.5	23.1
4	70.3	74.9	19.9	22.8	23.0	23.5	12.7	13.4	41.1	45.9
5	19.6	19.6	12.2	16.2	8.7	10.0	1.9	2.3	8.7	9.0
6	21.3	19.5	17.6	13.1	9.4	7.3	4.2	4.8	7.7	8.4

Notes:
Subarea definitions: 1 = Towns, 2 = Suburbs, 3 = Rural, 4 = Southwest, 5 = Western Suburbs, 6 = Groveland.
HBW= Home Based Work, HB = Home Based, NHB = Non-Home Based, IXXI= Internal-External and External-Internal,
RTDM = Tuolumne County Regional Travel Demand Model

As shown in Table 9, the updated and calibrated RTDM produces VMT results which are reasonably consistent with collected AirSage data.

APPENDIX A

Existing (2015) Regional Travel Demand Model Validation Summary
Tuolumne County SB 743 VMT Study Phase 1

#	Roadway/Highway	Segment	Functional Classification (FC)	FC #	Count Year	Exist ADT Count	Exist Peak Month ADT	Base Year Model ADT Volume	Diff. (Base Year Model ADT Volume - Exist ADT Count)	Diff. Squared	Allowable Link Deviation % (+/-)	Percent Diff. (Base Year Model ADT - Exist ADT Count)	Link Deviation % Met?
1	SR 108 Corridor	w/o Tulloch rd	4-Lane Highway	1	2014	11,200	13,500	11,846	646	416,870	36%	5.8%	YES
2		b/w O'Byrnes Ferry Rd & La Grange Rd	2-Lane Highway	1	2014[1]	15,300	17,800	15,838	538	289,555	30%	3.5%	YES
3		b/w La Grange Rd & SR 120 (Yosemite Junction)	2-Lane Highway	1	2014[1]	18,000	21,800	19,066	1,066	1,135,812	29%	5.9%	YES
4		b/w SR 120 (Yosemite Junction) and SR 49 (Montezuma Junction)	2-Lane Highway	1	2008[1]	17,600	18,500	16,794	-806	649,750	29%	-4.6%	YES
5		b/w SR 49 (Stockton Rd) and S Washington St/Lime Kiln Rd	2-Lane Highway	1	2014[1]	19,900	21,400	22,177	2,277	5,186,564	28%	11.4%	YES
6		w/o Mono Way	2-Lane Highway	1	2014[1]	20,500	22,000	20,470	-30	884	28%	-0.1%	YES
7		b/w Mono Way and Hess Ave	2-Lane Highway	1	2014	20,800	22,500	20,265	-535	285,993	28%	-2.6%	YES
8		b/w Hess Ave and Peaceful Oak Rd	2-Lane Highway	1	2014[2]	15,700	17,400	15,175	-525	275,645	30%	-3.3%	YES
9		b/w Peaceful Oak Rd and Mono Way	2-Lane Highway	1	2014[2]	14,200	16,500	14,707	507	257,143	31%	3.6%	YES
11		b/w Mono Way and Soulsbyville Rd	2-Lane Highway	1	2014[1]	14,600	17,900	22,744	8,144	66,319,370	31%	55.8%	NO
12		b/w Soulsbyville Rd and W Conn. Twain Harte Dr	4-Lane Highway	1	2014	8,100	9,000	12,984	4,884	23,857,486	41%	60.3%	NO
13		b/w W & E Conn Twain Harte Dr	2-Lane Highway	1	2014	8,000	9,400	9,726	1,726	2,978,493	41%	21.6%	YES
14		e/o East Conn. Twain Hart Rd	2-Lane Highway	1	2014	8,100	11,300	8,614	514	263,736	41%	6.3%	YES
15		w/o Chief Fuller Rd	2-Lane Highway	1	2014	6,900	7,400	6,817	-83	6,921	44%	-1.2%	YES
16		e/o Chief Fuller Rd	2-Lane Highway	1	2014	4,450	6,800	4,900	450	202,561	52%	10.1%	YES
17		w/o West Long Barn Conn.	2-Lane Highway	1	2014	4,200	5,400	4,122	-78	6,140	52%	-1.9%	YES
18		b/w West Long Barn Conn. and East Long Barn Conn.	2-Lane Highway	1	2014	5,100	7,100	3,715	-1,385	1,917,929	48%	-27.2%	YES
19		b/w Kennedy Meadows Rd and Tuolumne/Mono Countyline	2-Lane Highway	1	2014	790	960	756	-34	1,152	68%	-4.4%	YES
20	SR 49 Corridor	n/o Tuolumne/Mariposa County Line	2-Lane Highway	1	2014	630	730	642	12	152	68%	2.0%	YES
21		s/o South Jct SR 120	2-Lane Highway	1	2014	820	920	1,493	673	453,199	68%	82.1%	NO
22		n/o North SR 120 Jct	2-Lane Highway	1	2014	1,550	1,900	4,315	2,765	7,644,015	63%	178.4%	NO
23		b/w SR 49 (Montezuma Jct) & Bell Mooney Rd	2-Lane Highway	1	2014	18,600	23,400	21,126	2,526	6,381,112	29%	13.6%	YES
24		b/w Bell Mooney Rd and South Jct Main St	2-Lane Highway	1	2014[1]	19,300	22,900	22,696	3,396	11,531,466	28%	17.6%	YES
25		b/w South Jct Main St and Rawhide Rd	2-Lane Highway	1	2014[1]	19,300	22,200	22,547	3,247	10,540,837	28%	16.8%	YES
26		b/w Rawhide Rd and Fifth Ave	2-Lane Highway	1	2014[1]	19,700	19,900	23,429	3,729	13,903,277	28%	18.9%	YES
27		b/w Fifth Ave and Stockton Rd/SR 108	2-Lane Highway	1	2014	23,500	24,900	24,029	529	279,402	27%	2.2%	YES
28		btn SR 108 and Fairview Lane (Ponderosa)	2-Lane Highway	1	2014	11,900	12,600	9,763	-2,137	4,567,895	34%	-18.0%	YES
29		b/w Fairview Lane and Southgate Dr	2-Lane Highway	1	2014	10,700	11,500	8,463	-2,237	5,006,347	36%	-20.9%	YES
30		b/w Southgate Dr and Washington St	2-Lane Highway	1	2014	10,900	11,500	7,475	-3,425	11,730,047	36%	-31.4%	YES
31		b/w Stockton Rd and Dodge St	2-Lane Highway	1	2014	18,500	19,600	15,852	-2,648	7,012,564	29%	-14.3%	YES
32		n/o Dodge St	2-Lane Highway	1	2014	19,400	19,800	15,404	-3,996	15,970,172	28%	-20.6%	YES
33		s/o N Washington St / Columbia Way	2-Lane Highway	1	2014	16,100	16,500	16,280	180	32,414	30%	1.1%	YES
34		n/o N Washington St / Columbia Way	2-Lane Highway	1	2014	15,400	17,700	14,082	-1,318	1,736,576	30%	-8.6%	YES
35		e/o Parrotts Ferry Rd (Columbia WYE)	2-Lane Highway	1	2014	13,300	15,200	13,345	45	2,009	33%	0.3%	YES
36		w/o Parrotts Ferry Rd (Columbia WYE)	2-Lane Highway	1	2014	5,050	5,700	6,409	1,359	1,846,987	48%	26.9%	YES
37		e/o Rawhide Rd	2-Lane Highway	1	2014	5,500	6,100	6,789	1,289	1,662,122	48%	23.4%	YES
38		b/w Rawhide Rd and Turttletown	2-Lane Highway	1	2014	4,550	4,850	5,980	1,430	2,044,362	52%	31.4%	YES
39		b/w Tuttletown and Tuolumne / Calveras County Line	2-Lane Highway	1	2014	5,600	6,000	5,954	354	126,653	48%	6.3%	YES
40	SR 120 Corridor	b/w Tulloch Rd and La Grange Rd	4-Lane Highway	1	2014	11,600	14,600	11,846	246	60,346	34%	2.1%	YES
42		b/w East Jct 108 and North Jct SR 49	2-Lane Highway	1	2014	2,700	3,350	2,945	245	59,979	58%	9.1%	YES
43		b/w North Jct SR 49 and Jacksonville Rd	2-Lane Highway	1	2014	3,750	5,600	5,494	1,744	3,041,249	52%	46.5%	YES
44		b/w Jacksonville Rd and South Jct SR 49	2-Lane Highway	1	2014	5,000	7,600	6,208	1,208	1,460,415	48%	24.2%	YES
45		b/w South Jct SR 49 and Priest-Coulterville Rd	2-Lane Highway	1	2014	3,900	6,000	3,622	-278	77,482	52%	-7.1%	YES
46		w/o Ferretti Rd (Groveland Townsite)	2-Lane Highway	1	2014	4,800	6,900	7,384	2,584	6,675,830	52%	53.8%	NO
47		e/o Ferretti Rd (Groveland Townsite)	2-Lane Highway	1	2014	5,800	8,600	4,023	-1,777	3,158,637	48%	-30.6%	YES
48		w/o Hells Hollow Rd	2-Lane Highway	1	2014	4,850	7,200	4,459	-391	153,265	52%	-8.1%	YES
49		e/o Smiths Station Rd	2-Lane Highway	1	2014	3,800	8,100	4,186	386	149,274	52%	10.2%	YES
50		w/o Cherry Valley/Lake Rd	2-Lane Highway	1	2014	3,600	6,400	4,023	423	178,713	58%	11.7%	YES
51		w/oYosemite Park West Boundary	2-Lane Highway	1	2014	3,500	6,300	3,566	66	4,314	68%	1.9%	YES
52	Mono Way	w/o Sanguinetti Rd	2-Lane Arterial HiCap	2	2014	22,205		16,762	-5,443	29,622,667	27%	-24.5%	YES
53		b/W Sanguinetti Rd & Greenley Rd	4-Lane Arterial HiCap	2	2014	16,986		13,887	-3,099	9,605,419	29%	-18.2%	YES
54		b/w Greenley Rd & Fir Dr	4-Lane Arterial HiCap	2	2014	21,628		26,575	4,947	24,469,472	27%	22.9%	YES
55		b/w Fir Dr & Tuolumne Rd	4-Lane Arterial HiCap	2	2014	25,060		22,557	-2,503	6,265,371	26%	-10.0%	YES
56		b/w Tuolumne Rd & Hess Ave	4-Lane Arterial HiCap	2	2014	12,327		13,247	920	847,243	34%	7.5%	YES
57		b/w Hess Ave & Standard Rd / Peaceful Oak Dr	2-Lane Arterial HiCap	2	2014	12,076		9,662	-2,414	5,827,721	34%	-20.0%	YES
58		b/w Standard Rd/Peaceful Oak Dr & SR 108	2-Lane Arterial HiCap	2	2014	7,435		9,259	1,824	3,325,543	44%	24.5%	YES

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Existing (2015) Regional Travel Demand Model Validation Summary
Tuolumne County SB 743 VMT Study Phase 1

#	Roadway/Highway	Segment	Functional Classification (FC)	FC #	Count Year	Exist ADT Count	Exist Peak Month ADT	Base Year Model ADT Volume	Diff (Base Year Model ADT Volume - Exist ADT Count)	Diff Squared	Allowable Link Deviation % (+/-)	Percent Diff (Base Year Model ADT - Exist ADT Count)	Link Deviation % Met?
59	Standard Road	b/w Tuolumne Rd & Mono Way	2-Lane Arterial LoCap	3	2014	3,391		3,487	96	9,130	58%	2.8%	YES
60	Cabezut Road	b/w Greenly Rd and Shannon Dr	2-Lane Collector	4	2014	5,775		4,668	-1,107	1,226,434	48%	-19.2%	YES
61		e/o Shannon Dr	2-Lane Collector	4	2014	260		182	-78	6,077	68%	-30.0%	YES
62	Parrots Ferry Road	b/w SR 49 & Sawmill Flat Rd	2-Lane Arterial HiCap	2	2014	11,100		11,708	608	369,677	36%	5.5%	YES
63		b/w Sawmill Flat Rd & Springfield Dr	2-Lane Arterial HiCap	2	2014	7,900		7,458	-442	195,036	41%	-5.6%	YES
64		n/o Springfield Dr	2-Lane Arterial HiCap	2	2014	8,066		8,691	625	390,568	41%	7.7%	YES
65		s/o Calaveras County Line	2-Lane Arterial HiCap	2	2014	4,071		4,335	264	69,703	52%	6.5%	YES
66	Fifth Avenue	s/o SR 108 / 49	2-Lane Collector	4	2014	2,640		2,487	-153	23,616	58%	-5.8%	YES
67		n/o SR 108 / 49	2-Lane Collector	4	2014	792		329	-463	214,821	68%	-58.5%	YES
68	Greenley Road	b/w Lyons Bald Mt Rd/Lyons Rd & Cabezut Rd	2-Lane Arterial LoCap	3	2014	5,868		5,755	-113	12,754	48%	-1.9%	YES
69		b/w Cabezut Rd/ Morning Star Rd & Delnero Dr	2-Lane Arterial LoCap	3	2014	11,332		9,077	-2,255	5,083,471	34%	-19.9%	YES
70		b/w Delnero Dr & Mono Way	2-Lane Arterial LoCap	3	2014	15,317		15,610	293	85,951	30%	1.9%	YES
71	La Grange Road	b/w County Line & Bonds Flat Rd	2-Lane Arterial HiCap	2	2014	2,703		2,871	168	28,219	58%	6.2%	YES
72		b/w Bonds Flat Rd & Red Hills Rd	2-Lane Arterial HiCap	2	2014	2,868		5,230	2,362	5,580,137	58%	82.4%	NO
73		b/wRed Hills Rd & SR 108-SR 120	2-Lane Arterial HiCap	2	2014	2,399		5,012	2,613	6,828,406	63%	108.9%	NO
74	Seco Street	b/w Camp Seco Rd & 3rd Ave	2-Lane Collector	4	2014	1,050		1,687	637	405,809	68%	60.7%	YES
75		b/w 3rd Ave & Main St	2-Lane Local Road	5	2014	2,902		3,402	500	249,526	58%	17.2%	YES
76		s/o Campo Seco Rd	2-Lane Arterial LoCap	3	2014	1,036		1,807	771	594,458	68%	74.4%	NO
77	Tuolumne Road	b/w Mono Way & Lambert lake Rd	2-Lane Arterial HiCap	2	2014	15,203		14,078	-1,125	1,265,839	39%	-7.4%	YES
78		b/w Lambert Lake Rd & Hess Ave	2-Lane Arterial HiCap	2	2014	13,042		12,552	-490	240,490	33%	-3.8%	YES
79		b/w Hess Ave & Wards Ferry Rd	2-Lane Arterial HiCap	2	2014	12,283		11,434	-849	719,973	34%	-6.9%	YES
80		b/w Wards Ferry Rd & Standard Rd	2-Lane Arterial HiCap	2	2014	11,745		12,030	285	81,138	34%	2.4%	YES
81		b/w Standard Rd & Woodhams Carne	2-Lane Arterial HiCap	2	2014	11,955		11,807	-148	21,896	34%	-1.2%	YES
82		b/w Woodhams Carne & Cherokee Rd	2-Lane Arterial HiCap	2	2014	11,848		9,650	-2,198	4,831,933	34%	-18.6%	YES
83	Wards Ferry Road	s/o Yosemite Rd	2-Lane Collector	4	2014	2,399		1,083	-1,316	1,732,186	63%	-54.9%	YES
84		s/o Tuolumne Rd	2-Lane Collector	4	2014	1,799		1,838	39	1,526	63%	2.2%	YES
85	Twain Harte Drive	n/o Hunts Rd	2-Lane Arterial LoCap	3	2014	3,642		3,640	-2	4	58%	-0.1%	YES
86		w/o East Ave	2-Lane Arterial LoCap	3	2014	4,466		2,055	-2,411	5,812,651	52%	-54.0%	NO
87		e/o Tiffeni Dr (eastern Most)	2-Lane Arterial LoCap	3	2014	1,914		2,956	1,042	1,086,079	63%	54.4%	YES
88	Shaws Flat Road	s/o SR 49	2-Lane Collector	4	2014	3,057		3,892	835	697,531	58%	27.3%	YES
89		n/o SR 49	2-Lane Collector	4	2014	1,989		2,212	223	49,819	63%	11.2%	YES
90	Jamestown Road	s/o Shaws Flat Rd	2-Lane Arterial LoCap	3	2014	2,486		3,330	844	712,031	63%	33.9%	YES
91		s/o Racetrack Rd	2-Lane Arterial LoCap	3	2014	3,134		3,755	621	385,689	58%	19.8%	YES
92		b/w Golf links & Fifth Ave	2-Lane Arterial LoCap	3	2014	2,798		3,608	810	656,250	58%	29.0%	YES
93	Rawhide Road	n/o SR 49 & 108 (by the Bridge)	2-Lane Arterial HiCap	2	2014	4,149		5,246	1,097	1,203,180	52%	26.4%	YES
94		s/o SR 49 (near Tuttletown)	2-Lane Arterial HiCap	2	2014	2,407		3,564	1,157	1,339,349	63%	48.1%	YES
95	Phoenix Lake Road	e/o Creekside Dr	2-Lane Arterial LoCap	3	2014	2,095		2,416	321	103,020	63%	15.3%	YES
96		e/o Paseo de Los Portales	2-Lane Arterial LoCap	3	2014	4,796		4,241	-555	308,200	52%	-11.6%	YES
97		e/o Ridgewood	2-Lane Arterial LoCap	3	2014	5,495		6,878	1,383	1,911,804	48%	25.2%	YES
98		e/o Hess Ave	2-Lane Arterial LoCap	3	2014	7,746		10,280	2,534	6,420,941	41%	32.7%	YES
99		w/o Hess Ave	2-Lane Arterial LoCap	3	2014	4,729		2,992	-1,737	3,018,659	52%	-36.7%	YES
100	Old Wards Ferry Road	s/o Sanguinetti Rd (n/o of Walmart & Lowes Driveway)	4-Lane Arterial HiCap	2	2014	7,116		3,892	-3,224	10,391,808	44%	-45.3%	NO
101		1/4 mile s/o Sanguinetti Rd (over Highway 108)	2-Lane Local Road	5	2014	805		1,156	351	123,071	68%	43.6%	YES
102		s/o Jacobs Rd	2-Lane Local Road	5	2014	502		529	27	704	68%	5.3%	YES
103	Soulsbyville Road	e/o Black Oak Dr	2-Lane Arterial LoCap	3	2014	1,033		1,107	74	5,439	68%	7.1%	YES
104		s/o Willow Springs Dr	2-Lane Arterial LoCap	3	2014	1,817		2,924	1,107	1,224,767	63%	60.9%	YES
105		n/o of SR 108	2-Lane Arterial LoCap	3	2014	6,457		10,336	3,879	15,046,969	44%	60.1%	NO
106	Tuolumne Rd North	b/w Tuolumne Rd & Black Oak Casino Entrance St	2-Lane Arterial HiCap	2	2014	6,436		4,612	-1,824	3,325,849	44%	-28.3%	YES
107		n/o Mi Wu St	2-Lane Arterial HiCap	2	2014	2,391		1,990	-401	161,150	63%	-16.8%	YES
108		n/o East Ave	2-Lane Arterial HiCap	2	2014	1,436		1,840	404	162,874	63%	28.1%	YES
109	O'Byrnes Ferry Rd	n/o SR 108	2-Lane Arterial HiCap	2	2014	5,998		5,358	-640	409,442	48%	-10.7%	YES
110		n/o Prison/Calaveras County Line	2-Lane Arterial LoCap	3	2014	3,796		4,035	239	57,110	52%	6.3%	YES
111	Longeway Rd	e/o Soulsbyville Rd	2-Lane Arterial LoCap	3	2014	8,050		9,897	1,847	3,410,173	41%	22.9%	YES
112		e/o Crystal Falls Dr	2-Lane Arterial LoCap	3	2014	4,283		3,933	-350	122,562	52%	-8.2%	YES
113	Stewart St	b/w Lyons St & Elkin St	2-Lane Local Road	5	2014	6,597		6,932	335	112,266	44%	5.1%	YES
114		b/w Mono wWay/Restano Way & Church St	2-Lane Local Road	5	2014	5,905		3,604	-2,301	5,295,262	48%	-39.0%	YES
115	S Washington St	n/o SR 108	2-Lane Arterial HiCap	2	2014	10,859		8,142	-2,717	7,382,329	36%	-25.0%	YES
116		b/w Restano Way & Church St	2-Lane Arterial HiCap	2	2014	18,595		14,262	-4,333	18,771,763	29%	-23.3%	YES
117	Sanguinetti Rd	b/w Mono Way & S Greenley Rd (eb one-way)	2-Lane Arterial HiCap	2	2014	4,299		3,434	-865	748,722	52%	-20.1%	YES
118		b/w S Greenley Rd & Fir Dr	4-Lane Arterial HiCap	2	2014	8,500		7,628	-872	759,967	41%	-10.3%	YES
119		b/w Fir Dr & Mono Way	2-Lane Arterial HiCap	2	2014	3,182		262	-2,920	8,524,347	58%	-91.8%	NO

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#	Roadway/Highway	Segment	Functional Classification (FC)	FC#	Count Year	Exist ADT Count	Exist Peak Month ADT	Base Year Model ADT Volume	Diff (Base Year Model ADT Volume - Exist ADT Count)	Diff Squared	Allowable Link Deviation % (+/-)	Percent Diff (Base Year Model ADT - Exist ADT Count)	Link Deviation % Met?
120	Peaceful Oak Dr	n/o SR 108 Bypass	2-Lane Arterial LoCap	3	2014	596		184	-412	169,560	68%	-69.1%	NO
121		b/w SR 108 Ramps	4-Lane Arterial LoCap	3	2014	2,663		934	-1,829	3,344,210	58%	-68.7%	NO
122		b/w Mono Way and SR 108	4-Lane Arterial LoCap	3	2014	5,316		602	-4,714	22,226,137	48%	-88.7%	NO
123	Other Roads	Bell Mooney Rd, w/o Jacksonville Rd	2-Lane Local Road	5	2014	148		392	244	59,568	68%	164.9%	NO
124		Big Hill Rd, b/w Sawmill Flat Rd & N Bald Mountain Rd	2-Lane Collector	4	2014	1,169		1,420	251	62,975	68%	21.5%	YES
125		Black Oak Rd, n/o Tuolumne Rd	2-Lane Collector	4	2014	1,586		994	-592	350,609	63%	-37.3%	YES
126		Bonanza Rd, w/o Snell Rd	2-Lane Local Road	5	2014	1,330		3,479	2,149	4,619,468	63%	161.6%	NO
127		Bonds Flat Rd, e/o La Grange Rd	2-Lane Arterial HiCap	2	2014	1,113		4,335	3,222	10,382,743	68%	289.5%	NO
128		Campo Seco Rd, e/o Seco Rd	2-Lane Collector	4	2014	1,454		1,164	-290	84,058	63%	-19.9%	YES
129		Cherokee Rd, w/o Tuolumne Rd North	2-Lane Collector	4	2014	1,656		2,218	562	315,910	63%	33.9%	YES
130		Chicken Ranch Rd, w/o SR 108	2-Lane Local Road	5	2014	1,406		1,370	-36	1,295	63%	-2.6%	YES
131		Draper Mine Rd, e/o SR 108 & SR 49	2-Lane Local Road	5	2014	942		1,036	94	8,789	68%	10.0%	YES
132		East Ave, s/o Twain Harte Dr	2-Lane Local Road	5	2014	1,392		969	-423	178,684	63%	-30.4%	YES
133		Ferretti Road, s/o Pine Mt Dr	2-Lane Arterial HiCap	2	2014	2,870		2,857	-13	158	58%	-0.4%	YES
134		Golf Links Rd, n/o SR 108	2-Lane Local Road	5	2014	1,032		2,039	1,007	1,013,717	68%	97.6%	NO
135		Hess Ave, b/w SR 108 & Mono Way	2-Lane Local Road	5	2014	8,137		7,655	-482	232,356	41%	-5.9%	YES
136		Jacksonville Rd, s/o Twist Ave	2-Lane Arterial HiCap	2	2014	1,301		1,253	-48	2,263	63%	-3.7%	YES
137		Jacobs Rd, w/o Old Wards Ferry Rd	2-Lane Local Road	5	2014	596		724	128	16,274	68%	21.4%	YES
138		Lime Kiln Rd, s/o Campo Seco Rd & SR 108	2-Lane Local Road	5	2014	3,973		841	-3,132	9,808,921	52%	-78.8%	NO
139		Lyons Bald Mt.Rd, e/o Greenley Rd	2-Lane Collector	4	2014	1,709		1,620	-89	7,833	63%	-5.2%	YES
140		Lyons St, w/o Greenley Rd	2-Lane Local Road	5	2014	5,501		4,293	-1,208	1,458,222	48%	-22.0%	YES
141		Main St (Jamestown), n/o Donovan St	2-Lane Local Road	5	2014	1,526		2,795	1,269	1,611,479	63%	83.2%	NO
142		Merrell Rd, s/o SR 120	2-Lane Local Road	5	2014	480		45	-435	189,137	68%	-90.6%	NO
143		Morningstar Dr, w/o Greenley Rd	2-Lane Local Road	5	2014	1,517		1,122	-395	156,126	63%	-26.0%	YES
144		Old Priest Grade, 1/2 Mile e/o SR 120	2-Lane Local Road	5	2014	2,172		2,674	502	251,828	63%	23.1%	YES
145		Sawmill Flat Rd, e/o Parrots Ferry Rd	2-Lane Collector	4	2014	2,300		4,413	2,113	4,462,973	63%	91.9%	NO
146		Smith Station Rd, s/o SR 120	2-Lane Arterial HiCap	2	2014	537		577	40	1,581	68%	7.4%	YES
147		Snell Rd-Racetrack Rd, n/o Bonanza Rd	2-Lane Collector	4	2014	3,586		4,100	514	264,135	58%	14.3%	YES
148		South Greenley Rd, b/w Mono Way & Sanguinetti Rd	4-Lane Arterial HiCap	2	2014	8,815		3,014	-5,801	33,656,678	38%	-65.8%	NO
149		Springfield Rd, n/o Horseshoe Bend Rd	2-Lane Collector	4	2014	1,892		2,629	737	542,443	63%	38.9%	YES
150		Woodhams Carne Rd, s/o Tuolumne Rd	2-Lane Collector	4	2014	1,473		551	-922	850,077	63%	-62.6%	YES
151		Yankee Hill Rd, e/o Bigler St	2-Lane Collector	4	2014	1,149		2,474	1,325	1,754,756	68%	115.3%	NO
152		Willow Springs Dr, e/o Bonnie St	2-Lane Local Road	5	2014	2,707		2,256	-451	202,999	58%	-16.6%	YES
153		Barron Ranch Rd, n/o Black Oak Rd	2-Lane Local Road	5	2014	611		1,422	811	657,320	68%	132.7%	NO
154		Delnero Dr, e/o Greenly Rd	2-Lane Local Road	5	2014	986		543	-443	196,503	68%	-45.0%	YES
					TOTAL:	1,033,102		1,040,587	7,485	530,656,552			126

Note: Dir = Direction, FC = Functional Classification, FC # = Functional Classification Number, ADT = Average Daily Traffic, Diff = Difference, Exist = Existing, NB = Northbound, SB = Southbound

[1] Counts based off of SR 108 TCR (dated 2014) and Caltrans Count Book

[2] Counts based off of year 2014 travel forecasts for SR 108 after completion of East Sonora Bypass Phase 2 (provided by Caltrans)

Diff Squared = [Diff (Base Year (2015) Model ADT - Exist ADT Count)]^2

Allowable Link Deviation % (+/-) is based on Caltrans Model Validation Report, dated November 1992

Link Deviation % Met = If absolute value of Percent Difference is less than the Allowable Link Deviation Percentage, then "YES", otherwise "NO"

FC Target Met = If absolute value of Percent Difference is less than the FC % Error Target Percentage, then "YES", otherwise "NO"

FC % Error Target, Correlation Coefficient, R Squared are based on Caltrans Travel Forecasting Guidelines, dated November 1992

The Functional Classifications used in this Validation Table are for modeling purposes only.

Functional Classification Percent Error

FC#	Classification	Target % Error		Total Count	Total Model	Actual% Error	Met FC Target?
1	Freeways/Highways	+/-	7%	507,040	534,541	5%	YES
2	Arterial-HiCap	+/-	10%	322,904	301,072	-7%	YES
3	Arterial-LoCap	+/-	15%	114,256	115,737	1%	YES
4	Collectors	+/-	25%	37,735	39,959	6%	YES
5	Frontage/Local Roads	+/-	25%	51,167	49,277	-4%	YES
			Total	1,033,102	1,040,587	1%	

Validation Targets	Target		Model	Met?
Total Links			152	
Correlation Coefficient	>	88%	96%	YES
Root Mean Square Error (%RMSE)	<	40%	28%	YES
Model to Count Ratio	<	5%	1%	YES
Caltrans Difference Validation	>	75%	83%	YES
R Squared	>	0.88	0.91	YES

Note: %RMSE = [(Difference Squared)/(Total Links - 1)]^(0.5)/[(Total Exist ADT Count)/(Total Links)], and is based on Model Validation and Reasonableness Checking Manual, dated February 1997.

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

April 17, 2019

Mr. Darin Grossi (dgrossi@co.tuolumne.ca.us)
Tuolumne County Transportation Council
2 South Green Street
Sonora, California 95370

RE: Proposal - Tuolumne County SB 743 VMT Study Phase 2

Dear Mr. Grossi,

As requested, this proposal contains the Scope of Work, proposed budget, and preliminary schedule from Wood Rodgers, Inc. (Wood Rodgers) for Phase 2 of the Tuolumne County SB 743 Vehicle Miles Traveled (VMT) Study (Project). The SB 743 VMT Study will provide an overview of the new California Environmental Quality Act (CEQA) transportation metric VMT and discuss the requirements set forth in the revised CEQA Guidelines. One of the main goals for this Project will be to determine the best VMT strategy for the rural Tuolumne County (County) region that utilizes existing technical resources, ensures a fair playing field for development, and helps support VMT reduction goals.

The original Scope of Work provided by Tuolumne County Transportation Council (TCTC) has been broken out into three main phases, as follows:

- **Phase 1** – VMT Data Collection, Regional Travel Demand Model (RTDM) Update, and VMT Threshold Best Practices Research (currently underway and to be completed by June 30, 2019)
- **Phase 2** – Develop County VMT Guidelines, Thresholds, and Tools
- **Phase 3** – VMT Impact Fee Program

This proposal is to complete Phase 2 of the Tuolumne County VMT Study only. Phase 1 is currently underway and Phase 3 would be completed separately. Wood Rodgers has provided an approach and cost for each of the Tasks identified as part of Phase 2 (see Tasks 1 through 6 below). The following Scope of Work will be accomplished through our existing On-Call Agreement with TCTC.

SCOPE OF WORK

TASK 1 – FACILITATE STEERING COMMITTEE, PROJECT MEETINGS AND COORDINATION

This Task encompasses agency meetings and coordination activities, including preparation of agendas and minutes, as well as management of the Project's Scope of Work, budget, and schedule. Task 1 also includes organizing and attending meetings with Project Stakeholders and the Steering Committee in order to gather input on the VMT process. Wood Rodgers anticipates conducting one (1) Project kick-off meeting with TCTC and Caltrans; two (2) meetings between Caltrans, TCTC, and the stakeholders; and (2) Steering Committee meetings.

The Project's Kick-Off meeting will also serve as an opportunity to finalize the Project schedule and Scope of Work proposed herein. This Task also includes overall management and administration of the Project, including invoicing, status reports, and coordination of Project staff.

Deliverables:

- Kick-Off Meeting (1)
- Coordination and/or Stakeholder Meetings (2)
- Steering Committee Meetings (2)
- Status Reports

TASK 1 Budget = $22,011

TASK 2 – DEVELOP RECOMMENDED METHODOLOGIES

2.1 – Develop VMT Screening Criteria

Wood Rodgers will prepare a list of screening criteria for different types of land uses and transportation projects. If a project meets the County's screening criteria, it would not require a full VMT analysis. Examples of screening criteria are: a residential development containing less than a certain number of units or located in an area designated as low VMT by a screening map (e.g.: due to proximity to multi-modal facilities, diverse destinations, etc.)

2.1.1 – Prepare VMT Heat and Screening Maps

Wood Rodgers will prepare up to six (6) VMT heat and/or screening maps for different land use types. For example, a Residential VMT Screening Map would highlight areas of the County where a residential project would be expected to generate VMT below the County threshold.

2.1.2 – Develop a GIS-based Website Version of the VMT Screening Maps

Wood Rodgers will create a website version of the VMT Screening Maps. The end product would be a web page where a developer could input their project address in order to determine if the project is located in a screening area.

2.2 – Develop a VMT Evaluation Tool

Wood Rodgers will develop a spreadsheet-based VMT Evaluation Tool which can be used to easily estimate the VMT Impacts of a proposed development that does not meet the County's screening criteria. The tool will focus on estimating VMT for residential and employment land uses within the County, including the following: single-family residential, multi-family residential, office, retail (note that not all retail will be able to use the tool), and industrial. The tool would not be intended to estimate VMT generated by land uses where the majority of VMT is generated by visitors or customers (such as some retail, hotel, and resort) because these land uses would require a more detailed VMT analysis or study. For retail projects, the decision to use the VMT Evaluation Tool or perform a more detailed VMT study will likely have to be made on a case by case basis. Small, specialty retail projects or mixed-use projects including a small portion of retail may be able to use the tool to estimate VMT, while larger retail projects may require a more detailed study to account for the rerouting of existing trips that are made to other retail destinations. The VMT Evaluation Tool will produce the approximate VMT generated by a development and how it compares to the County's thresholds.

2.2.1 – Establish Method of Calculating VMT for Different Land Uses and Areas
Wood Rodgers will establish a standard methodology of calculating VMT for proposed land uses within different areas of Tuolumne County using the updated and validated Tuolumne County RTDM and trip length averages prepared as part of Phase 1 of the Tuolumne County SB 743 VMT Study, as well as standard published Institute of Transportation Engineers trip generation rates.

2.2.2 – Develop List of VMT Reduction Strategies and Associated Reductions
Wood Rodgers will develop a list of typical VMT reduction strategies that could be implemented for proposed developments in Tuolumne County to reduce their VMT. Wood Rodgers will relate implementation of the VMT reduction strategies to a percent decrease in VMT using existing research and/or the current version of the Tuolumne County RTDM. When appropriate, Wood Rodgers will establish an elasticity value which relates an independent variable (for example, distance from a development to the nearest bicycle facility) to a percent reduction in VMT.

2.3 – Prepare a VMT Evaluation Tool User Guide

Wood Rodgers will prepare a technical memorandum documenting the purpose and development of the VMT Evaluation Tool. This memorandum will include details on assumptions that went into creating the tool, definitions of key terms in the tool, and step-by-step instructions on how to use the tool.

2.4 – Develop Methods of Analyzing VMT for Other Types of Projects

Wood Rodgers will prepare a general set of guidelines on how to perform a VMT analysis for projects that cannot use the VMT Evaluation Tool, such as retail/hotel/resort developments, transportation improvements, and County/City area plans.

Deliverables:

- Draft VMT Screening Criteria
- Spreadsheet-based VMT Evaluation Tool
- VMT Evaluation Tool User Guide
- Draft VMT Analysis Methods for Other Types of Projects
- Website Version of the VMT Screening Maps

TASK 2 Budget = $54,244

TASK 3 – DEVELOP THRESHOLDS FOR CITY AND COUNTY PROJECTS AND PLANS

Wood Rodgers will develop a list of VMT thresholds for different project types, including private developments, public developments, County/City plans, and transportation improvements. All VMT thresholds will be developed using the updated and validated Tuolumne County RTDM and trip length averages prepared as part of Phase 1 of the Tuolumne County SB 743 VMT Study, and the recommendations and guidelines contained in the *Technical Advisory on Evaluating Transportation Impacts in CEQA* (California Governor's Office of Planning and Research, December 2018). VMT thresholds will be developed using the same methodologies which will be used to analyze project-specific VMT, consistent with California Governor's Office of Planning and Research Guidelines.

Deliverables:

- Draft Tuolumne County VMT Thresholds

TASK 3 Budget = $17,381

TASK 4 – DEVELOP MITIGATION MEASURES FOR CITY AND COUNTY PROJECTS AND PLANS

Wood Rodgers will develop a list of typical mitigation measures that could be applied to mitigate the VMT impacts of a project. Separate lists of mitigations will be developed for different types of projects, including public and private developments, County/City plans, and transportation improvement projects. VMT Reduction Strategies identified for the VMT Evaluation Tool in Task 2.2.2 may be used as mitigation measures for development projects. Wood Rodgers will provide basic guidance on how to quantify the benefits of a proposed mitigation measure.

Deliverables:

- Draft Mitigation Measures for developments, County/City plans, and transportation improvements.

TASK 4 Budget = $20,987

TASK 5 – CEQA VMT TRANSPORTATION IMPACT GUIDELINES

Wood Rodgers will prepare a CEQA VMT Transportation Impact Guidelines Report outlining the recommended methodology and guidelines for implementing CEQA transportation analysis of a project's impacts on VMT in Tuolumne County. This CEQA VMT Transportation Impact Guidelines Report will summarize the findings and methodologies of Tasks 2 through 4 of this proposal. The CEQA VMT Transportation Impact Guidelines Report will:

- Recommend/define VMT significance criteria, screening criteria, and thresholds of significance for environmental clearance for development projects, transportation projects, and County/City plans in Tuolumne County.
- Provide a general work flow of how to evaluate a project's VMT impacts in Tuolumne County, including the recommended steps, methodologies, and tools to perform the analysis.
- Recommend potential mitigation measures that could be implemented to mitigate significant VMT impacts.

Deliverables:

- Draft CEQA VMT Transportation Impact Guidelines Report
- Final CEQA VMT Transportation Impact Guidelines Report

TASK 5 Budget = $26,077

TASK 6 – VMT Training for Local Staff and Board Meeting Presentations

Wood Rodgers will teach two days of VMT training courses to be hosted by TCTC. Wood Rodgers will provide class slides and handouts. The training will focus on the background information of SB 743 and on evaluating VMT for CEQA, as well as provide an overview of how to implement the Tuolumne County CEQA VMT Transportation Impact Guidelines completed in Task 5. The training will focus on assisting local government staff with becoming familiar with the VMT analysis process.

Wood Rodgers will prepare a presentation summarizing the results of the SB 743 VMT Study Phase 2 including slides and handouts. Wood Rodgers anticipates giving this presentation at up to three (3) total meetings.

Deliverables:

- VMT Training Class Materials
- SB 743 VMT Study Phase 2 Presentation (Slides and Handouts)

TASK 6 Budget = $27,000

TOTAL BUDGET = $167,700 (Time & Materials)

Wood Rodgers will deliver the above Scope of Work for a Time & Materials amount of $167,700. We anticipate a schedule of approximately ten months for completion of the work as outlined above. A detailed cost estimate (**Exhibit "A"**) is attached at the end of this proposal. It is understood that this will be consistent with all terms of our approved On-Call Agreement. Should you have any questions, please contact me at (916) 826-6420 or via email at mrayback@WoodRodgers.com.

Sincerely,

WOOD RODGERS, INC.

Mark Rayback, PE, QSD/QSP
Vice President

8341

Attachments:
Exhibit "A": SB 743 VMT Study Phase 2 Detailed Cost Proposal

Tuolumne Region SB 743-VMT Study - Timeline - Public Presentations

Deliverable	Steering Committee	BOS Planning Committee	County BOS	City Council	City PC
SB 743 Overview	Complete - 9.26.19	-			5:30 pm -Feb 10th 2019
VMT Thresholds & Screening Tools		Feb 20th 1:30pm			June
Mitigation Measures		April			
VMT Evaluation Tool					
Task 6 - Training Session One Day					
	4 meetings - TCTC present				