

TRANSPORTATION ANALYSIS GUIDELINES



CITY OF ELK GROVE

ADOPTED FEBRUARY 2019

UPDATED DECEMBER 2019

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1. INTRODUCTION

Transportation Analysis (TA) Guidelines are routinely established by jurisdictions to assist applicants with assessing potential traffic operations of proposed projects. The following guidelines have been developed to provide a clear and consistent technical approach to transportation analysis for projects within Elk Grove's jurisdiction.

On September 27, 2013, Governor Brown signed Senate Bill 743 (SB 743) and started a process intended to fundamentally change transportation impact analysis as part of California Environmental Quality Act (CEQA) compliance. These changes include the elimination of auto delay, level of service, and other similar measures of vehicle capacity or traffic congestion as a basis for determining significant impacts. The Governor's Office of Planning and Research (OPR) has issued final guidance entitled, *Proposed Updates to the CEQA Guidelines* (November 2017), covering the specific changes to the CEQA guidelines. The final guidance recommends elimination of auto delay and level of service for CEQA purposes and the use of Vehicle Miles Traveled, or VMT, as the preferred CEQA transportation metric. The City of Elk Grove General Plan (2018) incorporates the change in transportation impact analysis, resulting from SB 743, and includes VMT policy that establishes significance thresholds for CEQA analysis of future projects.

This document establishes protocol for transportation analysis studies and reports based on the current state-of-the-practice in transportation planning and engineering and includes guidance for General Plan consistency analysis (using roadway and intersection performance) and CEQA analysis (using VMT).

The City expects these guidelines to result in studies that provide comprehensive and accurate analysis of potential transportation operations to City facilities and services. This information is essential for decision makers and the public when evaluating individual projects.

PROJECT CONSIDERATIONS

The following types of projects may require a TA.

- Land use entitlements requiring discretionary approval by Elk Grove, which include but are not limited to: annexations, general plan amendments, specific plans, zoning changes, conditional use permits, and tentative maps.
- Transportation infrastructure modification or expansion, including Capital Improvement Projects (CIP) on City roads and State highways.
- Land use activity advanced by agencies other than Elk Grove that is subject to jurisdictional review under State and Federal law.
- Land use activity advanced by agencies other than Elk Grove that is inconsistent with the City's General Plan.

Section 2 identifies specific project parameters or "triggers" that may necessitate a TA.



INTENT OF ANALYSIS GUIDELINES

These guidelines address key elements required for preparing and reviewing transportation analysis studies in Elk Grove. This document is intended to be a resource applied in concert with professional judgment of the City's Public Works Director. The following major issues are addressed in this document.

- Situations and thresholds that commonly trigger the need for a TA.
- Scope and extent of the required study.
- Transportation analysis methods.
- Criteria to determine if the transportation-related impacts of a proposed project are significant under the California Environmental Quality Act (CEQA).
- Mitigation measure requirements.
- Guidelines for documentation of the findings, conclusions, and recommendations.

The City will primarily review transportation studies and reports based on the guidelines presented in this document. However, each project is unique, and the TA guidelines are not intended to be prescriptive beyond practical. Not all criteria and analyses described in this document will apply to every project. Early and consistent communication with the Development Services and Public Works Departments is encouraged to confirm the type and level of analysis required on a case-by-case basis. Ultimate determination of the criteria and analysis required for a project shall be the responsibility of the Public Works Director (as used in this document, "Public Works Director" means the Public Works Director or his or her designee).

GENERAL PLAN CONTEXT

The City of Elk Grove General Plan specifically identified the preparation of transportation analysis guidelines to support General Plan implementation.

The General Plan and implementing programs serves as a blueprint for future growth and development. The common vision is for Elk Grove to be a great place to make a home, a great place to work, a great place to play, where members of the community travel easily using all modes of transportation.

The General Plan vision is supported by nine Supporting Principles, with the most relevant to transportation listed here:

- Mobility and Active Transportation: Moving Around Anywhere, Any Way:

Our residents, workers, and visitors need to move about efficiently, and have a variety of ways to do so. Connected transportation networks, regional coordination, and public and active transportation options are priorities for our community. Connected and mobile community members have the ability to travel within the City and to other places in the region by a variety of methods, with seamless transitions between modes and regions. Our community has roadways in place that allow for efficient movement and safe travel spaces for all modes of getting around. The infrastructure and facilities for pedestrians, bicyclists, and transit users are clean, safe, and well maintained, and walkways and bike lanes are continuous and completed with convenient connections to local and regional transit.



2. TRIGGERS REQUIRING ANALYSIS

Unless explicitly waived by the City, a TA is required when any one or more of the following conditions is met:

1. The project has the potential to create a significant environmental impact under CEQA (review Table 13 for a list of significance thresholds for all modes).
2. A project with unique land uses or operating characteristics that is not easily characterized, as determined by the Public Works Director.
3. A transportation project that is likely to lead to a substantial or measurable increase in VMT (review Page 10 for a list of projects not likely to lead to a substantial or measurable increase in VMT).
4. The project requires a discretionary planning approval and was not previously analyzed under a prior TA or similar study.
5. The project will substantially alter physical or operational conditions on a City roadway, bikeway, sidewalk, or other transportation facility as determined by the Public Works Director.
6. The project potentially impacts a facility by creating an elevated collision concentration or rate as determined by the Public Works Director.

In general, a TA is applicable for three years. After three or more years of inactivity, a TA should be updated; however, the ultimate decision of if an updated TA is required shall be at the discretion of the Public Works Director.

In some instances, a master TA may be prepared for a larger development. If the master TA fully addresses development phasing and the phase or project is consistent with the intent of the larger development, specific phases will generally not require supplemental transportation analysis. However, each phase or project of the larger development will be required to prepare a site-access and on-site circulation analysis which would be based on current conditions at the time of the application or notice of preparation of an environmental document.

At a minimum, a site access and on-site circulation review is required for every project (see Page 39 for more information about the scope of site access and on-site circulation analysis).

PROJECT DEFINITION

The applicant shall provide a project description that, at a minimum, includes the following:

- Specific land uses and transportation facilities intended for the site or off-site roadway improvements that are part of the project.
- Size or intensity of the proposed development (e.g., square footage, acreage, dwelling units, tonnage, etc.).
- Documentation to inform the City whether the project will affect off-site transportation facilities or



services including transit, rail crossings, roadways, bikeways, and sidewalks (see discussion of multimodal analysis beginning on Page 17 and Table 13 for more information about potential multimodal impacts).

An accurate project description will help determine if a TA is required based on potentially significant environmental impacts.

VEHICLE MILES TRAVELED (VMT) ANALYSIS

The City has established VMT limits for projects, which are designed to achieve a 15 percent reduction in VMT below the 2015 baseline for new land use development. The VMT limits are established at the Citywide or Study Area level as well as the land use designation level underlying the project.

The City has also established VMT limits for new transportation projects. Transportation projects should not result in VMT greater than baseline VMT and should be consistent with regional VMT forecasts and transportation plans. Transportation projects in Elk Grove identified within the Sacramento Area Council of Governments (SACOG) Metropolitan Transportation Plan/Sustainable Communities Strategy (MTP/SCS) are considered regionally consistent.

Projects with VMT less than or equal to the established limits will likely be found to have less than significant transportation impacts under CEQA. Projects with VMT exceeding the established limits that are unable to reduce VMT through reduction strategies identified in Table 12:

1. May be required by the City to demonstrate clear community benefit, within the context of the General Plan and consistent with the Climate Action Plan; and
2. May be found to have significant and unavoidable transportation impacts, requiring the City to adopt a statement of overriding considerations. Projects are required to mitigate transportation impacts to the extent feasible.

The following outlines screening for land use and transportation projects.

Land Use Project Screening

The City has established specific limits on VMT allowable for each land use project by General Plan land use designation as well as Citywide limits and limits within each Study Area. The City's Development Services Department will conduct an initial assessment of each project based on the project description and proposed uses. Figure 1 summarizes the VMT analysis process for land use projects.

Land use projects must show consistency with the General Plan Land Use Plan. Projects that are inconsistent with the Land Use Plan are automatically considered inconsistent with the VMT policy and shall conduct a VMT analysis. Projects that are consistent with the Land Use Plan move to the next step.

Projects that are not likely to lead to a substantial or measurable increase in VMT and are presumed to be less than significant include, but are not limited to, the following:

- Project located within pre-screened areas on the VMT Screening Map shown in Figure 2.



- Project located within ½ mile of an existing major transit stop¹ or an existing stop along a high-quality transit corridor². (At the time this document was approved, there were no major transit stops in Elk Grove).

For projects located within ½ mile of an existing major transit stop, the presumption of less than significant impact would not apply if project-specific or location-specific information indicates that the project will still generate significant levels of VMT. For example, the presumption might not be appropriate if the project:

- Has a floor area ratio of less than 0.75
- Includes substantially more parking for use by residents, customers, or employees of the project than required by the City such that it discourages transit use by making it too convenient to drive.

If any of these apply, the project will be subject to VMT analysis. Notwithstanding these provisions, the Public Works Director may determine that a VMT analysis is required for any discretionary project where substantial evidence indicates the project is likely to result in substantial VMT.

¹ Public Resource 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 frequency of service interval of 15 minutes or less during the morning and afternoon peak commute periods.”).

² Public Resource 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.”)



Figure 1 – Land Use Project VMT Analysis Process

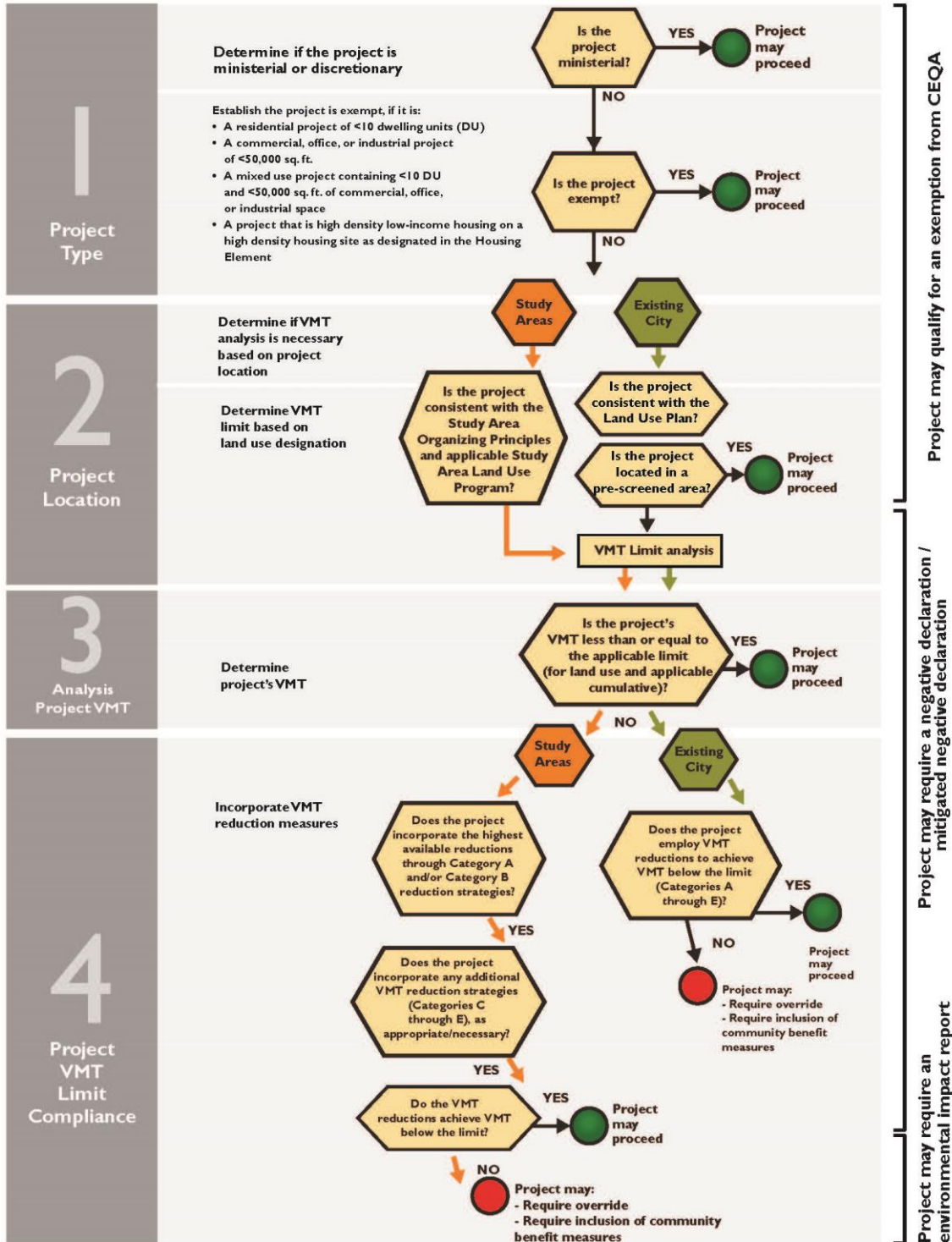
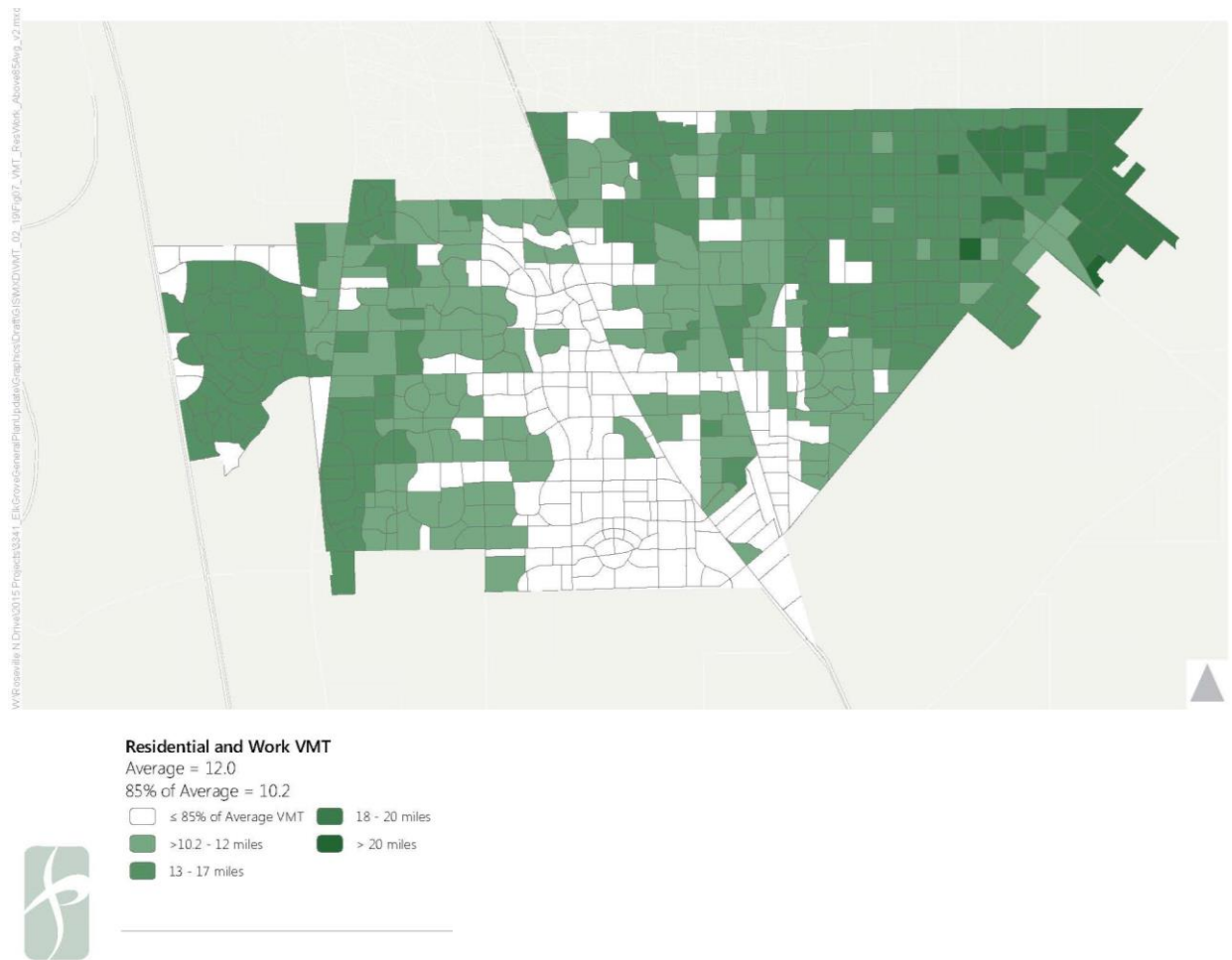


Figure 2 shows the VMT Screening Map that identifies areas in the City that are exempt from VMT analysis. These include sites that have been pre-screened through citywide VMT analysis. Pre-screened areas are shown in white and have been determined to result in 15 percent or below the average service population VMT established for that land use designation if built to the specifications of the Land Use Plan.

Areas shown in green on the screening map have not been pre-screened, based on analysis indicating that daily home-based residential and worker VMT will likely exceed the 15 percent below baseline limit unless reduction strategies are employed. Projects not pre-screened must proceed to VMT analysis.

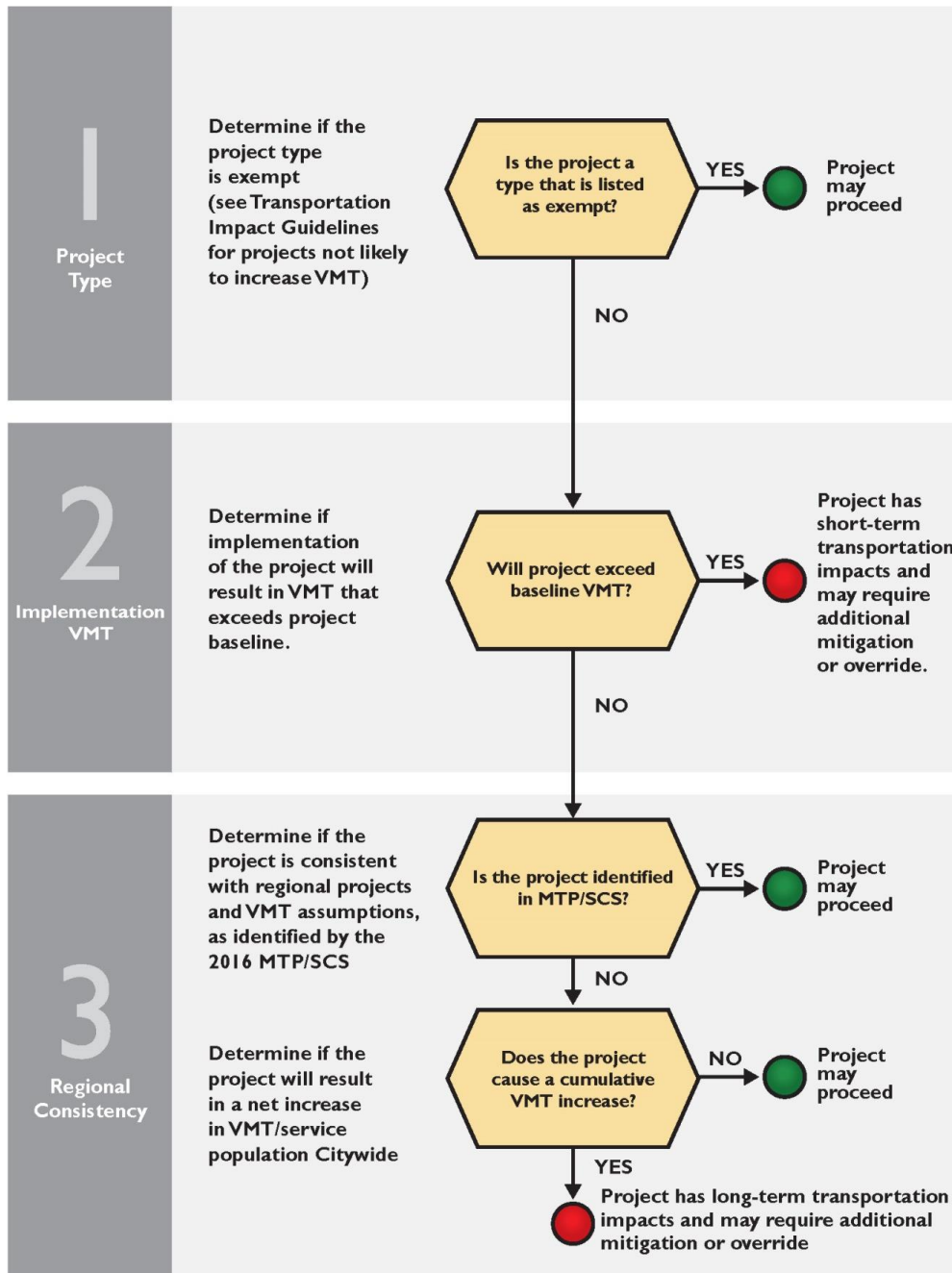
Figure 2 – Land Use Project VMT Screening Map



Transportation Project Screening

Figure 3 outlines the VMT analysis process for transportation projects.

Figure 3 – Transportation Project VMT Analysis Process



Projects that are not likely to lead to a substantial or measurable increase in VMT include, but are not limited to, the following³:

- Public transit (e.g., establishing new routes or services or modifying existing routes or services).
- Addition of active transportation improvements (e.g., new trail segments), like on-street bike lanes and shoulder improvements to improve conditions for cyclists.
- Addition of roadway capacity on local and collector roadways only provided for the purpose of improving conditions for pedestrians, cyclists, and public transit (as applicable).
- Resurfacing, rehabilitation, maintenance, preventative maintenance, replacement, and repair projects that do not add additional roadway capacity.
- Installation, removal, or modification of turn lanes.
- Installation, removal, or modification of traffic control devices, including traffic signals, wayfinding, and traffic signal priority systems.
- Traffic signal optimization and or coordination to improve vehicle, bicycle, or pedestrian flow.
- Installation of roundabouts.
- Installation or modification of traffic calming devices.
- Lane reductions (i.e., road diets”).
- Addition of auxiliary lanes that do not add additional roadway capacity.
- Removal of off-street parking and addition, adoption, or modification of parking devices and management strategies.
- Safety improvements, including roadway shoulder enhancements and auxiliary lanes, and grade separations for rail, transit, pedestrian, and bicycle facilities.
- Sidewalk infill, removing barriers to accessibility, and American with Disabilities Act (ADA) Improvements.
- Installation or modification of access control restrictions.
- Complete Streets Projects that do not add additional roadway capacity.
- Other improvements to the circulation system that do not add additional roadway capacity.

The City shall conduct an initial assessment of each project to determine if the proposed project is likely to substantially increase VMT, as determined by the Public Works Director, and would therefore require VMT analysis.

³ OPR provides a more detailed list of project types that the State anticipates would not result in increased VMT in the *Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA (January 2016)*. Applicants may find this discussion helpful in determining which types of projects to pursue.



3. SCOPE OF THE STUDY

The content and extent of a transportation analysis depend on the location and size of the proposed development, the prevailing conditions in the surrounding area, and the technical questions being asked by decision makers and the public.

STUDY AREA

The study area should be based on the current state-of-the-practice in transportation planning and engineering. For General Plan consistency analysis, the City must approve study locations before traffic data collection and analysis commences. Careful consideration of all modes and facilities (i.e., transit, pedestrian, bicycle, vehicle, rail crossings, or similar) is required when selecting the study area boundary. The study area should be viewed as the “area of influence” of a specific project. The extent of the study area should be determined according to the following guidelines:

- The minimum study area shall include the transportation network within two miles of the project site or the network area where the project adds more than 10 peak hour trips.

Additional facilities may be studied based on circumstances unique to the site. Applicants should consult with the City early regarding any additional study locations based on local or site-specific issues, especially those related to, pedestrians, bicycles, rail crossings, and transit.

CEQA requires environmental analyses to reflect a “good faith effort at full disclosure” (CEQA Guidelines § 15151). Therefore, VMT analysis should not be truncated at jurisdictional or other boundaries. The City’s VMT thresholds were developed using SACOG’s SACSIM model and estimated for the entire model network. Consequently, CEQA analysis should use the SACSIM model network for consistency of evaluation. There may be projects that require estimating travel beyond the SACSIM model network. Under these circumstances, the applicant should consult with the City to determine an appropriate area for analysis.

TRANSPORTATION ANALYSIS SCENARIOS

The potential transportation analysis scenarios are listed below. Most isolated or small projects consistent with the General Plan will be required only to complete the Present Conditions analysis. Larger projects and projects near other potential development projects may be required to analyze both Present and Near-Term Conditions.

Present Conditions

- **Existing Conditions** represented by transportation conditions for all travel modes in the study area based on recent field observations. Traffic volumes for roadway analysis should be based on recent count data. For CEQA compliance, the transportation impact analysis must include a description of the physical environmental condition near the project, as they exist at the time of



the notice of preparation is published, or if no notice of preparation is published, at the time environmental analysis is commenced, from both a local and regional perspective (CEQA Guidelines Section 15125(a)).

- **Existing Plus Project Conditions** represented by project changes to existing transportation conditions for all travel modes in the study area. Traffic volume forecasts for roadway analysis should reflect existing conditions plus traffic generated by the proposed project. For re-use or conversion projects, this will involve accounting for any existing use of the site that remains or will be discontinued.

Near-Term Conditions

- **Existing Plus Approved Projects Conditions** represented by changes to existing transportation conditions for all travel modes in the study area resulting from approved projects. Traffic volume forecasts for roadway analysis should reflect existing conditions plus growth due to approved development (this scenario may be skipped if the study area has limited or no approved developments).
- **Existing Plus Approved Projects Plus Project Conditions** represented by Existing Plus Approved Projects Conditions plus changes to these conditions caused by the proposed project (this scenario may be skipped if the study area has limited or no approved developments).

Future Conditions

- **Cumulative No Project Conditions** represented by transportation conditions for all travel modes in the study area reflecting all approved projects plus pending projects or expected development of other areas of the City designated for growth. In most cases, the project site will likely be vacant under this scenario. In some cases, though, this scenario may need to account for any existing uses on the site that could continue and potential increases in development allowed by ministerial approvals only.
- **Cumulative Plus Project Conditions** represented by Cumulative Conditions plus changes to these conditions caused by the proposed project. This scenario needs to account for whether the project is changing any existing or planned land uses on the site.

Additional analysis scenarios may be required in the traffic analysis dependent on project conditions and setting. For example, other scenarios may be needed for phasing or other interim conditions at the discretion of the City.

TRANSPORTATION ANALYSIS TIME PERIODS

The determination of analysis time periods will depend on the travel modes being evaluated. For non-auto travel modes, the analysis may include daily, peak period, or peak hour conditions. Final determination shall be made in consultation with City staff. For roadway analysis, General Plan Policy MOB-1-3 identifies average daily conditions for roadway performance and peak hour conditions for intersection performance. At a minimum, average daily traffic volumes will be used to determine compliance with roadway



performance and weekday AM and PM peak hour traffic volumes will be used to determining compliance intersection performance. For recreational and other non-typical peak hour uses, weekday afternoon, weekday late evening, or weekends shall be considered.

Based on the land use of the proposed project and upon consultation with the City, the study shall analyze traffic operations during the peak hour of the following time periods.

- Weekday morning peak (7:00 – 9:00 AM)
- Weekday evening peak (4:00 – 6:00 PM)

For some projects, the City may substitute or require additional peak hour analysis for the following time periods, or others as determined by the Public Works Director.

- Weekday afternoon peak (2:00 – 4:00 PM)
- Friday evening peak (5:00 – 7:00 PM)
- Weekend midday peak (11:00 AM – 1:00 PM)
- Weekend evening peak (4:00 – 7:30 PM)

The determination of study time periods should be made separately for each proposed project based upon the peaking characteristics of project-generated traffic and peaking characteristics of the adjacent street system and land uses. The time period(s) that should be analyzed are those that exhibit the maximum combined level of project-generated traffic and adjacent street traffic. Projects involving special events or that have unusual trip generation characteristics shall also analyze the peak hour for the project (i.e., the peak hour of the trip generator).

CONSULTATION WITH OTHER JURISDICTIONS

If the study area overlaps with other jurisdictions, the other jurisdictions shall be consulted to verify study locations and to specify the impact significance criteria that should be used in the TA for these locations. Section 15086 of the CEQA Guidelines shall be followed as the basis for satisfying consultation requirements. Roadway crossings of rail lines may require coordination with the Public Utilities Commission (PUC). The focus of any analysis related to rail crossings should be on whether the current crossing complies with current railroad design standards.

MAJOR COMPONENTS OF THE STUDY

The extent and complexity of a transportation analysis can vary greatly. Table 1 provides basic transportation and circulation elements that shall be acknowledged in every project requiring a TA. Section 4 identifies relevant General Plan policies. Specific analysis methodologies and significance criteria for each of the listed elements are described in further detail in Sections 5 and 6. Communicating the transportation analysis results. Effective graphics, charts, and simulations are often necessary to successfully communicate analysis results to decision makers and the public.



TABLE 1: TRANSPORTATION AND CIRCULATION ELEMENTS ADDRESSED IN AN IMPACT STUDY

Elements	Evaluation
On-site Circulation	Review and evaluate site access locations, driveway throat depths, size of major circulation features with respect to operations and safety, turning movement volumes at site access points, queuing at site access driveways, dimensions of truck loading areas, and emergency access. Address and accommodate pedestrian and bicycle access. See Appendix D for a sample.
Off-Site Traffic Operations	Study all roadway facilities using methods and procedures contained in the latest version of the <i>Highway Capacity Manual</i> (HCM).
Bicycle Facilities	Identify any existing or planned bicycle facilities that may be affected by the project. Focus on maintaining or enhancing connectivity and completing network gaps.
Pedestrian Facilities and Americans with Disabilities Act (ADA) compliance	Identify any existing or planned pedestrian facilities that may be affected by the project. Focus on maintaining or enhancing connectivity, completing network gaps, and removing barriers. Disclose evaluation and documentation of project features (e.g., road widening) with likely disparate impact on pedestrians (e.g., longer crossing time).
Parking	Compare the project parking plan with City standards.
Trucks (or other heavy vehicles)	For projects related to goods or materials movement, identify the number of truck trips that will be generated, and design facilities necessary to accommodate truck traffic. This will generally require evaluation of the Traffic Index for existing roadways serving the project and an assessment of whether roadways meet current City design standards.
Transit	Identify any existing or planned transit facilities that may be affected by the project. Focus on maintaining or enhancing connectivity and completing network gaps. For system planning, use crush load as capacity, not seated capacity.
Intersection Traffic Control	Evaluate unsignalized intersections located within the study to determine appropriate traffic control with or without the project. Consider stop control, signal control, and roundabout control.
General Plan Consistency	Evaluate the project against goals, policies, and actions set forth in the General Plan.
Other Subject Areas	Consider other subject areas on a case-by-case basis.
Other Jurisdictional Requirements	<p>In situations where several agencies must approve a development or are responsible for affected roadways, the applicant must contact lead and responsible agencies to determine issues to be addressed, scope of study, etc.</p> <p>In general, the applicant will be responsible for analyzing project impacts against appropriate jurisdictional thresholds; however, the analysis methodology will be determined by the City in compliance with CEQA and the impacts will be mitigated consistent with City standards.</p>
VMT	<p>New land use plans or development projects must demonstrate that VMT produced by the proposed project does not exceed established VMT limits for the applicable land use designation. In addition, analysis of the VMT effect of new development projects may also be required at the direction of the Public Works Director.</p> <p>Transportation projects must demonstrate that: (a) the VMT effect of the project does not exceed baseline conditions, and (b) the project is consistent with SACOG's MTP/SCS.</p>



4. RELEVANT POLICIES

An important aspect of a TA is to provide sufficient information for the City to determine that a project is consistent with the General Plan. As such, individual projects shall be reviewed against relevant policies contained in the General Plan. Applicants should review the full policy statement in the General Plan.

TRANSPORTATION NETWORK DIAGRAM

General Plan Policy MOB-1-4 includes performance targets for intersections and roadways. The City strives to implement the intersection and roadway segment performance targets summarized in these policies. The objective of Policy MOB-1-4 is to balance the effectiveness of design requirements to achieve the targets with the character of the surrounding area as well as the cost to complete the improvement and ongoing maintenance obligations. Figure 4 shows the roadway system and sizing diagram, which reflects the implementation of the RPT policy at a macro level; the City will consider the specific design of individual segments and intersections in light of this policy and the guidance in the Transportation Network Diagram.

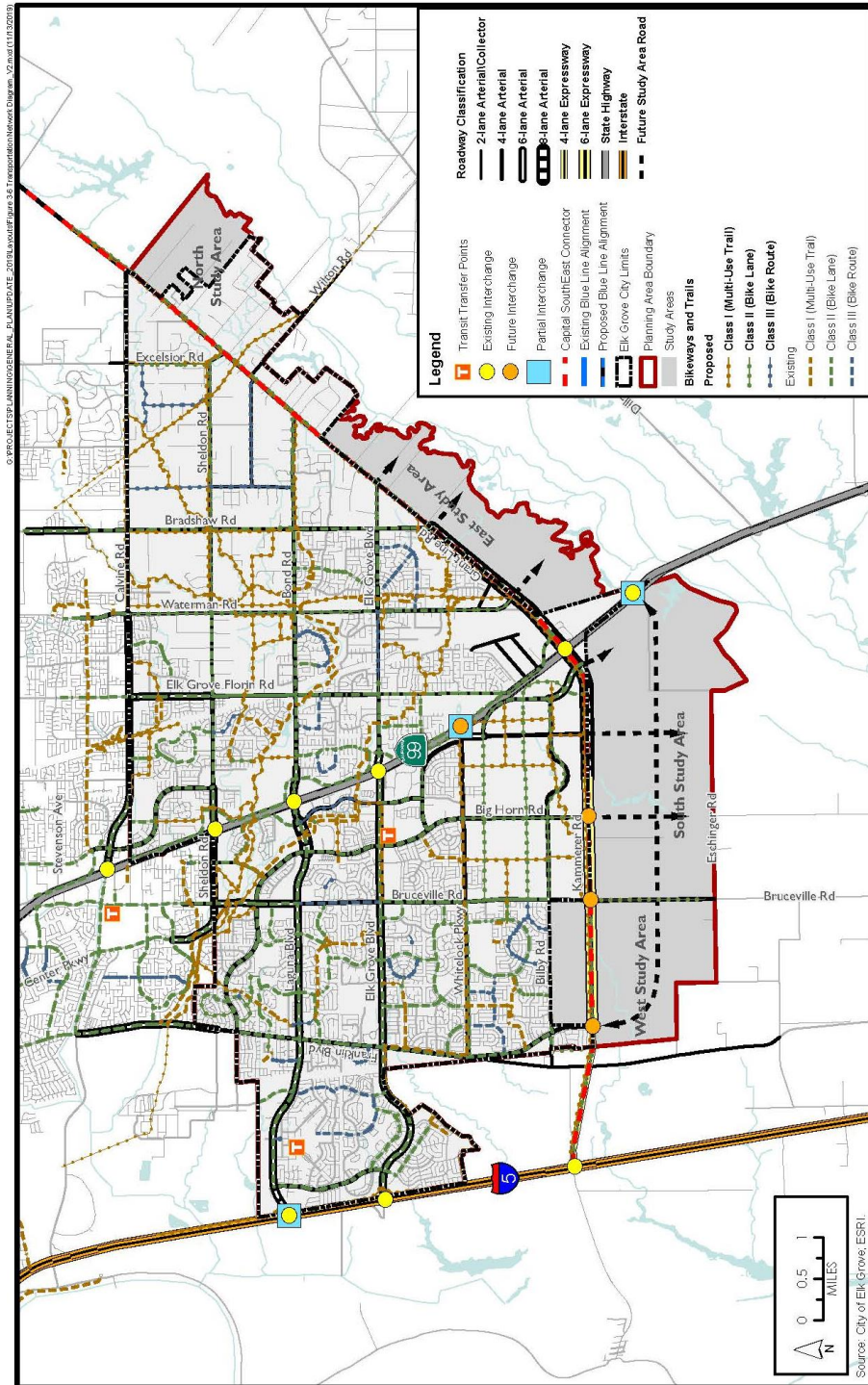
Table 2 provides a correspondence between the City’s General Plan roadway classifications and the FHWA functional classifications

TABLE 2: ROADWAY CLASSIFICATION CORRESPONDENCE

FHWA Functional Classification	City General Plan Roadway Classification
Interstate	Interstate and State Highway
Other Freeway or Expressway	
Other Principal Arterial	Principal Arterial
Minor Arterial	Major Arterial
Major Collector	Minor Arterial/Collector
Minor Collector	
Local	
Local	Local Roads



Figure 4: Transportation Network Diagram



5. ANALYSIS METHODOLOGY

This section provides data collection and analysis procedures for conducting transportation impact studies in Elk Grove. The City is committed to equal levels of analysis for all modes of travel. The methodology presented in this section includes robust data collection and analysis techniques for pedestrian, bicycle and transit networks, in addition to vehicle circulation.

The General Plan includes policy guidance regarding roadway efficiency; however, the efficiency of the roadway network is not measured through LOS. Rather, the policy is structured to evaluate a range of metrics including vehicular capacity, intersection delay, pedestrian and bicycle safety and stress levels, and the character and context of the surrounding environment.

TRANSPORTATION DATA COLLECTION

Accurate data is essential to achieve a high level of confidence in transportation analysis results. Existing traffic conditions data shall be collected using the guidelines set forth in Table 3.

TABLE 3: EXISTING CONDITIONS DATA COLLECTION PROTOCOL

Data Set	Procedure
Peak period turning movement counts	Collect data for all study intersections on a Tuesday, Wednesday, or Thursday during weeks without holidays, large special events, or heavy construction in the study area that results in temporary travel pattern shifts. Fall or Spring days without rain and when school is in session are preferred. <ul style="list-style-type: none"> • Care should be taken to collect data on days when schools are in session. • Consult with the City to determine if adjustments are necessary to account for seasonal variation in traffic volumes. • Traffic counts shall not be used if more than three years old at study initiation. If available, City counts may be used but the traffic counts must be adjusted to reflect current year traffic volumes and patterns. • Bicycles and pedestrians should be included in all counts. • Some projects may require vehicle classification or occupancy counts. Consult with the City on a case-by-case basis.
Daily traffic counts	Collect data for all study roadway segments using the parameters described above for peak period turning movement counts except for collecting bicycle and pedestrian data.
Roadway geometrics	Establish existing geometrics from a combination of aerial photography, as-built plans, and site visits.
Travel time and speed	Only as necessary. Collect data using a floating car survey.
Signal timing	Request timing from the City and other operating agencies such as Caltrans. Verify timing in the field.



Data Set	Procedure
Collision data	<p>For City facilities, collision shall be obtained from the Elk Grove Police Department. Obtain Statewide Integrated Traffic Records System (SWITRS) through the local California Highway Patrol or Traffic Accident Surveillance and Analysis System (TASAS) database through Caltrans District 3 for collision records in other jurisdictions or on the State Highway System.</p> <p>For City facilities, the calculated crash frequency shall be compared to the predicted crash frequency for similar facilities from the Highway Safety Manual (HSM). If the calculated crash frequency is greater than the predicted crash frequency, consult the Local Roadway Safety Manual (LRSM) or the Crash Modification Factor Clearinghouse to identify countermeasures to reduce crash frequency.</p>
Mode split	Summarize daily and peak hour mode split from study area or communities adjacent to study area. Data sources could include the Census journey-to-work survey, the SACOG household travel survey, or other available surveys.
Transit routes and use	Map existing transit routes and stops serving the study area and identify service hours and levels of use. Document amenities (benches, shelters, bicycle parking, etc.) available at transit stops and centers within ¼-mile of non-residential projects and a ½-mile of residential projects.
Bicycle and pedestrian facilities	Map existing bicycle and pedestrian facilities within the study area (include sidewalks, crosswalks, signal heads, push buttons, related signing and striping). Document barriers, deficiencies and high-pedestrian demand land uses including schools, parking, senior housing facilities, and transit stops or centers.

MULTIMODAL ANALYSIS

Evaluate the project's potential adverse effects on transportation facilities and services related to transit, rail crossings, bicycles, and pedestrians. The evaluation could include identification of any disruption to existing facilities and services or interference with the implementation of planned facilities and services. This effort will require identifying and mapping existing facilities. Particular attention should be made to roadway or intersection widening mitigation that would increase pedestrian/bicycle crossing times or increase the potential for vehicle and pedestrian/bicycle conflicts. Consideration should also be given to how a project affects accessibility between each travel mode and the surrounding land uses.

Pedestrian Level of Traffic Stress

The Pedestrian Level of Traffic Stress (LTS) refers to the pedestrian comfort associated with a roadway or intersection. The Pedestrian LTS methodology builds on Mekuria, Furth, and Nixon's 2012 Low Stress Bicycling and Network Connectivity report and LTS methodology with a corresponding index for pedestrian comfort. Pedestrian LTS includes recommended parameters for the pedestrian environment provided by the NACTO Urban Streets Design Guide (USDG) and additional considerations of comfort informed by practitioner and best practice experience. Roadway segments and intersection approaches receive



individual scores based on different considerations. The following factors are considered in developing the Pedestrian Streetscore LTS for roadways and intersections:

<u>Roadways</u>	<u>Intersections</u>
Usable sidewalk space	Crossing distance
Driveways	Accessibility
Pedestrian-scale lighting	Channelized right-turns
Street trees and landscaping	Leading pedestrian intervals (LPIs) and pedestrian scrambles
Speed	
Sidewalk quality	
Number of travel lanes	
Heavy vehicle volumes	
Crosswalk frequency	

The Pedestrian Streetscore LTS uses a scale that ranges from 1 to 4, with 1 being the least stressful and 4 being the most stressful. Table 4 summarizes Pedestrian Streetscore LTS.

TABLE 4: PEDESTRIAN STREETSCORE LTS

Streetscore LTS	Description
1	Highly comfortable, pedestrian-friendly, and easily navigable for pedestrians of all ages and abilities, including seniors or school-aged children walking unaccompanied to school. These streets provide an ideal “pedestrian-friendly” environment.
2	Generally comfortable for many pedestrians, but parents may not feel comfortable with children walking alone. Seniors may have concerns about the walking environment and take more caution. These streets may be part of a “pedestrian-friendly” environment where it intersects with a more auto-oriented roadway or other environmental constraints.
3	Walking is uncomfortable but possible. Minimum sidewalk and crossing facilities may be present, but barriers are present that make the walking experience uninviting and uncomfortable.
4	Walking is a barrier and is very uncomfortable or even impossible. Streets have limited or no accommodation for pedestrians and are inhospitable and possibly unsafe environment for pedestrians.

Bicycle Level of Traffic Stress

Bicycle LTS refers to the comfort associated with roadways, or the mental ease people experience riding on them. Metrics for bicycling LTS were developed at the Mineta Transportation Institute (MTI) and published in the report “Low-Stress Bicycling and Network Connectivity.”⁴ The criteria establish a “weakest link” approach, as roadways are classified based on their segments with the highest level of traffic stress,

⁴ Mekuria, Maaza C., Peter G. Furth, and Hilary Nixon, (2012). *Low-Stress Bicycling and Network Connectivity*. San Jose, California: Mineta Transportation Institute.



assuming that only those that are comfortable riding under the higher stress would travel on that road. Factors influencing LTS include:

- Number of travel lanes
- Speed of traffic
- Number of vehicles
- Presence of bike lanes
- Width of bike lanes
- Presence of physical barrier

Bicycle riders vary in experience, skill, ability, and confidence. As such, they rely on the bikeway system to cater to their specific needs and abilities. Advanced cyclists are more comfortable riding in traffic and value bikeways and routes that are direct and limit unnecessary delay. People with limited bicycling confidence and lower or developing skill levels such as children and older adult riders may desire more separation from traffic to feel comfortable enough to ride. Different bicycle types also require more space in bicycle facilities, such as trailers for children or cargo or adult tricycles. For these reasons, facilities should be designed to accommodate the lowest skill levels, especially in heavily traveled areas.

Recent research has correlated these different bicycle riders with the level of “traffic stress” they are willing to experience while cycling. Bicycle LTS criteria span from 1 to 4, with 1 being the least stressful and 4 being the most stressful. Table 5 summarizes Pedestrian Streetscore LTS.

TABLE 5: BICYCLE STREETSCORE LTS

Streetscore LTS	Description
1	Most children and elderly riders can tolerate this level of stress and feel safe and comfortable. LTS 1 roadways typically require more separation from traffic.
2	This is the highest level of stress that the mainstream adult population will tolerate while still feeling safe.
3	Bicyclists who are considered “enthused and confident” but still prefer having their own dedicated space for riding will tolerate this level of stress and feel safe while bicycling.
4	For bicyclists, this is tolerated only by those characterized as “strong and fearless,” which comprises a small percentage of the population. These roadways have high speed limits, multiple travel lanes, limited or non-existent bike lanes and signage, and large distances to cross at intersections.



TRAFFIC OPERATIONS ANALYSIS

Traffic impacts shall be analyzed using standard or state-of-the-practice professional procedures for trip generation, trip distribution, and traffic assignment, which can generally be found through organizations such as Institute of Transportation Engineers (ITE), Caltrans, Federal Highway Administration (FHWA), and American Planning Association (APA).

Intersection performance analysis calculation methods must be consistent with the latest edition of the Highway Capacity Manual (HCM). The HCM is published by the Transportation Research Board. The current version (as of the date of this document) was published in 2016.

Analysis Parameters

Analysis parameters (e.g., signal phasing, conflicting pedestrian volumes, etc.) for Existing and Existing Plus Project conditions shall be based on field measurements taken during traffic count collection or field observation. This typically applies to Existing Plus Approved Projects and Existing Plus Approved Projects Plus Project analysis.

For new study intersections and under Cumulative conditions, Table 5 provides guidance on state-of-the-practice procedures. Consult with the City regarding other analysis parameters not listed in Table 6.

TABLE 6: ANALYSIS PARAMETER RECOMMENDATIONS

Parameter	Recommendation
Peak hour factor (PHF)	Use measured approach PHF obtained through traffic data collection. For cumulative scenarios and existing conditions where peak hour factors are not available, refer to the HCM and maintain consistency through analysis scenarios and peak hours.
Saturation flow rate	A field measurement of the saturation flow rate is recommended in accordance with procedure in the HCM, Chapter 31, Section 5. For cumulative conditions, use the value recommended in the most recent HCM unless physical conditions and traffic controls warrant a change. The HCM recommends 1,900 vehicles per hour per lane.
Yellow Change Interval	Base on posted speed limit using California MUTCD reference table in Part 4 of Chapter 4D.
Red Clearance Interval	1 second per phase (if traffic signal is present under existing conditions, use existing red phase). Red phase may be greater on high-speed roadways.



Parameter	Recommendation
<p>Conflicting pedestrians for signalized intersections and roundabouts</p>	<p>Primarily based on existing pedestrian counts or observations. Otherwise, refer to the most current version of the HCM to determine the amount of pedestrian activations per cycle into appropriate categories. The following three categories are included in the 2010 HCM.</p> <ul style="list-style-type: none"> • Low pedestrian activity (near freeway interchanges/community commercial sites) – 10% of the cycles are expected to have pedestrian activations • Medium pedestrian activity (near community commercial sites) – 25% of the cycles are expected to have pedestrian activations • High pedestrian activity (in and around downtown) – 50% of the cycles are expected to have pedestrian activations <p>To determine conflicting pedestrians, assume one pedestrian per activation.</p> <p>Pedestrian activity must also be considered at roundabout intersections.</p>
<p>Traffic signal cycle lengths</p>	<p>Replicate existing coordination plans, cycle length, and phasing (e.g., leading left turns) when possible. For new signalized locations, segment the cycle lengths into the following three categories unless other cycle lengths can be justified through the traffic operations analysis.</p> <ul style="list-style-type: none"> • In and around downtown – try to limit signal cycle lengths to less than 60 seconds • In and around suburban areas – try to limit signal cycle lengths to less than 90 seconds • Near freeway interchanges/regional commercial – try to limit signal cycle lengths to less than 120 seconds <p>Ensure that minimum pedestrian times are satisfied.</p>
<p>Heavy truck percentages</p>	<p>Based on the existing heavy-truck percentage and adjusted to account for future planned development. In general, heavy-truck percentages should be greater on truck routes and main thoroughfares than on local streets. Minimum recommended value is 2%.</p>
<p>Lane utilization factor</p>	<p>If applicable, adjust lane utilization factors based on field observations.</p>



Analysis Tools and Methods

Traffic operations analysis for state highways and local roadways shall be conducted using tools and methods approved by the City. Table 7 identifies recommended analysis tools. Other tools or methods may be used upon receiving approval from the Public Works Director. Special conditions related to congested conditions, state highway facilities, and roundabouts are discussed in more detail below.

TABLE 7: INTERSECTION OPERATIONS ANALYSIS RECOMMENDED ANALYSIS TOOL

Software/ Method	Traffic Studies ¹		Roundabouts		Arterial/ Interchange Operations	Simulation Analysis ⁴		
	Operations ²	Signal Coordination ³	Planning	Design		Unique Geometrics	Heavily Congested Conditions	Multi- Modal
FHWA Roundabout Guidelines			X					
Synchro/ SimTraffic	X	X	X		X	X		
HCS	X				X			
AASIDRA ⁵			X	X				
Micro- Simulation ⁶		X		X	X	X	X	X

Notes: The most current version of analysis software (with updated software patches) should be used.

1. Refer to thresholds for identifying if a traffic study is required.
2. Appropriate for isolated intersection operations or for signal systems that are not coordinated.
3. Mandatory for coordinated signal systems to maximize vehicle progression.
4. Should be applied to analyzing operations of congested conditions or non-standard conditions where traditional analytical approaches may not be appropriate.
5. AASIDRA is to be used only for roundabout analysis.
6. Specific software program selection should be conducted in consultation with the City and consider the types of technical questions being asked in the study and the modes to be included.



Congested Conditions

Analysts should note that the HCM recommends the use of simulation models to analyze congested conditions. Since simulation tools can simultaneously evaluate vehicle interactions across a complete network (including the interaction of multiple modes), they can provide a more complete understanding of traffic operating conditions during peak congested periods and what may happen when a specific bottleneck is modified or eliminated.

State Highway Analysis

In Elk Grove, the analysis of the State highway system will typically include basic freeway segments, ramp junctions, weaving sections, and ramp terminal intersections. HCM methods shall be used for basic freeway segments, ramp junctions, and ramp terminal intersections, but Caltrans has alternative analysis methods for weaving sections as defined in the Caltrans *Highway Design Manual* (HDM Section 504.7). The Caltrans District 3 traffic operations branch shall be consulted before beginning analysis affecting a state facility. Analyzing ramp terminal intersections should consider that these intersections are closely spaced in most cases and operate as an integrated system versus as isolated locations.

Intersection and Roadway Performance Targets

General Plan Policy MOB-1-4 includes performance targets for intersections and roadways. The City strives to implement the intersection and roadway segment performance targets (RPT) summarized in Table 8 and 9, respectively. The objective of Policy MOB-1-4 is to balance the effectiveness of design requirements to achieve the targets with the character of the surrounding area as well as the cost to complete the improvement and ongoing maintenance obligations. The Transportation Network Diagram (Figure 4) reflects the implementation of the RPT policy at a macro level; the City will consider the specific design of individual segments and intersections in light of this policy and the guidance in the Transportation Network Diagram.

Deviations from these metrics may be approved by the approving authority (e.g., Zoning Administrator, Planning Commission, City Council). These targets represent aspirational goals but shall not be mandated performance standards.

TABLE 8: INTERSECTION PERFORMANCE TARGETS

Intersection Control	(Delay in Seconds)
Stop (Side-Street & All-Way)	< 35.1
Signal	< 55.1
Roundabout	< 35.1



TABLE 9: ROADWAY SEGMENT PERFORMANCE TARGETS

Facility Type	Number of Lanes	Median	Speed (mph)	Average Daily Traffic Design Target (Number of Vehicles)
Arterial or Arterial\Collector	2	No	25	13,600
			30	14,600
			35	15,700
			40	16,600
			45	17,700
			55	18,600
	2	Yes	25	14,300
			30	15,600
			35	16,500
			40	17,500
			45	18,600
			55	19,600
	4	No	30	29,800
			35	31,600
			40	33,500
			45	35,300
	4	Yes	30	31,400
			35	33,300
40			35,300	
45			37,200	
5	Yes	45	45,600	
6	Yes	30	46,400	
		35	48,900	
		40	51,500	
		45	54,000	
7	Yes	45	59,400	
8	Yes	45	64,800	
		55	72,000	
Expressway	4*	Yes	55	64,800
	6	Yes	55	97,200
Freeway	4	Yes	55+	74,400
	6	Yes	55+	111,600
	8	Yes	55+	148,800

For the SouthEast Connector Expressway, the City may implement alternative design targets in consultation with the JPA.



ON-SITE TRANSPORTATION REVIEW

A detailed site review is required for every project. Consideration should be given to the following qualitative and quantitative reviews and summarized in the TA.

- Existence of any current traffic problems in the local area such as a high-accident location, non-standard intersection or roadway, or an intersection in need of a traffic signal.
- Applicability of context-sensitive design practices compatible with adjacent neighborhoods or other areas that may be impacted by the project traffic.
- Proximity of proposed site driveway(s) to other existing driveways or intersections.
- Adequacy of vehicle parking relative to both the anticipated project demand and zoning code requirements.
- Adequacy of the project site design to fully satisfy truck loading demand on-site, when the anticipated number of deliveries and service calls may exceed 10 per day.
- Adequacy of the project site design to provide at least the minimum required throat depth at project driveways.
- Adequacy of the project site design to convey all vehicle types
- Adequacy of on-site vehicle, bicycle, and pedestrian circulation and provision of safe pedestrian paths from residential areas to school sites, public streets to commercial and residential areas, and the project site to nearby transit facilities.
- Project site design resulting in inadequate emergency access or response times.



TRAFFIC FORECASTS AND VMT ANALYSIS

A fundamental requirement for establishing transportation analysis is to follow state-of-the-practice or best practice methodology. This ensures that the analysis meets environmental regulatory conditions and provides a high level of confidence in the results. For traffic volume forecasts, this means that the forecasting models being used should meet the following five criteria.

- **The scale of the model should match that of the project.** Most studies will cover local projects, meaning that they involve specific intersections, roadways, interchanges, or corridors. Therefore, locally valid travel demand models should be used to develop traffic volume forecasts. Using regional travel demand models without modification to address the scale of the project is not appropriate.
- **The model should be calibrated and validated within the study area.** The model's validation in the study area should be verified for each time period being forecast (i.e., daily, AM peak hour, PM peak hour, etc.) and for each mode being analyzed.
- **The model validation should include static and dynamic tests.** Static validation tests should include those specified in *2017 Regional Transportation Plan Guidelines for Metropolitan Planning Organizations* (California Transportation Commission, 2017). Dynamic tests verify that the model contains an appropriate level of sensitivity related to the types of transportation network or land use changes associated with the project. Appendix C contains sample tests.
- **The model forecasts should be adjusted to account for base year model error.** Raw model volume forecasts need to be adjusted to account for differences between base year model volume estimates and base year traffic counts. The specific methodology should be based on *National Cooperative Highway Research Project 255, Highway Traffic Data for Urbanized Area Project Planning and Design*, Transportation Research Board, December 1982.

The City's VMT thresholds were developed using SACOG's SACSIM model and estimated for the entire model network. Consequently, CEQA analysis should use the SACSIM model network for consistency of evaluation.

VMT Methods

Prior to SB 743, CEQA required VMT analysis as part of air pollution and greenhouse gas (GHG) analysis. SB 743 and the modifications to the CEQA guidelines introduced another VMT analysis for transportation. The analyses require different VMT inputs, which are described below. The following three methods shall be used for calculating VMT for project analysis, unless an alternative method is approved by the Public Works Director:

- The Boundary Method
- The Origin-Destination Method (Regional Targets Advisory Committee, or "RTAC")
- The Origin-Destination Method (Tour-Based)



Table 10 compares the three common methods used to estimate VMT for project analysis, including the analysis application, the types of trips included in the calculation, whether the method accounts for the full length of trips, and source of the VMT. The tour-based methodology used to calculate VMT for the City of Elk Grove General Plan Update is outlined in Appendix E.

TABLE 10: VMT METHODS

Method	Analysis Application	Approach	Formula	Trip Types Included ¹	Full Accounting?		Source
					Trip Length	Trips	
Boundary	Air Quality	Estimates/forecasts VMT for a specific boundary area like the City of Elk Grove	Volume x Distance for all model links in the boundary	II IX XI XX	Does not account for entire trip length	Excludes trips without an origin or destination at the home	Assigned model roadway network
OD ³	RTAC	Estimates/forecasts VMT based on all trips that have one end in a project location	Trips x Trip Length	II 50% IX 50% XI	Fully accounts for entire trip length	Excludes trips without an origin or destination at the home	Model origin-destination trip matrix
	Tour-Based	Transportation	Estimates/forecasts VMT based on all trips that have one end in a project location	Trips x Trip Length	II IX XI	Fully accounts for entire trip length	Includes trips without an origin or destination at the home

Notes:

¹RTAC – Regional Targets Advisory Committee

²Description of Trip Types

³“OD” means Origin-Destination

II – Internal to Internal Trips

IX – Internal to External Trips

XI – External to Internal Trips

XX – External to External (Through) Trips

VMT Analysis – Land Use Projects

The project’s total daily VMT should be evaluated against the underlying General Plan Land Use Designation limit of VMT per service population and Citywide (or Study Area) limit of total daily VMT (see Table 11). VMT analysis methods should be consistent with those identified in Table 10 for transportation applications.

VMT analysis must be submitted to and approved by the Public Works Director. If the Public Works Director determines the project’s daily VMT is at or below the established limits, no further analysis or VMT reduction measures are required.



TABLE 11: VMT METRICS

Data Set	Data Set	Purpose
Total Daily VMT	Sum of all daily vehicle miles traveled produced by all uses within the City or applicable Study Area.	Assessing a project against Citywide or Study Area total limits.
VMT per Service Population	Sum of all vehicle miles traveled produced by uses in the applicable land use designation, divided by the sum of total employees working within the assessed area and dwelling units in the assessed area.	Assessing a project against land use designation limits.

Reduction Strategies (Mitigation)

If the Public Works Director determines the project’s daily VMT for the underlying land use designation is above the established limits, the VMT study shall be augmented to identify VMT reduction strategies, drawn from the accepted categories shown in Table 12, and associated VMT reductions to achieve daily values below the established limit. Infill projects may use any category of reduction strategies. Projects within the growth areas must incorporate the highest available reductions through Category A and/or Category B reduction strategies first (as determined by the City) before utilizing strategies in other categories.

TABLE 12: VMT REDUCTION STRATEGIES

Data Set		Description
A	Land Use/ Location	Land use-related components such as project density, location, and efficiency related to other housing and jobs; and diversity of uses within the project. Also includes access and proximity to destinations, transit stations, and active transportation infrastructure.
B	Site Enhancement	Establishing or connecting to a pedestrian/bike network; traffic calming within and in proximity to the project; car sharing programs; shuttle programs.
C	Transit System Improvement ¹	Improvements to the transit system including reach expansion, service frequency, types of transit, access to stations, station safety and quality, parking (park-and-ride) and bike access (to transit itself and parking), last-mile connections.
D	Commute Trip Reduction ¹	<u>For residential:</u> transit fare subsidies, education/training of alternatives, rideshare programs, shuttle programs, bike share programs <u>For employer sites:</u> transit fare subsidies, parking cash-outs, paid parking, alternative work schedules/telecommute, education/training of alternatives, rideshare programs, shuttle programs, bike share programs, end of trip facilities
E	In-Lieu Fee	A fee is levied that is used to provide non-vehicular transportation services that connect project residents to areas of employment or vice versa. This service may be provided by the project applicant in cooperation with major employers.



Notes:¹ Can be achieved through TDM program measures.

VMT Analysis – Transportation Project

Short-term analysis is required for all projects determined not to be exempt. To conduct short-term analysis, projects should use the City of Elk Grove base year travel forecasting model to estimate the CEQA baseline no project VMT/Service Population, as follows:

1. Add the transportation project to the base year travel forecasting model to estimate the CEQA baseline plus project VMT/Service Population.
2. Provide the City with a comparison of project VMT estimates to the VMT policy limits to determine if the addition of the transportation project would result in a short-term transportation impact.

Long-term VMT analysis is only required if the project is not consistent with the current Sacramento Metropolitan Transportation Plan/Sustainable Communities Strategy (MTP/SCS). The City shall review and determine if the project is specifically referenced or listed in the MTP/SCS and accurately represented in the regional travel forecasting model. If the project is not listed, the City shall conduct long-term VMT analysis using one of two methods.

1. Use the current MTP/SCS travel forecasting model to estimate the cumulative no project VMT/Service Population. Add the transportation project to the base year travel forecasting model to estimate the cumulative plus project VMT/Service Population. Compare VMT estimates to the VMT policy limits to determine if the addition of the transportation project would result in a long-term transportation impact.
2. Calculate VMT/Service population using the ratio of City-generated VMT (using an origin-destination method) and Citywide service population. If the project would result in a net increase of VMT/Service Population, the project may have a long-term transportation impact.

Reduction Strategies (Mitigation)

If the City determines that the project exceeds short-term or long-term VMT limits, the transportation project shall be determined to have transportation impacts. Additional mitigation measures may be required of the project. Possible mitigation measures may include the following:

- Addition of Class 1, Class 2, or Class 4 bicycle lanes
- Addition of sidewalks or other pedestrian improvements
- Incorporation of transit-related improvements



6. IMPACT ASSESSMENT

The main intent of the TA is to determine potential transportation impacts of proposed projects. This information is essential for decision makers and the public when evaluating individual projects. This section explains what operating conditions shall be used when determining an impact. These guidelines also establish criteria for when a project impact is considered significant.

SCENARIO EVALUATION

Transportation impact determination for a proposed development project shall be based upon the comparison of the following scenarios using the significance criteria cited below.

- Existing Conditions vs. Existing Plus Project Conditions
- Existing Plus Approved Projects Conditions vs. Existing Plus Approved Projects Plus Project Conditions (if necessary)
- Cumulative No Project Conditions vs. Cumulative Plus Project Conditions

SIGNIFICANCE CRITERIA

A project impact is considered significant when it meets the criteria listed in Table 13.



TABLE 13: SIGNIFICANCE CRITERIA

Elements	Significant Impact Determination
On-Site Circulation	<ul style="list-style-type: none"> Project designs for on-site circulation, access, and parking areas fail to meet City or industry standard design guidelines. A project fails to provide adequate accessibility for service and delivery trucks on-site, including access to truck loading areas.
Bicycle Facilities	<ul style="list-style-type: none"> A project disrupts existing or planned bicycle facilities or conflicts with adopted City non-auto plans, guidelines, policies, or standards. The project adds trips to an existing transportation facility or service (e.g., bike path) that does not meet current design standards. The project degrades the Bicycle Streetscore LTS.
Pedestrian Facilities and Americans with Disabilities Act (ADA) compliance	<ul style="list-style-type: none"> A project fails to provide accessible and safe pedestrian connections between buildings and to adjacent streets and transit facilities. A project disrupts existing or planned pedestrian facilities or conflicts with adopted City non-auto plans, guidelines, policies, or standards. The project adds trips to an existing transportation facility or service (e.g., sidewalk) that does not meet current design standards. The project degrades the Pedestrian Streetscore LTS.
Parking	<ul style="list-style-type: none"> A project increases off-site parking demand above that which is desired according to the City in the immediate project area.
Trucks (or other heavy vehicles)	<ul style="list-style-type: none"> A project fails to provide safe accommodation of forecast truck traffic or temporary construction-related truck traffic. The project adds 100 daily passenger vehicle trips (or equivalent – see Appendix D – FHWA Vehicle Classification Definitions) to an existing roadway that does not meet current City design standards (e.g., structural section, horizontal and vertical curves, lane and shoulder width, or similar).
Transit	<ul style="list-style-type: none"> A project creates demand for public transit services above the crush load capacity that is provided or planned. A project disrupts existing or planned transit facilities and services or conflicts with adopted City non-auto plans, guidelines, policies, or standards.
VMT	<ul style="list-style-type: none"> Project exceeds VMT per service population limits outlined in Policy MOB-1.
General Plan Consistency	<ul style="list-style-type: none"> A project conflicts or creates inconsistencies with General Plan policies.
Other Subject Areas	<ul style="list-style-type: none"> The construction of a project creates a temporary but prolonged impact due to lane closures, need for temporary signals, emergency vehicles access, traffic hazards to bikes/pedestrians, damage to roadbed, truck traffic on roadways not designated as truck routes, etc.
Other Jurisdictional Requirements	<ul style="list-style-type: none"> The project exceeds established significance criteria thresholds for locations under the jurisdiction of other agencies.



CUMULATIVE IMPACTS

Cumulative impact analysis must comply with the California Environmental Quality Act (CEQA). Land use development and infrastructure projects that are consistent with the General Plan, are expected to rely on the General Plan cumulative traffic analysis and EIR conclusions.

- The cumulative scenario is required per CEQA Guidelines Section 15130.
- The general definition of cumulative as a scenario is that it represents past, present, and reasonably foreseeable actions regarding land use development and the transportation network (see CEQA Guidelines Section 15355).

The General Plan environmental impact report (EIR) was based on a full build out of the City's land use designations and will generally cover the cumulative traffic effects of consistent development projects. However, over time, it is likely that general plan amendments or regional growth will influence background traffic volumes. If this occurs, individual projects may be required to conduct a project-specific cumulative analysis based on the determination of the Public Works Director.



7. RECOMMENDED PROCESS AND DOCUMENTATION

The project applicant shall retain a professional traffic engineer to conduct the transportation analysis. It is recommended that the applicant's consultant conduct the work in the following phased manner and seek City acceptance before initiating the next task. In some cases, review by other affected jurisdictions will be required.

Based on the criteria outlined in Section 2 (Triggers Requiring an Impact Study), determine the level of analysis needed. The analysis may require a General Plan consistency analysis, using roadway and intersection performance, and CEQA analysis, using VMT. All projects are required to complete a site access and on-site circulation review.

- **Transportation Study Scope of Work** detailing project description, site location, analysis method, area-wide assumptions, study intersections and/or roadways, peak hours for analysis, and traffic data collection.
- **Project Trip Generation and Trip Distribution** documenting all key technical assumptions, data sources, and references.
- **Administrative Draft Transportation Study Report** prepared according to the Scope of Work, Project Trip Generation, and Trip Distribution approved by the City.
 - The format of this report may need to be discussed with the environmental consultant to determine if an independent transportation study report is required or if the consultant should prepare a transportation and circulation section for incorporation into a specified environmental document.
- **Draft Transportation Study Report** addressing the City's comments on the Administrative Draft Report.
- **Final Transportation Study Report / Response to Public Comments** addressing comments from the City, Caltrans, neighboring cities, or other responsible agencies.
 - The format of this report may need to be discussed with the environmental consultant. It may be a final report incorporating the comments or written responses to public comment.

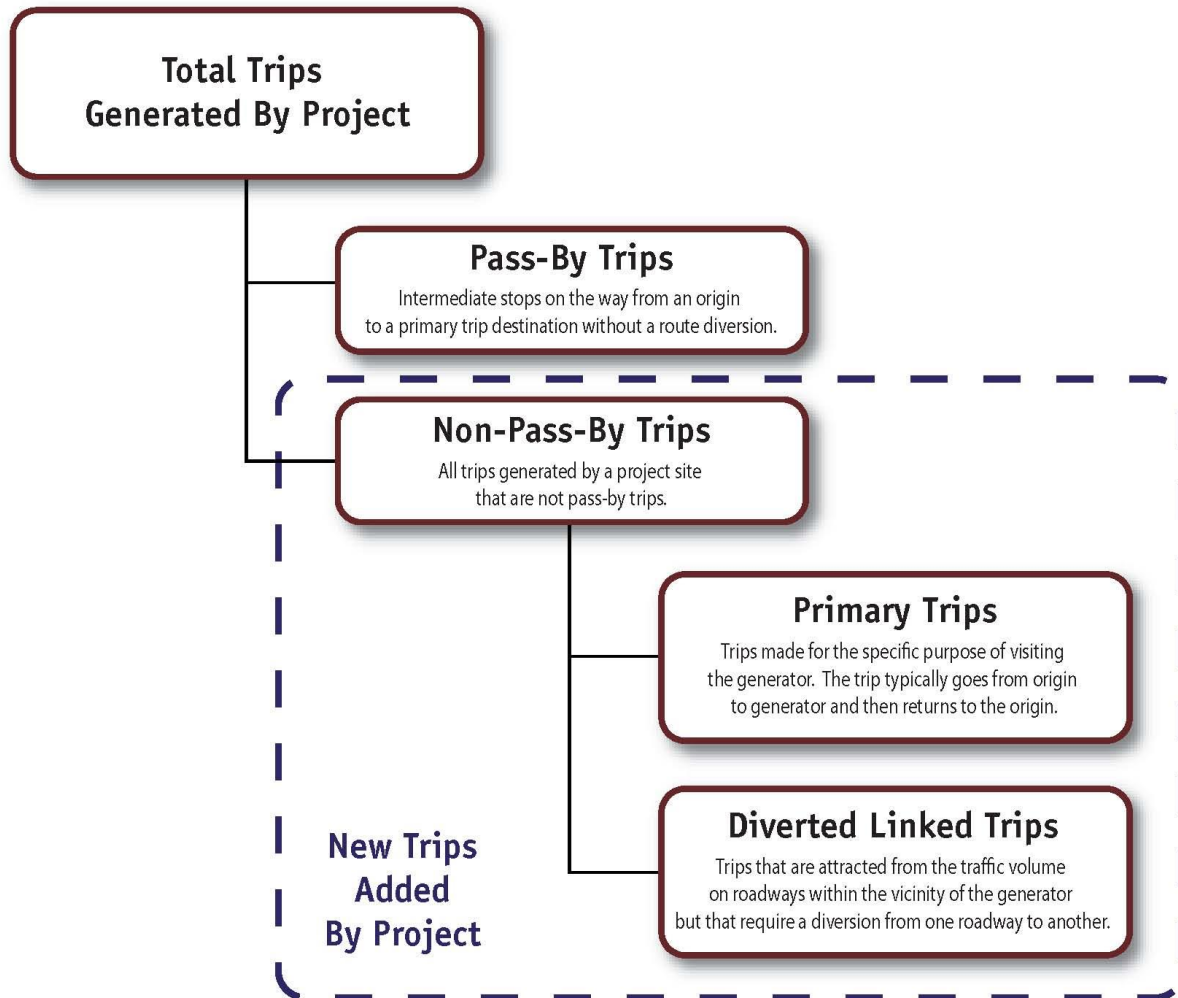
Appendix B contains a recommended outline for the TIS document.



Appendix A: Trip Generation Sample Calculations



The following figure describes trip types relevant to trip generation and the difference between the total trips generated by the project versus new trips added by the project.



The estimation of new trips generated by the proposed development project may include credit for trips associated with existing uses on the site. Existing uses are those actively present on the project site at the time data is gathered for the traffic impact study.

The final estimate of new daily and peak-hour trips associated with a proposed development project should represent the net contribution of the proposed project. The City will review the trip generation analysis and determine if additional analysis is required.

Trip generation analysis should be primarily based on trip generation rates derived from local empirical data. Recognizing that this is not always possible, applicants may use the most recent version of the Institute of Transportation Engineers (ITE) *Trip Generation Manual*⁵ and recommendations provided in the *Trip Generation Handbook*.⁶ If multiple trip generation rate sources exist, the study shall provide a comparison and use the rates that best reflect local conditions and applicable regulatory constraints.

The project trip generation rate cannot be based solely on one nearby or similar land use facility. The sample used for non-standard trip generation rates shall include at least three similar facilities in Elk Grove or neighboring jurisdictions with similar characteristics.

If the study involves comparable sites located in other communities, the applicant must demonstrate to the satisfaction of the City that the sites and uses to be studied are reasonably equivalent to the site and use proposed within the City.

The final trip generation rates used for the project should be a weighted average of the various trip generation rates available. A tabular summary of the final trip generation rate calculation shall be provided. Appendix A provides sample trip generation calculations.

1. *Trip Generation Manual*, 10th Edition, Institute of Transportation Engineers, Washington, D.C., 2017
2. *Trip Generation Handbook*, 3rd Edition, An ITE Recommended Practice, Institute of Transportation Engineers, Washington, D.C., June 2014



Table A-1 shows how trip generation information and assumptions should be prepared and documented for submittal to Elk Grove.

TABLE A-1: SAMPLE ESTIMATED PROJECT TRIP GENERATION

Land Use	Size	Unit	Daily		Trip Rates						Trips						
			Rate	Trips	AM Peak Hour			PM Peak Hour			AM Peak Hour			PM Peak Hour			
					In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Residential																	
Single-Family ¹	400	du	9.31	3,724	0.18	0.54	0.72	0.59	0.34	0.93	72	216	288	236	136	372	
Apartments ²	100	du	7.51	751	0.11	0.42	0.53	0.47	0.26	0.73	11	42	53	47	26	73	
Commercial																	
Commercial ³	100	ksf	67.91	6,791	0.96	0.61	1.57	3.00	3.26	6.26	96	61	157	300	326	626	

Note: du = dwelling units; ksf = 1,000 square-feet

1. Trip generation based on Institute of Transportation Engineers (ITE), *Trip Generation*, (7th Edition) regression equations for Single-Family Detached Housing (Land Use Code 210):
 Daily: $\ln(T) = 0.92 \ln(X)$ (50% Inbound, 50% Outbound)
 AM Peak Hour: $T = 0.70(X) + 9.43$ (25% Inbound, 75% Outbound)
 PM Peak Hour: $\ln(T) = 0.90 \ln(X) + .53$ (63% Inbound, 37% Outbound)
 Where: T = trips generated, X = dwelling units, Ln = natural log
2. Trip generation based on Institute of Transportation Engineers (ITE), *Trip Generation*, (7th Edition) regression equations for Apartment (Land Use Code 220):
 Daily: $T = 6.01(X) + 150.35$ (50% Inbound, 50% Outbound)
 AM Peak Hour: $T = 0.49(X) + 3.73$ (20% Inbound, 80% Outbound)
 PM Peak Hour: $T = 0.55(X) + 17.65$ (65% Inbound, 35% Outbound)
 Where: T = trips generated, X = dwelling units, Ln = natural log
3. Trip generation based on Institute of Transportation Engineers (ITE), *Trip Generation*, (7th Edition) regression equations for Shopping Center (Land Use Code 820):
 Daily: $\ln(T) = 0.65 \ln(X) + 5.83$ (50% Inbound, 50% Outbound)
 AM Peak Hour: $\ln(T) = 0.60 \ln(X) + 2.29$ (61% Inbound, 39% Outbound)
 PM Peak Hour: $\ln(T) = 0.66 \ln(X) + 3.40$ (65% Inbound, 35% Outbound)
 Where: T = trips generated, X = 1,000 square-feet, Ln = natural log

Source: ITE, *Trip Generation*, (7th Edition), 2003; Fehr & Peers, 2005.

Additional Notes:

- Survey data or the most recent version of ITE should be used to calculate trip generation.
- Pass-by reductions should be considered for commercial uses where applicable.

For mixed use developments, internalization should be considered. Internalization can be calculated using ITE's *Trip Generation Handbook*.



Appendix B: TA Sample Report Format Outline



The following outline for transportation analysis includes topic areas for General Plan consistency analysis, using roadway and intersection performance, and CEQA analysis, using VMT. The actual outline for any analysis documentation will depend on the scope of the analysis and may be comprehensive and include necessary topics for General Plan consistency analysis, CEQA analysis, and site-access and on-site circulation, or may just need to document a review of site-access and on-site circulation.

Introductory Items

- Front Cover/Title Page – signed and sealed by a registered California Civil or Traffic Engineer
- Table of Contents, List of Figures, and List of Tables
- Executive Summary

1. Introduction/Background

- Project description
- Project sponsor/contact info
- Type and size of development
- Site plan (include proposed driveways, roadways, traffic control, parking facilities, emergency vehicle access, and internal circulation for vehicles, bicyclists, and pedestrians)
- Location map (include major streets, study intersections, and neighboring zoning and land uses)

2. Existing Conditions

- Existing roadway system within project site and surrounding area
- Location and routes of nearest public transit system serving the project
- Location and routes of nearest pedestrian and bicycle facilities serving the project
- Figure of study intersections with peak hour turning movement counts, lane geometries, and traffic control
- Map of study area showing ADT of study roadways
- Table of existing peak hour average vehicle delay
- Table summarizing existing VMT



3. Existing Plus Project Conditions

- Table of trip generation for project
- Figure/map of trip distribution (in percent)
- Maps of study area with applicable peak hour turning movements (Project Only and Existing Plus Project)
- Table of Existing and Existing Plus Project intersection peak hour average vehicle delay
- Traffic signal and other warrants
- Findings of project impacts
- Mitigation measures for project impacts (include a map showing physical mitigation)
- Scheduling and implementation responsibility of mitigation measures
- Impacts of mitigation measures
- VMT comparison table

4. Existing Plus Approved Projects Conditions

- Table of trip generation for approved project(s)
- Figure and/or table of approved projects trip distribution (in percent)
- Map of study area with applicable peak hour turning movements (Approved Projects Only and Existing Plus Approved)
- Table of intersection peak hour average vehicle delay
- Traffic signal and other warrants
- VMT comparison table

5. Existing Plus Approved Projects Plus Project Conditions

- Similar content to Existing Plus Project Conditions



6. Cumulative and Cumulative Plus Project Conditions

- Map of study area with Cumulative No Project peak hour turning movements
- Map of study area with Cumulative Plus Project peak hour turning movements
- Table of Cumulative and Cumulative Plus Project intersection peak hour average vehicle delay
- Traffic signal and other warrants
- VMT comparison table
- Findings of project impacts
- Mitigation measures for project impacts (include a map showing physical mitigation)
- Scheduling and implementation responsibility of mitigation measures
- Impacts of mitigation measures

7. Construction Impacts

8. Phasing Impacts (for large projects only)

9. Appendices

- List of references
- List of authors
- Traffic counts
- Technical calculations for all analyses – signed and sealed by a registered California Civil or Traffic Engineer



Appendix C: Travel Demand Model Validation Tests



As noted in the TA guidelines, the model validation shall include both static and dynamic tests. Static validation tests compare the model's base year traffic volume estimates to traffic counts using the statistical measures listed below and the threshold criteria contained in Table C-1 as specified in the *Travel Forecasting Guidelines*, Caltrans, 1992.

- Volume-to-Count Ratio – is computed by dividing the volume assigned by the model and the actual traffic count for individual roadways model-wide.
- Percent of Links Within Caltrans Deviation Allowance – the deviation is the difference between the model volume and the actual count divided by the actual count.
- Correlation Coefficient – estimates the correlation between the actual traffic counts and the estimated traffic volumes from the model.
- 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.

TABLE E-C-1: STATIC VALIDATION CRITERIA AND THRESHOLDS

Validation Item	Criteria for Acceptance ¹
Percent of links with volume-to-count ratios within Caltrans deviation allowance	At Least 75%
Correlation Coefficient	At Least 0.88
Percent Root Mean Squared Error (RMSE)	Below 40%
Notes: ¹ Travel Forecasting Guidelines, Caltrans, 1992.	

Dynamic validation determines a model's sensitivity to changes in land uses and/or the transportation system. These tests are recommended in the *Model Validation and Reasonableness Checking Manual* (Travel Model Improvement Program, FHWA, 1997). The results of dynamic validation tests are inspected for reasonableness in the direction and magnitude of the changes.

Dynamic validation will include one or more of the following model sensitivity tests, as appropriate given the specific type of project under analysis.

- Add lanes to a link
- Add a link
- Delete a link
- Change link speeds
- Change link capacities
- Add 100 households to a TAZ
- Add 1,000 households to a TAZ
- Add 5,000 households to a TAZ
- Add 10,000 households to a TAZ

Review of the model's response to the dynamic validation tests should indicate changes to the model volumes have occurred in the appropriate direction and magnitude.



Appendix D: FHWA Vehicle Classification Definitions



VEHICLE AND TRUCK TRIP EQUIVALENCIES

Vehicle and Truck Trip Equivalencies		
Vehicle Classification	Description	Trigger for a TIS (New Vehicle Trips Per Day)
Auto	2 axles	100
Small Truck	2 axles/6 tires (includes buses)	50
Medium Truck	3 & 4 axles	20
Large Truck	5 plus axles	5

FHWA VEHICLE CLASSES WITH DEFINITIONS

(Source: <http://www.fhwa.dot.gov/policy/ohpi/vehclass.htm>)

Class 1: Motorcycles -- All two or three-wheeled motorized vehicles. Typical vehicles in this category have saddle type seats and are steered by handlebars rather than steering wheels. This category includes motorcycles, motor scooters, mopeds, motor-powered bicycles, and three-wheel motorcycles.

Class 2: Passenger Cars -- All sedans, coupes, and station wagons manufactured primarily for the purpose of carrying passengers and including those passenger cars pulling recreational or other light trailers.

Class 3: Other Two-Axle, Four-Tire Single Unit Vehicles -- All two-axle, four-tire, vehicles, other than passenger cars. Included in this classification are pickups, panels, vans, and other vehicles such as campers, motor homes, ambulances, hearses, carryalls, and minibuses. Other two-axle, four-tire single-unit vehicles pulling recreational or other light trailers are included in this classification. *Because automatic vehicle classifiers have difficulty distinguishing class 3 from class 2, these two classes may be combined into class 2.*

Class 4: Buses -- All vehicles manufactured as traditional passenger-carrying buses with two axles and six tires or three or more axles. This category includes only traditional buses (including school buses) functioning as passenger-carrying vehicles. Modified buses should be considered to be a truck and should be appropriately classified.

NOTE: In reporting information on trucks the following criteria should be used:

1. Truck tractor units traveling without a trailer will be considered single-unit trucks.
2. A truck tractor unit pulling other such units in a "saddle mount" configuration will be considered one single-unit truck and will be defined only by the axles on the pulling unit.
3. Vehicles are defined by the number of axles in contact with the road. Therefore, "floating" axles are counted only when in the down position.
4. The term "trailer" includes both semi- and full trailers.



Class 5: Two-Axle, Six-Tire, Single-Unit Trucks -- All vehicles on a single frame including trucks, camping and recreational vehicles, motor homes, etc., with two axles and dual rear wheels.

Class 6: Three-Axle Single-Unit Trucks -- All vehicles on a single frame including trucks, camping and recreational vehicles, motor homes, etc., with three axles.

Class 7: Four-Axle Single-Unit Trucks -- All trucks on a single frame with four or more axles.

Class 8: Four or Fewer Axle Single-Trailer Trucks -- All vehicles with four or fewer axles consisting of two units, one of which is a tractor or straight truck power unit.

Class 9: Five-Axle Single-Trailer Trucks -- All five-axle vehicles consisting of two units, one of which is a tractor or straight truck power unit.


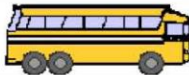




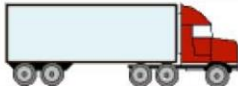




Class 10: Six or More Axle Single-Trailer Trucks -- All vehicles with six or more axles consisting of two units, one of which is a tractor or straight truck power unit.

Class 11: Five or fewer Axle Multi-Trailer Trucks -- All vehicles with five or fewer axles consisting of three or more units, one of which is a tractor or straight truck power unit.

Class 12: Six-Axle Multi-Trailer Trucks -- All six-axle vehicles consisting of three or more units, one of which is a tractor or straight truck power unit.

Class 13: Seven or More Axle Multi-Trailer Trucks -- All vehicles with seven or more axles consisting of three or more units, one of which is a tractor or straight truck power unit.



Class	Description	Picture	ESAL*/Truck	Traffic Factor (car =1)
Class 1 Class 2 Class 3	Motorcycle Passenger Car Pickup Van		0.0004	1
Class 4	Bus		0.39	969
Class 5	2 Axles, 6-Tire Single Units		0.04	103
Class 6	3 Axles, Single Unit		0.49	1,236
Class 7	3 to 4 Axles, Single Trailer		2.12	5,296
Class 8	3 to 4 Axles, Single Trailer		0.45	1,116
Class 9	5 Axles, Single Trailer		1.19	2,970
Class 10	6 or More Axles, Single Trailer		1.06	2,650
Class 11	5 or Less Axles, Multi-Trailers		0.96	2,402
Class 12	6 Axles, Multi-Trailers		2.71	6,765
Class 13	7 or More Axles, Multi-Trailers		1.69	4,224

* ESAL = Equivalent Single Axle Load



Appendix E: General Plan Update VMT Calculation Methodology



Based on SB 743 and the modifications to the CEQA guidelines, the following origin-destination (OD) tour-based VMT was applied to develop the VMT thresholds for the City of Elk Grove General Plan Update.

Method		Analysis Application	Approach	Formula	Trip Types Included	Full Accounting?		Source
						Trip Length	Trips	
OD	Tour-Based	Transportation	Estimates/forecasts VMT based on all trips that have one end in a project location	Trips x Trip Length	II IX XI	Fully accounts for entire trip length	Includes trips without an origin or destination at the home	DAYSIM ¹ travel diary
Notes: ¹ DAYSIM activity-based travel demand model II – Internal to Internal Trips IX – Internal to External Trips XI – External to Internal Trips Internal trips are trips that have an origin or destination SACSIM model (the Sacramento Regional Travel Simulation Model) area. External trips have an origin or destination external to the SACSIM model area.								

The OD (Tour-Based) methodology outlined above includes the following input files and calculation steps:

Input Files

II VMT calculations:

- Trip Table (sout.dbf)
- Skim Tables (a3, md, p3, and ev)
- Script File – attach skims to trips.s

Internal-External (IX)/External-Internal (XI) VMT calculations:

- INTEGRATION_11_TRAVEL_IXXI_trip.sql
- ixxi_taz.dbf
- parc_(model year).dbf (parcel table for the specific model year)
- TAZ to RAD correspondence table
- Script File – 3_ixxi_cv_taz_res_shr_revise.s

Calculation Steps

1. II VMT Calculations
 - a. Adjust auto trip distance in the output trip table from SACSIM model using skims
 - i. Run “attach skims to trips.s” script
(script inputs: sout.dbf (the trip segment outputs from DAYSIM), skim tables; script



output: sout_2.dbf)

ii. Open Sout_2.dbf

1. Calculate VMT by filtering for vehicle trips and multiplying DISTAU field (automobile trip segment distance) by mode (Mode 7 *1, Mode 5 *0.3, Mode 6 *0.5)

b. Summarize VMT by parcel

- i. Select origins from trips that start in the study area and end in both the study area and outside the study area. Select destinations for trips that started outside the study area and ended in the study area. Remove any VMT internal to parcels and then summarize VMT by parcel.

2. IX/XI VMT Calculations

- a. Note – the previous process calculates VMT for trips starting and ending within the SACSIM model region. IX/XI VMT is calculated separately.

- i. Run "3_ixxi_cv_taz_res_shr_revise.s" script (script output: ixxi_taz.dbf)

- ii. Calculate the total share of IX/XI VMT by parcel by summarizing the VMT shares by RAD and calculating ratio of VMT/population, VMT/employment and VMT/(population+employment) at the RAD level (adapting methodology outlined in INTEGRATION_11_TRAVEL_IXXI_trip.sql)

- iii. Apply RAD level ratios to parcel_(model year).dbf

3. Total VMT is II VMT + IX/XI VMT divided by population + employment (i.e., service population) at the parcel level

4. Summarize service population by land use category using VMT by parcel and placetype field

