



CITY OF HUGHSON TRANSPORTATION IMPACT ANALYSIS GUIDELINES

Prepared for:
City of Hughson

Prepared by:

FEHR & PEERS
TRANSPORTATION CONSULTANTS



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1. INTRODUCTION

The purpose of these guidelines is to assist project applicants and their development teams in assessing the potential traffic impacts of development proposed within the City of Hughson. The following guidelines have been developed to provide a clear and consistent technical approach to transportation impact analysis by establishing guidance for all transportation impact studies and reports based on the current state-of-the-practice in transportation planning and engineering.

A project in context of these guidelines means any development activity in and around the City of Hughson that may affect the City's transportation system. Examples are listed below.

- Infrastructure modification or expansion including, but not limited to, City of Hughson capital improvement projects (CIP) and state highway projects
- Land use entitlements requiring a discretionary approval by the City of Hughson including, but not limited to, zoning changes, general plan amendments, specific plans, conditional use permits, and tentative maps
- Annexations and modifications to the City's sphere of influence
- Any other land use activity being promoted by agencies other than the City of Hughson that is routed to the City for review under the requirements of state and/or federal environmental laws, and other applicable laws

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



2. SCOPE AND APPLICABILITY

These guidelines address the key elements required for preparing and reviewing transportation impact studies for development projects in and around the City of Hughson. The major issues addressed in this document include the following:

- Situations and thresholds that commonly trigger the need for a transportation impact study
- Scope of transportation impact study
- Transportation impact analysis methods
- Standards/criteria to determine if the transportation-related impact(s) of the proposed project is (are) significant as per the California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA)
- Mitigation measure requirements
- Guidelines for documentation of the findings, conclusions, and recommendations of a transportation impact study

The City of Hughson will review transportation studies and reports based on the guidelines presented in this document.

It should be noted that the guidelines presented in this report are not intended to be used as an exclusive set of applicable procedures; not all criteria, warrants and analyses described in this document will be applicable for each project being reviewed for transportation impact analysis. The need for a transportation impact study will be reviewed by the City Engineer on a case-by-case basis. Likewise, the type and level of required analysis shall be governed by issues relevant to the proposed project in context of its site and vicinity as well as current and anticipated traffic conditions. Therefore, these guidelines provide the latitude for addressing the unique situations on a case-by-case basis.

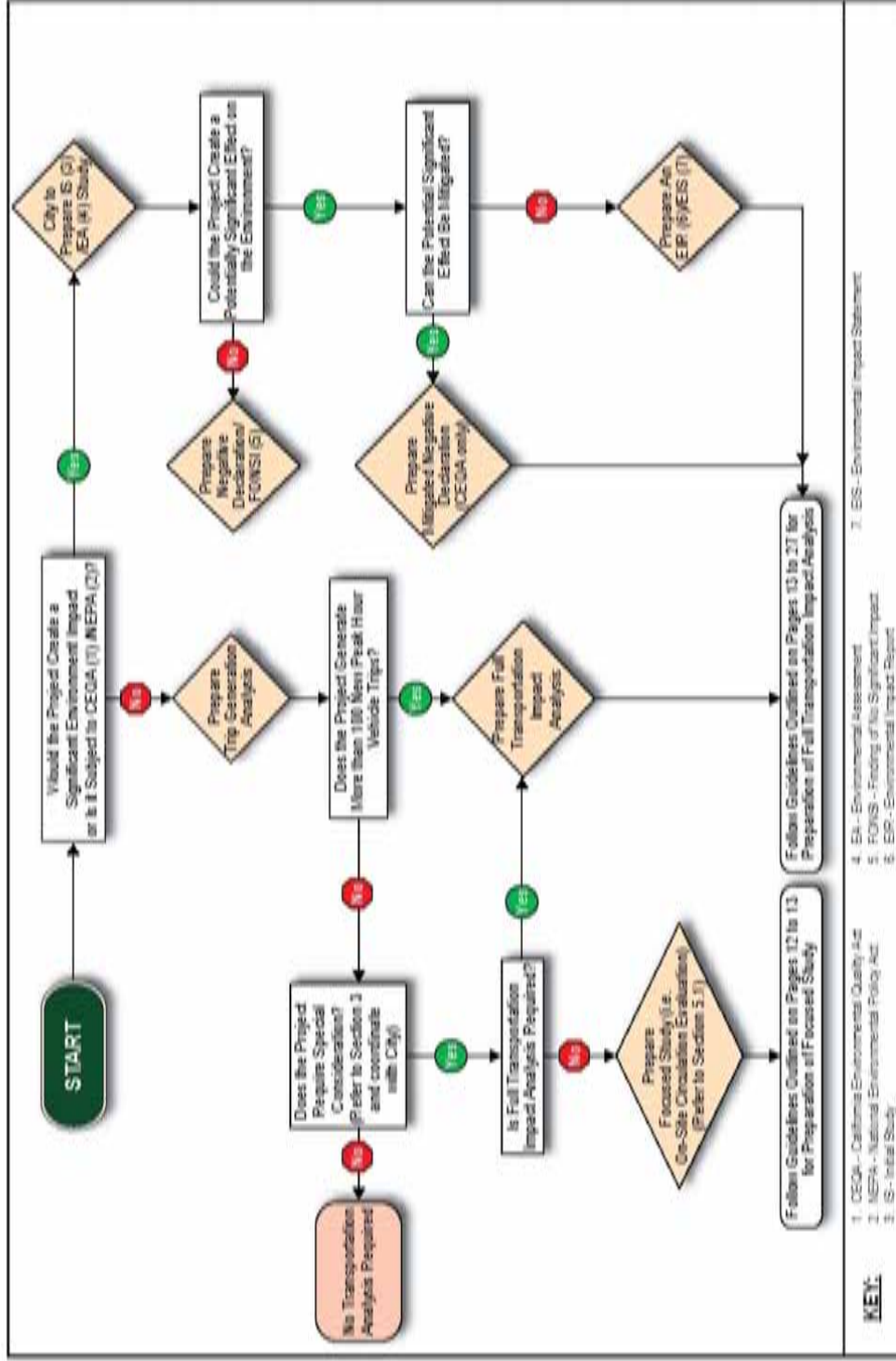


3. TRIGGERS FOR TRANSPORTATION IMPACT STUDY

This section addresses a key question: "When is a transportation impact analysis study needed by the City of Hughson?" Figure 1, Transportation Impact Analysis Flow Chart, incorporates the following guidelines and provides a method to determine if a transportation impact analysis will be required for a proposed project in the City of Hughson.

- According to the City of Hughson General Plan there are critical situations or sensitive issues related to the proposed development that trigger the need for transportation impact evaluation of the project including:
 - General Plan Policy C-2.1: *New applicants for development with the potential to generate 100 vehicle trips per day of traffic may be required to have a qualified traffic engineer prepare a traffic study to identify potential traffic impacts and specify improvement measures needed to ensure an acceptable LOS on affected streets. The City Engineer will determine the extent of the traffic study based on existing conditions and key issues associated with site plans.*
 - Entitlement requiring discretionary approval
 - Receipt of a Notice to Proceed for a project within the City
- As required under CEQA and/or NEPA, the project has the potential to create significant environmental impact(s) on one or more components of the transportation network. This aspect is addressed in section 3.2.
- There is a potential effect on the physical or operational conditions of the City's transportation system due to the proposed project

As a first step in the transportation analysis of a proposed development project, the applicant shall provide a project description that includes specific land uses intended for the site and the size of the proposed development (e.g., square footage, acreage, dwelling units, etc.). The following sections provide information, in conjunction with Figure 1, to determine if a transportation impact analysis is required based on significant environmental impacts or a trip generation analysis.



November 2016
Title Order #0949000206-1 Flow Chart

TRANSPORTATION IMPACT ANALYSIS FLOW CHART

Figure 1

Hughson TIA Guidelines



3.1 CITY TRIGGERS

The City would require a transportation impact analysis if the project generates more than 100 vehicle trips per day. To determine if this criterion is met see section 3.3, Trip Generation Analysis.

In addition, submission of an entitlement application requiring discretionary approval would trigger the need for a transportation impact evaluation. This does not include ministerial applications (i.e., building permits). Another trigger would be the City's receipt of a Notice to Proceed for a project under its jurisdiction or for a facility operated by another jurisdiction (e.g., Caltrans, County, or Special District) within its boundaries. The study would be required to assist the City in making an informed decision throughout the approval process.

3.2 SIGNIFICANT ENVIRONMENTAL IMPACTS

As mentioned above, a transportation impact analysis may be required if a proposed project, as required under CEQA and/or NEPA, has the potential to create significant environmental impacts. To facilitate Figure 1, actions subject to CEQA include the following:

- Infrastructure construction, adoption of an ordinance or a resolution, and land use changes
- Proposed projects supported through public agency contracts, grants, subsidies, loans, or other assistance
- Proposed projects involving public agency issuance of a lease, permit, license, certificate, or other entitlement (CEQA Guidelines Sec. 15378)

Actions subject to NEPA are activities that require any of the following:

- Federal permit or entitlement
- Federal funding
- A federal agency serves as the "lead agency" for the project

If the proposed project includes any of the above mentioned activities or actions, an Initial Study (IS) or Environmental Assessment (EA) needs to be prepared to determine the appropriate environmental clearance documents such as an Environmental Impact Report (EIR) or Environmental Impact Statement (EIS).



3.3 TRIP GENERATION ANALYSIS

All applicants of discretionary approvals are required to submit a trip generation analysis. In the case of “shell” buildings with unidentified use or where the ultimate tenant use of the building cannot be restricted, the City Engineer shall recommend the use of the highest traffic intensity among all permitted uses to establish traffic impacts and to calculate Project Impact Fees. Traffic impacts may be assessed based on a use with lower traffic intensity if the City and the developer establish a conditional use permit. The project impacts would need to be re-evaluated if a land use with a higher traffic intensity was proposed.

The applicant shall submit a trip generation analysis that identifies the number of new daily and peak hour vehicle-trips from the proposed project. The applicant or their consultant shall conduct the work in compliance with the guidelines in this section. The trip generation estimation for all new or proposed development projects shall include the summation of primary trips and diverted linked trips, or simply all trips generated by a project site that are not pass-by trips (see the following sections for definitions).

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, i.e., “proposed minus existing” land use. The following sections provide guidelines for trip generation analyses.

The City will review the trip generation analysis and determine if additional analysis is required.

A. Fundamental Requirements

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*¹ and recommendations provided in the *Trip Generation Handbook*.² If multiple trip generation rate sources exist, the study shall provide a comparison and use the rates that best reflect local conditions.

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 the City of Hughson, Stanislaus County, or neighboring cities with similar characteristics.

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

The final trip generation rates used for the project should be an appropriate 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.



B. Types of Trips

ITE has developed a recommended practice to establish a basis for consistency in transportation impact studies, with the primary purpose of providing reliable guidance for site access, on-site circulation, and off-site improvement planning in accommodating site and other traffic safely and efficiently.³

The trip generation rates and equations contained in *Trip Generation* are derived from actual measurements of traffic generated by individual sites. These rates and equations represent the total number of vehicles entering and exiting a site. Therefore, these volumes are appropriate for determining the total traffic to be accommodated by site driveways. The remainder of this section has been extracted from the industry-standard reference *Trip Generation Handbook*.

The total number of trips generated by a site can be different from the amount of new traffic **added** to the street system by the generator. For example, retail-oriented developments such as shopping centers, discount stores, restaurants, banks, service stations, and convenience markets often locate adjacent to busy streets to attract the motorists already traveling on the roadway. These sites attract a portion of their trips from traffic already passing the site on the way from an origin to an ultimate destination. Therefore, some retail trips **may not add new traffic** to the adjacent street system.

Trip-making can be broken down into two major categories: **pass-by trips** and **non-pass-by trips**. In some traffic impact study applications, it is necessary to further subdivide non-pass-by trips into **primary trips** and **diverted linked trips**. These trip types are defined below.

Pass-by Trips are made as intermediate stops on the way from an origin to a primary trip destination without a route diversion. Pass-by trips are attracted from passing the site on an adjacent street or roadway that offers direct access to the project site. Pass-by trips are not diverted from another roadway.

Non-pass-by Trips are simply all trips generated by a project site that are not pass-by trips. This term is sometimes used when diverted linked trips are not tabulated separately from primary trips.

Primary Trips are trips made for the specific purpose of visiting the generator, i.e., the stop at the generator is the primary reason for the trip. The trip typically goes from origin to generator and then returns to the origin. For example, a home-to-shopping-to-home combination of trips is a primary trip set.

Diverted Linked Trips are trips that are attracted from the traffic volume on roadways within the vicinity of the generator but that require a diversion from one roadway to another roadway to gain access to the site. These trips could travel on highways or freeways adjacent to a generator, but without direct access to the generator. Diverted linked trips add traffic to streets adjacent to a project site, but may not add traffic to the area's major travel routes. Both pass-by and diverted linked trips may be part of a multiple-stop chain of trips.



4. SCOPE OF STUDY

This section describes the technical considerations associated with determining the extent of the study area and the scope of a traffic impact study.

4.1 EXTENT OF STUDY AND STUDY AREA BOUNDARIES

A transportation impact study may be as simple as collecting traffic counts and performing a warrant analysis or as complex as developing a microscopic traffic operations simulation model. In large part, the contents and extent of a transportation impact study depend on the location and size of the proposed development, the prevailing conditions in the surrounding area, the technical questions being asked by decision makers and the public, and the available project resources and schedule.

Transportation studies analyzing off-site access shall include the following minimum requirements.

- All site access points
- All roadway and intersections (signalized and unsignalized) that may be affected by the proposed project
 - Traffic operations are governed by intersections on conventional highway, arterial, and collector street systems
 - Project impacts should be based on intersection operations analysis
 - Arterial and collector roadway segment analysis may be used for planning studies and when evaluating locations a substantial distance from the proposed project

Consult with the City Engineer regarding any additional study locations to be included based on the following criteria.

- Local or site-specific issues
- Land use type, development size, vehicle type, etc.
- Likelihood of adverse impacts to residential areas
- Impacts other than pure capacity relationships (e.g., "cut-through" traffic, traffic noise, traffic calming, etc.)

The following are general guidelines for determining the study area.

- If a project generates more than 10 peak hour trips and less than 100 peak hour trips, a trip generation analysis is required and the City will determine if there is a need to study near-by



- intersections or roadway facilities. Facilities within two miles of the project site are likely candidates to be included in the study area.
- If a project generates more than 100 peak hour trips a traffic analysis is required. The study area shall include facilities that serve 10 percent or more of the project-generated traffic or where project traffic constitutes at least two percent of existing traffic at that location. Facilities within five miles of the project site are likely candidates to be included in the study area. If the project is of regional significance as defined in Section 15086 of the CEQA Guidelines, then the study area shall consider facilities within 10 miles of the project site.
 - Additional facilities may be studied based on the City Engineer recommendations and/or concerns raised by citizens in the vicinity of the project

4.2 MAJOR COMPONENTS OF THE TRANSPORTATION AND CIRCULATION SYSTEM

It is the consultant's responsibility to identify potential traffic safety and/or traffic operations issues that may or may not have been included in the project scope, in the request for proposals, or in discussions with the City Engineer. Such issues must be brought to the attention of the City Engineer and/or addressed in the transportation impact study report.

The study scope shall include, but is not limited to, the potential transportation and circulation elements listed in Table 1. Section 5.0 of this document discusses other elements that should be considered for inclusion in the study scope.



**Table 1
List of Potential Transportation and Circulation Elements for Inclusion in
Transportation 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.
Off-Site Traffic Operations	<p>Study all intersections using method and procedures contained in the latest version of the <i>Highway Capacity Manual</i> (HCM) where (1) the project circulation system intersects the existing or planned roadway system; (2) project traffic may alter existing or future traffic volumes or patterns; or (3) a significant impact may be created by the project. Study other locations such as roadway segments as required by the City Engineer. Traffic operations shall be analyzed for both planning level and project specific studies.</p> <p>Where closely spaced intersections exist or congestion occurs, the HCM procedures recommend the use of traffic operations models such as microsimulation that can accurately capture and analyze peak period queuing, delays, and operations.</p>
Bicycle Facilities	Identify any existing or planned bicycle facilities that may be affected by the project. Describe the project's potential effect on bicycle facilities and demand.
Pedestrian Facilities	Identify any existing or planned pedestrian facilities that may be affected by the project. Describe the project's effect on pedestrian facilities and demand.
Parking	Compare the project-related demand for parking (using ITE, Urban Land Institute's <i>Shared Parking</i> , or other information) with the proposed supply and City zoning requirements. If project parking demand exceeds the project-provided supply, determine ability of nearby parking to accommodate overflow.
Trucks	For industrial projects or other projects related to goods movement, identify the number of truck trips that will be generated, and design facilities necessary to accommodate truck traffic. This may require evaluation of the Traffic Index for existing roadways.
Project Access	Evaluate safety and operational issues related to driveways and intersections and their conformance to City and Caltrans design standards. Evaluate other project access issues as outlined in Section 5.1 and directed by the City Engineer.
Signal Warrants	Determine if any unsignalized intersections located within the study area boundary meet signal warrants with or without the project. The study shall include evaluation of the peak hour volume warrant. Other signal warrants may be analyzed at the discretion of the City Engineer. If signal warrants are met, the responsible state or local agency should undertake regular monitoring of actual traffic conditions and accident data, and perform a timely re-evaluation of the full set of warrants.



Elements	Evaluation
Other Subject Areas	Other subject areas should be considered as warranted by individual circumstances such as existing traffic related problems in the study area (existing congested locations, existing high accident rates, etc.), public perception and neighborhood sensitivity, safety, change in off-site transportation system, and other problems or deficiencies in terms of the ability of the transportation network to accommodate the development, etc. It may be necessary to perform qualitative and/or quantitative analysis for issues such as changes to circulation, traffic safety, etc.
Other Jurisdictional Requirements	In situations where several agencies must approve a development or are responsible for affected roadways, it will be the responsibility of the consultant to contact all agencies to determine issues to be addressed, scope of study, etc.
Communication of Analysis Results	Communicating the transportation impact study results is as important as the analysis itself. High-quality graphics, charts, and visualizations are often necessary to effectively communicate transportation analysis results to decision makers and the public. The City Engineer should be consulted regarding the preferred communication methods and formats for each study.



5. TRANSPORTATION IMPACT STUDIES

This section provides preparation guidelines for preparing a Focused Study and Full Transportation Impact Analysis.

5.1 FOCUSED ON- AND OFF-SITE TRANSPORTATION REVIEW

The project applicant shall retain a professional traffic engineer or civil engineer, who is licensed to practice in the State of California and qualified in traffic engineering, to conduct the site traffic review. Depending on the specific nature of the proposed project and its location, the review may include qualitative and/or quantitative analysis of one or more of the following operational concerns.^{4,5,6}

- 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
- Sensitivity of adjacent neighborhoods or other areas that may be impacted by the project traffic
- Close proximity of proposed site driveway(s) to other driveways or intersections
- Adequacy of vehicle parking relative to both the anticipated project demand and City 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 ten per day
- Adequacy of the project site design to provide at least the minimum required throat depth at project driveways
- Adequacy of on-site vehicle, bicycle, and pedestrian circulation
- Potential for the project to adversely impact transit operations or facilities
- Potential for the project to adversely affect bicyclist or pedestrian safety or facilities
- Substantial increase in potential hazards due to design features (e.g., sharp curves, dangerous intersections), proximity to railroad crossing, or incompatible uses (e.g., farm equipment)
- Project site design resulting in inadequate emergency access or response times
- Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)
- Response to comments from external public agencies (e.g., Caltrans, Stanislaus County, neighboring cities, etc.)



A sample illustration of site plan recommendations is contained in Appendix B.

5.2 FULL TRANSPORTATION IMPACT STUDY

This section applies to both the standalone transportation impact study and preparation of an EIR/EIS transportation chapter. This section provides the overall review process, general methodology, level of service (LOS) criteria, impact determination, mitigation measures, and traffic report contents for a full transportation impact study.

A. Overall Review Process

The project applicant shall retain a professional traffic or civil engineer who is licensed to practice in the State of California to conduct the transportation impact analysis. The consultant shall conduct the work in the following phased manner.

1. **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.
2. **Project Trip Generation and Trip Distribution** documenting all key technical assumptions, data sources, and references.
3. **Administrative Draft Transportation Study Report** prepared according to the Scope of Work, Project Trip Generation, and Trip Distribution approved by the City Engineer. The format of this report may need to be discussed with the EIR 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 the EIR or Mitigated Negative Declaration.
4. **Draft Transportation Study Report** addressing the City Engineer's comments on the Administrative Draft Report.
5. **Final Transportation Study Report / Response to Public Comments** addressing comments from the City Engineer, Caltrans, Stanislaus County, neighboring cities, etc. The format of this report may need to be discussed with the EIR consultant. It may be a final report incorporating the comments or written responses to public comment.

The City Engineer shall review the deliverable from each of the above phases of the transportation impact analysis study. In some cases, County or Caltrans review may be required where the project impacts facilities under the control of those jurisdictions. Project impacts at the following facilities are likely to involve the County: Geer Road, Hatch Road, Santa Fe Avenue, Service Road, Tully Road, and Whitmore Avenue. Approval of the deliverable at each phase of the study is necessary prior to continuing to a later phase.



B. General Methodology

1. All full transportation impact studies shall include the traffic operational analysis of study intersections for the following minimum scenarios:
 - i. **Existing Conditions** represented by traffic volumes based on recent count data
 - ii. **Existing plus Project Conditions** represented by projected traffic volumes reflecting existing conditions plus traffic generated by the proposed project
 - iii. **Existing Plus Approved Projects Conditions** represented by projected traffic volumes reflecting existing conditions plus growth due to approved development (this scenario may be skipped if there are no approved developments within the study area)
 - iv. **Existing Plus Approved Projects Plus Project Conditions** represented by Existing Plus Approved Projects Conditions plus traffic generated by the proposed project (this scenario may be skipped if there are no approved developments within the study area)
 - v. **Cumulative No Project Conditions** represented by projected traffic volumes reflecting all approved projects plus pending projects or expected development of other areas of the City designated for growth
 - vi. **Cumulative Plus Project Conditions** represented by Cumulative Conditions plus traffic generated by the proposed project

Additional analysis scenarios may be included in the traffic impact analysis at the direction of the City Engineer especially if necessary to allow the City to make an informed decision about the potential effects of the project.

2. Traffic impacts shall be analyzed in terms of 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). Trip generation shall be conducted on a daily basis and for all peak hours analyzed (see also number 8 below).
3. The traffic study shall identify and analyze all impacts to the operational conditions of the transportation facilities in the project area in accordance with the current *Highway Capacity Manual* (HCM). This includes the potential requirement to use traffic operations models such as arterial progression or microsimulation to analyze unique conditions such as closely spaced intersections or congested conditions.

As described in the HCM, the LOS for side street stop-controlled intersections is based on the average control delay for each individual movement. In addition to reporting the worst individual movement delay, the delay for the overall intersection shall be calculated and reported. This information will allow reviewers to gauge potential impacts to individual turn movements against those for the entire intersection because vehicles traveling through the intersection on the major



street (i.e., the uncontrolled approaches) experience no delay while vehicles to/from side streets and yielding to major street traffic may experience substantial delay.

4. Analysis parameters for Existing and Existing Plus Project conditions shall be based on field measurements taken during traffic count collection or field observation. The peak hour factor should be set to 1.00.
5. Analysis parameters for Existing Plus Approved Projects and Existing Plus Approved Projects Plus Project conditions shall be the same as existing conditions. For new locations, the Cumulative and Cumulative Plus Project conditions parameters shall be followed.
6. The following analysis parameters shall be used for Cumulative and Cumulative Plus Project conditions. Consult with the City Engineer to determine appropriate analysis parameters not listed below.
 - Peak Hour Factor (PHF) – 1.00
 - Ideal Saturation Flow Rate – Use the value recommended in the most recent HCM unless physical conditions and traffic controls have been modified from existing conditions that warrant a change. The 2000 HCM recommends 1,900 vehicles per hour per lane (vphpl).
 - Yellow phase – 4 seconds per phase (if traffic signal is present under Existing conditions use existing yellow phase)
 - All red phase – 1 second per phase (if traffic signal is present under Existing conditions use existing red phase)
 - Conflicting pedestrians for signalized intersections – Should be 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 2000 HCM:
 - 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

To determine conflicting pedestrians assume 1 pedestrian per activation.

- Traffic signal cycle lengths – Should be held constant from existing conditions, and existing phasing (e.g., leading left-turns) should be maintained 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.



- In and around downtown – limit signal cycle lengths to less than 60 seconds
 - In and around suburban areas – limit signal cycle lengths to less than 90 seconds
 - Near freeway interchanges/regional commercial – limit signal cycle lengths to less than 120 seconds
- Heavy-truck percentages shall be 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.
7. The study shall analyze the impacts of the proposed development on the adjacent roadway network, the adequacy of site access, and the suitability of on-site circulation and parking. To accurately gauge project impacts and potential improvements, the study should provide the following information, as appropriate to individual projects (see also Table 1):
- Characteristics of the existing roadway and public transit systems
 - Characteristics of the proposed development
 - Project access plans and site plan
 - Traffic generated by future approved developments
 - Traffic volume forecasts on individual roadway segments
 - Turning movement forecasts at individual intersections and access driveways
 - Roadway system adequacy and required improvements
 - Effect of numerous access points along an arterial as opposed to only a few consolidated access points
 - Effects of modest changes in land uses
 - Pedestrian, bicycle, and transit access requirements
8. The study area shall be based upon the type of land use, size of development, street system patterns, terrain, and specific or local site issues. The City Engineer will give input to the traffic consultant regarding the selection of study intersections using local knowledge of the area and the following guidelines:
- i. All site access driveways, adjacent roadways, and intersections around the site, plus the major or signalized intersections in each direction from the site leading up to the nearest regional corridor(s).
 - ii. Include locations that serve 10 percent or more of the project-generated traffic or where project traffic constitutes at least two percent of existing traffic at the location. Coordinate



with City Engineer to determine additional analysis locations. Based on the land use of the proposed project and upon consultation with City Engineer, 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:

- 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 – 6:00 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. The time period(s) that should be analyzed are those that exhibit the maximum combined level of project-generated traffic and adjacent street traffic.

9. Existing traffic conditions data shall be collected using the following guidelines:

- Peak hour turning movement counts shall be collected for all study intersections. Daily traffic counts shall be collected for all study roadway segments (if any).
- Data shall be collected 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. In addition, traffic counts should not be conducted during the week of or the week after Thanksgiving as well as between the third week of December and the second week of January. If possible, the counts should be conducted on days when schools are in session. Traffic counts for other periods such as during weekend peak periods or typical off-peak periods (midday, afternoon, etc.) shall be performed as needed.
- To account for seasonal variation in traffic volumes the City of Hughson will provide seasonal adjustment factors (i.e., winter, spring, summer, and fall) to normalize traffic counts to an average condition. The adjustment factors should be used for peak hour and daily traffic counts. The intersection turning movement or roadway link volume data collected should be multiplied by the adjustment factor to obtain the volumes used for the transportation analysis. Table 2 shows which season's adjustment factor should be applied depending on what month the counts were collected.
- Traffic counts shall not be used if more than two years old at study initiation. If available, County or City of Hughson traffic counts may be used but the traffic counts must be adjusted to reflect current year traffic volumes and patterns.



Table 2
Seasonal Traffic Count Adjustment Factors

Seasonal Adjustment Factor	Month of Traffic Count
Winter	December
	January
	February
Spring	March
	April
	May
Summer	June
	July
	August
	September
Fall	October
	November

Source: Fehr & Peers, 2007.

10. All LOS results reported under “Existing Conditions” must be verified by field observations during the peak periods analyzed. Specific operational problems and limitations of the analysis methodologies (e.g., HCM, etc.) in accurately describing observed field conditions must be identified and described in the traffic report. Field observations shall be conducted during the same time frame that the traffic counts are collected.
11. Cumulative traffic volumes will be derived from the City of Hughson TRAFFIX model or by other means consistent with state of the practice travel demand forecasting. If the consultant determines that the City’s TRAFFIX model does not provide defensible forecasts, then the consultant will meet with the City to develop optional forecasting methods that are compatible with available resources and the desired schedule for the project analysis.
12. Intersection operations analysis shall be conducted using the recommended analysis tools in Table 3. Signal timing information for City signals shall be provided by the City Engineer. Signal timing information for County-maintained signals shall be obtained from the County. Some of the recommended analysis tools provide vehicle queuing estimates for signalized intersections. The 95th percentile queue length shall be used to size turn pockets.
13. Certain project sites may provide future street connectivity. If so, the study shall include the analysis of traffic flows/patterns with and without the street connectivity as future background conditions. Project trips should be added to both background conditions.
14. Depending on the specific nature of the proposed project and its location the study shall include a site traffic review which may include qualitative and/or quantitative analysis of one or more of the operational concerns identified in Section 5.1.
15. The study shall include a circulation map/figure showing the plan view of the streets in the immediate study area, limitations on sight distances in and around the project site, the location



of surrounding driveways, and the location and description of unusual features that may pose particular vehicular, pedestrian, or bicycle circulation problems.

16. The study shall ensure that the proposed project meets the Hughson Municipal Code parking standards provided in Title 17 Zoning Chapter 1.



Table 3
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		
TRAFFIX	X		X					
HCS	X				X			
AASIDRA			X	X				
Rodel			X					
Micro-Simulation ⁵		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. 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.



C. Level of Service Criteria from General Plan

The City of Hughson General Plan Policy Document identifies the following LOS policy:

Policy C-1.2 The City shall strive to maintain a LOS of D on major streets and intersections. The City will strive to maintain this LOS during peak traffic hours, but recognizes that this may not always be feasible due to constraints associated with the built environment. Because seasonal traffic volume variation due to agricultural activities will represent a reduced percentage of the overall traffic as the County develops with urban uses, and is limited to a few months a year, the policy is to maintain LOS D under "typical" or "average annual" conditions versus during the peak agricultural harvest season.

D. Impact Determination

Traffic impact determination for a proposed development project shall be based upon the comparison of the roadway and intersection LOS between the following pairs of traffic operating conditions:

- Existing Conditions vs. Existing Plus Project Conditions
- Existing Plus Approved Projects Conditions vs. Existing Plus Approved Projects plus Project Conditions
- Cumulative No Project Conditions vs. Cumulative Plus Project Conditions

These comparisons will indicate project impacts on intersection and roadway segment traffic operations. The most recent edition of the HCM methodology shall be utilized to analyze signalized intersections, unsignalized intersections. Roadway segment LOS thresholds are shown in Table 4. The general roadway segment level of service thresholds are computed for daily traffic volumes and are based on the *City of Hughson General Plan Circulation Element, 2005* and *Stanislaus County General Plan, 2006*.



**Table 4
General Level of Service Thresholds for Roadways
Based on Daily Traffic Volumes**

Roadway Classification	Lanes	Control	Daily Traffic Volume at LOS		
			C	D	E
Collector	2	Undivided	7,700	11,600	12,900
Arterial	2	Undivided	9,200	13,700	15,450
	4	Divided	20,100	30,200	33,200
Class C Expressway	4	Divided	28,000	33,600	40,000
	6	Divided	42,000	50,400	60,000
Class B Expressway	4	Divided	35,000	42,000	50,000
	6	Divided	52,500	63,000	75,000

Note: Collector and arterial thresholds based on the City of Hughson General Plan. Class C and Class B daily LOS thresholds derived from peak hour LOS thresholds in the Stanislaus County General Plan. The peak hour thresholds were factored upward by 10 to determine daily thresholds.

Significant impacts at signalized and unsignalized intersections shall be determined by comparing the average control delay per vehicle for the overall intersection to the LOS thresholds contained in the HCM.

A project impact is considered significant under the following criteria:

1. When a roadway segment or intersection operates acceptably (i.e., LOS D or better) according to Policy C-1.2 under No Project conditions and the addition of project trips causes overall traffic operations on the facility to operate unacceptably (i.e., LOS E or worse) according to Policy C-1.2.
2. When a roadway segment or intersection operates unacceptably (i.e., LOS E or worse) according to Policy C-1.2 under No Project conditions and the addition of project trips increases the total roadway segment traffic volume by five percent or more, or the overall intersection delay by five seconds or more.
3. When the addition of project traffic causes an all-way stop-controlled or side street stop-controlled intersection to meet Caltrans (or MUTCD) signal warrant criteria.
4. When the project adds traffic to an existing roadway that does not meet current City design standards.



5. A project interferes with, conflicts with or precludes other planned improvements such as roadway extensions/expansions, planned trail facilities, etc.
6. A project conflicts or creates inconsistencies with adopted traffic plans, guidelines, policies or standards.
7. 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.
8. A project disrupts existing or planned pedestrian, bicycle, or transit services or facilities, or conflicts with adopted transit system plans, guidelines, policies or standards.
9. A project creates demand for public transit services above the capacity which is provided or planned.
10. Project designs for on-site circulation, access, and parking areas fail to meet industry standard design guidelines.
11. A project fails to provide sufficient on-site parking for vehicles based on City code.
12. A project increases off-site parking demand above that which is provided in the immediate project area.
13. A project fails to provide accessible and safe pedestrian connections between buildings and to adjacent streets and transit facilities.
14. A project fails to provide adequate accessibility for service and delivery trucks on-site including access to truck loading areas.

E. Mitigation Measures

All significant project impacts should be mitigated to meet the minimum criteria described in the General Plan LOS policies except when the mitigation would be inconsistent with other General Plan policies. Under these circumstances, the consultant should meet with the City Engineer to identify mitigation measures that balance the desired LOS against other desired conditions. For example, the removal of parking downtown to accommodate the LOS threshold may be inconsistent with other General Plan policies related to downtown economic activity. The traffic study should identify these types of potential conflicts and provide alternative mitigation measures. Table 5 shows the appropriate mitigation measures for each analysis scenario to comply with CEQA guidelines.



**Table 5
Appropriate Mitigation Measures**

Change Due to Project Traffic	Improvement not in Fee Program (or not Fully Funded)	Improvement in Fee Program	Mitigation
Near-Term Impacts (Existing plus Project or Existing Plus Approved Projects plus Project)			
Acceptable LOS to Unacceptable LOS	X		<p>Project applicant constructs improvement to bring location to an acceptable LOS.</p> <ul style="list-style-type: none"> • If improvement is infeasible to construct or to finance, impact remains significant and unavoidable and statement of overriding considerations is needed. • If improvement requires approval of other agencies or jurisdictions and that approval cannot be verified at DEIR stage, impact remains significant and unavoidable thus requiring a statement of overriding considerations. <p>At locations where the above conditions apply, consideration should be given to mitigation measures that would lessen the significance of the project impact.</p>
		X	<p>Project sponsor pays fee (only represents full mitigation if improvement is fully funded by fee program). If not fully funded, then either</p> <ul style="list-style-type: none"> • Agency may require project sponsor to construct improvements and receive credit toward impact fees, • Alternate or interim mitigation measures may be installed that would lessen the project impact to less than significant, or • Impact remains significant and unavoidable and statement of overriding considerations is needed.



Change Due to Project Traffic	Improvement not in Fee Program (or not Fully Funded)	Improvement in Fee Program	Mitigation
Unacceptable LOS to Unacceptable LOS	X		<p>Project sponsor constructs improvement that brings location to "pre-project" LOS or better.</p> <ul style="list-style-type: none"> If improvement is infeasible to construct or to finance, impact remains significant and unavoidable and statement of overriding considerations is needed. If improvement requires approval of other agencies or jurisdictions and that approval cannot be verified at DEIR stage, impact remains significant and unavoidable thus requiring a statement of overriding considerations. <p>At locations where the above conditions apply, consideration should be given to mitigation measures that would lessen the significance of the project impact.</p>
		X	Project sponsor pays fee (only represents full mitigation if improvement is fully funded by fee program).
Cumulative Impacts			
Acceptable LOS to Unacceptable LOS	X		<p>Project sponsor constructs improvement that brings location to "pre-project" LOS or better.</p> <ul style="list-style-type: none"> If improvement is infeasible to construct or to finance, impact remains significant and unavoidable and statement of overriding considerations is needed. If improvement requires approval of other agencies or jurisdictions and that approval cannot be verified at DEIR stage, impact remains significant and unavoidable thus requiring a statement of overriding considerations. <p>Impact remains significant and unavoidable until full funding is secured, and statement of overriding considerations is needed. At locations where this applies, consideration should be given to alternate, partial or phased mitigation</p>



Change Due to Project Traffic	Improvement not in Fee Program (or not Fully Funded)	Improvement in Fee Program	Mitigation
			measures that would lessen the significance of the project impact.
		X	Project sponsor pays fee (only represents full mitigation if improvement is fully funded by fee program). Impact remains significant and unavoidable until full funding is secured, and statement of overriding considerations is needed. At locations where this applies, consideration should be given to also implementing alternate, partial or phased mitigation measures that would lessen the significance of the project impact.
Unacceptable LOS to Unacceptable LOS	X		<p>Project sponsor pays fair-share contribution of improvement to bring location to an acceptable LOS, however impact remains significant and unavoidable until full funding is secured. Statement of overriding considerations is needed.</p> <ul style="list-style-type: none"> • If improvement is infeasible to construct or to finance, impact remains significant and unavoidable and statement of overriding considerations is needed. • If improvement requires approval of other agencies or jurisdictions and that approval cannot be verified at DEIR stage, impact remains significant and unavoidable thus requiring a statement of overriding considerations. <p>At locations where the above conditions apply, consideration should be given to mitigation measures that would lessen the significance of the project impact.</p>
		X	Project sponsor pays fee (only represents full mitigation if improvement is fully funded by fee program).

Additional Considerations:

- Near-term mitigation measures should be funded by the project applicant/sponsor, or if fully funded by a fee program, project applicant/sponsor should pay their fee



- Identify alternative mitigation measures, if possible
- Identify measures to lessen impact at locations that can not be fully mitigated (e.g., signal retiming and coordination, delaying project until improvements are built)
- Mitigation concurrency (mitigation measure being implemented concurrently with the project) is recommended
- Other jurisdiction mitigation responsibility – if your project causes a significant impact in another jurisdiction, offer mitigation and request a written response during EIR process. If they accept it, add it as a condition of approval. If they reject it, call impact significant and unavoidable and override. If they make no comment, call impact significant and unavoidable but add it as a condition of approval.

Mitigation measures may include, but are not limited to, the following examples.

1. Roadway Improvements

- Optimize location of access driveway(s)
- Provide additional through traffic lane(s), right-turn lane(s), and left-turn lane(s)
- Improve sight distances at intersections and driveways to acceptable standards
- Provide grade separation of facilities (for very large, major developments only)

2. Traffic Control Modifications (warrants must be met)

- Provide for yield or stop control
- Install new traffic signals
- Upgrade existing traffic signals
- Modify/optimize phasing of existing traffic signals
- Provide coordination/synchronization of traffic signals along a corridor
- Provide turn-lane channelization through raised islands
- Restrict certain turn movements

3. Transit Facilities

- Provide bus turn-outs, bus shelters, additional bus stops, and park-and-ride lots
- Fund increases in transit level of service

4. Parking Facilities

- Design parking facilities to allow free-flow access to and from the street



- Provide adequate off-street parking
- Implement shared parking among complementary land uses
- 5. Pedestrian and Bicycle Facilities
 - Provide for access to, from, and through the development for pedestrians and bicyclists
 - Designate Class I bicycle paths, Class II bicycle lanes, and other facilities
- 6. Land Use Changes
 - Alter development density
 - Alter proposed land use mix
- 7. Travel Demand Management (TDM)
 - Institute flexible employee working hours
 - Institute preferential parking for carpools
 - Encourage employees to use carpools and public transportation
 - Institute Transportation Management Association (TMA)

F. Study Report Contents

Though the extent and content of transportation impact reports will vary according to the needs of the proposed projects, certain guidelines are applicable to all such reports. The following sections shall be included in the traffic study report. Additional sections to the traffic report shall be included as needed/directed by the City Engineer.

1. Introductory Items
 - Front Cover/Title Page
 - Table of Contents, List of Figures, and List of Tables
 - Executive Summary
2. Introduction/Background
 - Project description
 - 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 land uses)
3. 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 and LOS
4. 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 and LOS
 - Findings of project impacts
 - Mitigation measures for project impacts
 - Scheduling and implementation responsibility of mitigation measures
 - Traffic signal and other warrants
5. 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 and LOS
- Traffic signal and other warrants
- 6. Existing Plus Approved Projects Plus Project Conditions
 - Similar content to Existing Plus Project Conditions
- 7. Cumulative 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 and LOS
 - Findings of project impacts
 - Mitigation measures for project impacts
 - Scheduling and implementation responsibility of mitigation measures
 - Traffic signal and other warrants
- 8. Construction Impacts
- 9. Phasing Impacts (for large projects only)
- 10. Appendices
 - List of references
 - List of authors
 - Traffic counts
 - Technical calculations for all analyses



ENDNOTES

- ¹ *(page 6) Trip Generation, 7th Edition*, Institute of Transportation Engineers, Washington, D.C., 2003.
- ² *(Page 6) Trip Generation Handbook, An ITE Recommended Practice*, Institute of Transportation Engineers, Washington, D.C., June 2004.
- ³ *(page 7) Transportation Impact Studies, Advancing the Land Development Process* (Brochure), Institute of Transportation Engineers.
- ⁴ *(page 12) Traffic Access and Impact Studies for Site Development, A Recommended Practice*, Transportation Planners Council, Institute of Transportation Engineers, Washington, D.C., 1991.
- ⁵ *(page 12) Interim Transportation Impact Analysis Guidelines for Environmental Review*, The Planning Group, City and County of San Francisco, January 2000.
- ⁶ *(page 12) Environmental Checklist Form*, California Environmental Quality Act.



APPENDIX A: SAMPLE TRIP GENERATION



**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

- 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
- 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: SAMPLE SITE PLAN REVIEW



RESIDENTIAL SITE PLAN
CONSULTANT RECOMMENDATIONS

Figure B-1





APPENDIX C:

**SAMPLE MINIMUM REQUIRED THROAT
DEPTH CALCULATION**



The minimum required throat depth (MRTD) for the project driveways should be determined using the 95th percentile queue for signalized intersections and the "Two-Minute Arrival" rule for unsignalized intersections. The 95th percentile queue should be determined using acceptable analysis software such as Synchro, TRAFFIX, etc. (Note: The two-minute rule may not work well for some driveways onto arterials because the arterial flow is dependent on upstream and downstream signals. If the driveway allows left-turn egress, the gap acceptance is longer than for right-turns and should be considered. Using SimTraffic or another micro-simulation tool should be considered under these conditions.)

"Two-Minute Arrival" refers to a method described in *A Policy on Geometric Design Highways and Streets*, American Association of State Highway and Transportation Officials, 1994. This method provides vehicle storage based on the number of vehicles expected to arrive during an average two-minute period of the peak hour (with a minimum storage for two vehicles).

MRTD Calculation for Unsignalized Intersection using "Two-Minute Arrival"

Basic Equations

$$\text{Vehicles per 2-minutes} = \frac{\# \text{ vehicles}}{\text{Hour}} \times \frac{1 \text{ hour}}{60 \text{ minutes}} \times 2 \text{ minutes}$$

$$\text{Throat Depth} = \text{vehicles per 2-minutes} \times \text{average vehicle length}$$

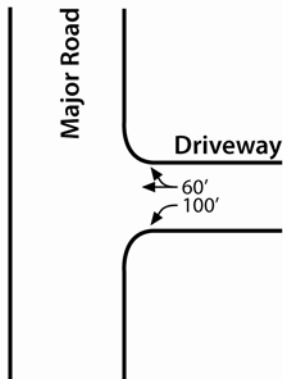
$$\text{MRTD} = \text{Throat Depth rounded up to the nearest 25 feet}$$

Note: The average vehicle length is typically assumed to be 25 feet; however, if trucks are anticipated to represent more than 25% of the vehicle mix, the average length should be increased to 40 feet to account for larger vehicles.



Example

Assuming the following peak hour volumes and lane configurations, and that vehicles are an average of 25 feet in length.



MRTD should be calculated based on the left-turn since this volume is highest.

$$\text{Vehicles per 2-minutes} = \frac{100 \text{ vehicles}}{\text{Hour}} \times \frac{1 \text{ hour}}{60 \text{ minutes}} \times 2 \text{ minutes} = 3.33 \text{ vehicles per 2-minutes}$$

$$\text{Throat Depth} = 3.33 \text{ vehicles} \times 25 \text{ feet} = 83.33 \text{ feet}$$

$$\text{MRTD} = 100 \text{ feet}$$