July 18, 2016

Transportation Impact Analysis Procedures

City of Flagstaff
Engineering Section
211 W. Aspen Ave.
Flagstaff, AZ 86001
928-213-2690

Table of Contents

I. INTRODUCTION

Purpose

Transportation Impact Analysis reports (TIA's) are also sometimes referred to as Traffic Impact Studies. For the purposes of this document, the City of Flagstaff refers to them as Transportation Impact Analysis reports, or TIA's, related to policy emphasis on multimodal transportation. TIA's are required for Site Plans, Rezoning's, General Plan Amendments, and Preliminary Plats. This section presents the analysis process and requirements for completing a TIA to determine the transportation needs of the development and the necessary modifications to the existing transportation system.

One of the City of Flagstaff's primary objectives is to operate and maintain a safe and efficient roadway system. The review and management of development-generated traffic is an integral part of that objective. The TIA procedures, as outlined in this document, have been established for this purpose. The TIA Procedures establish a range of transportation impact study categories based on the characteristics of development and estimated peak hour traffic volumes.

A TIA identifies existing traffic volumes and conditions, development traffic volumes and conditions, and their combined impacts on the existing and future roadway system. The TIA is a useful tool for early identification of potential traffic problems and can play an important role in the success of a development. When insufficient attention is given to the assessment of traffic impacts, on-site congestion and/or congestion on adjacent roadways, or inadequate access capacity limited flexibility to modify the development to eliminate problems or adjust to changed conditions may occur.

The TIA provides an opportunity for the City and the applicant to share information and jointly address traffic related problems. It provides a means of balancing development needs with the functional integrity of the roadways that serve both the development and the surrounding transportation system. The need of a TIA and its scope should be assessed as early as possible in the development process when there is maximum flexibility for mitigating traffic-related problems. The results of the TIA can affect development proposal, so it is important to begin the traffic analysis early and incorporate the TIA recommendations into the development plans.

The procedures contained herein are provided to:

- assist applicants through the approval process by outlining the requirements and level of detail of traffic analysis that is required of them during the approval process
- standardize the types and details of analysis required in the assessment of traffic impacts for developments with similar levels of size and intensity
- ensure consistency in the preparation and review of a TIA through standardization of the reports

These procedures are presented in a sequence that reflects the expected report outline – this introduction is a substitute for the executive summary.

General Information

A TIA is required of all new developments, additions, or expansions to existing developments. For development projects generating less than 100 peak hour trips, a Traffic Statement may be submitted in lieu of a full TIA. In some cases, where there are less than 100 peak hour trips, a TIA may be required when:

- current traffic problems or concerns exist; or
- the public may perceive an adverse impact on the adjacent neighborhoods or other areas; or
- the proximity of site drives to other drives or intersections could create traffic concerns; or
- other specific problems or concerns may be aggravated by the proposed development

Should such conditions arise, the City Traffic Engineer will evaluate the need for the study based on technical merit. Developments processed under previously approved Development Master Plans, site plans, subdivision plats, or rezoning cases with current approvals will not be required to provide a new or revised TIA during the platting or site planning process unless:

- the level of development changes significantly to warrant a new study;
- the adjacent roadway system changes significantly to warrant a new study;
- detailed information for commercial access analysis was not available during the initial development process;
- the access drives or openings are proposed to change;
- there is an increase in intensity of or change in land uses;
- there is an addition of drive-through facilities;
- there is an addition of schools

The need for a revised TIA will be determined by the City Traffic Engineer in accordance with the intent of these guidelines.

The TIA is required to be prepared by a registered professional engineer in the State of Arizona with professional traffic engineering experience. The report shall be bound, signed, and sealed by the registered professional engineer. The TIA is required to be submitted (3-paper copies and 1-electronic copy) with the Development Application package to the Planning and Development Services Section. Additional copies may be required if needed for distribution to other involved agencies impacted by the proposed development. Reviews and comments on TIA reports will follow procedures and standards set as part of the standard Development Review process with the application submittal. Review fees must be submitted at the time of application. Schedules and timelines may be found on the City's webpage under Planning and Development Services. Current review fees can be found in the Flagstaff City Code under section 3-10-001-0002 Engineering User Fees.

When the TIA is approved, it is imperative that the recommendations or requirements of the report are incorporated into the Development application. This will help not only reduce the number of review comments, but also reduce review times, number of reviews, necessary revisions, and resubmittals.

<u>Major Issues Addressed in the TIA</u>

The TIA document will address such issues as:

- the current transportation system and operational characteristics in the site vicinity;

- on-site circulation system and the adjacent circulation system, including collector systems;
- the intensity and character of the development;
- trip generation;
- distribution and assignment estimates; and
- impacts of the development on the existing and planned transportation systems

It is the City of Flagstaff's intent to have an open discussion between staff, the applicant, and the traffic engineering consultant, but prior to the Scoping Meeting it is recommended to have submitted a Pre-Scoping Form. This form can be found on the City of Flagstaff's Transportation Engineering webpage.

Once the Pre-Scoping Form has been received, if needed, the City will run the TransCAD model to determine the trip distribution. A scoping meeting will then be scheduled. At the meeting the model results will be discussed, along with any comments or concerns with the Pre-Scoping Form. The Pre-Scoping Form may need to be revised until a final agreeance can be made. Figure 1 is a detailed flow chart of the TIA review process, while Figure 2 is a detailed flow chart of the Traffic Statement review process. The need for and extent of the study shall be based on the criteria described in these procedures. It is the City's intention to be available to answer questions during the analysis process to minimize the review time and the number of comments. For more information on the preparation of a TIA see Chapter 2 "Site Planning" of the Institute of Transportation Engineers publication "Transportation and Land Development."

It is extremely important that the traffic engineering consultant explain the results and recommendations of the TIA in detail to the applicant prior to submittal of the development package to the City. The TIA includes recommendations that affect the development and could possibly impact its design. The TIA is not meant to be a report submitted to the City simply to meet requirements, but rather a tool used by the applicant to guide the design of a safe and efficient project. Projects submitted to the City that fail to include the results of the TIA on the plan may be returned as incomplete, to be revised and resubmitted for staff review.

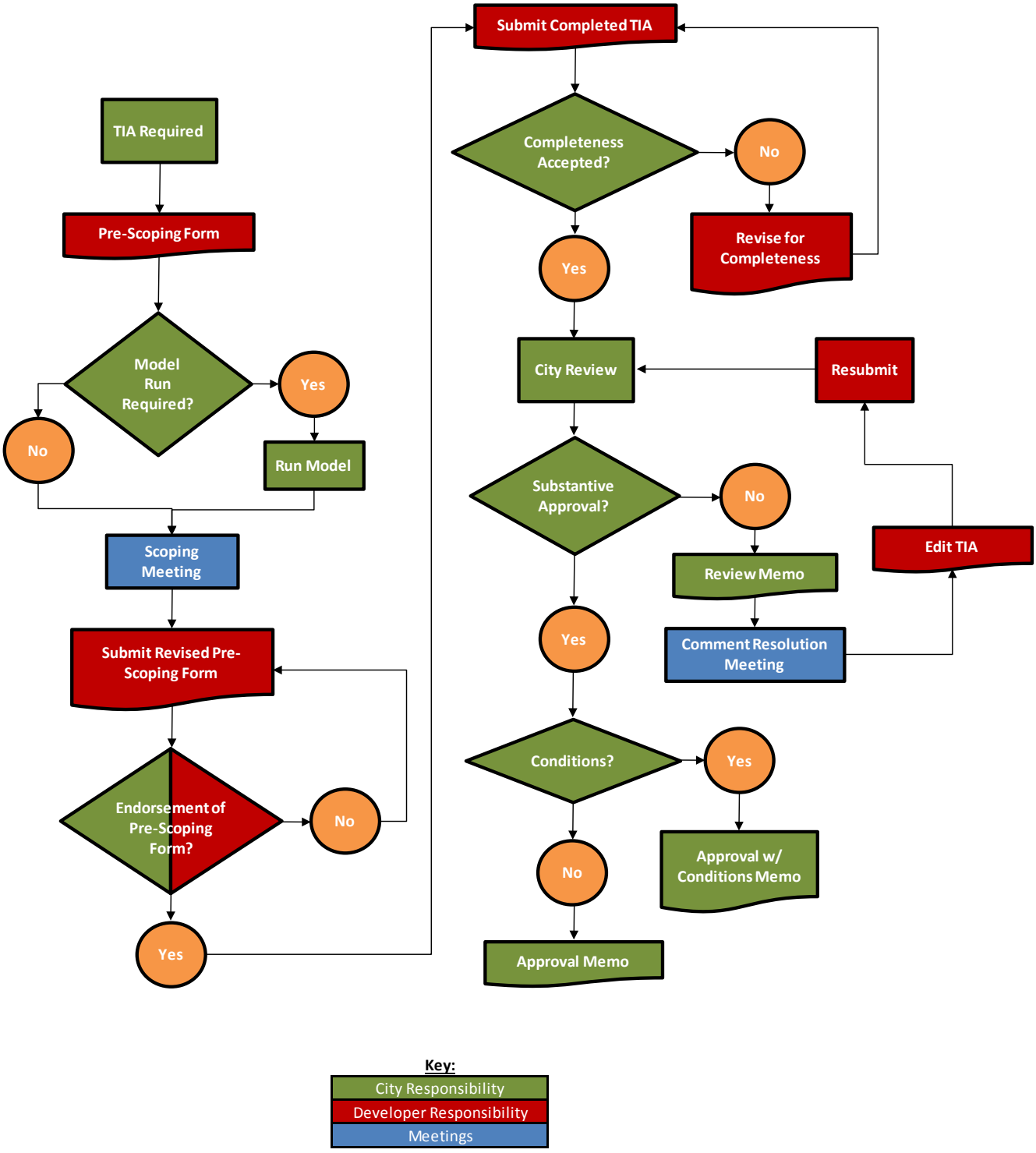

Figure 1. TIA Review Process

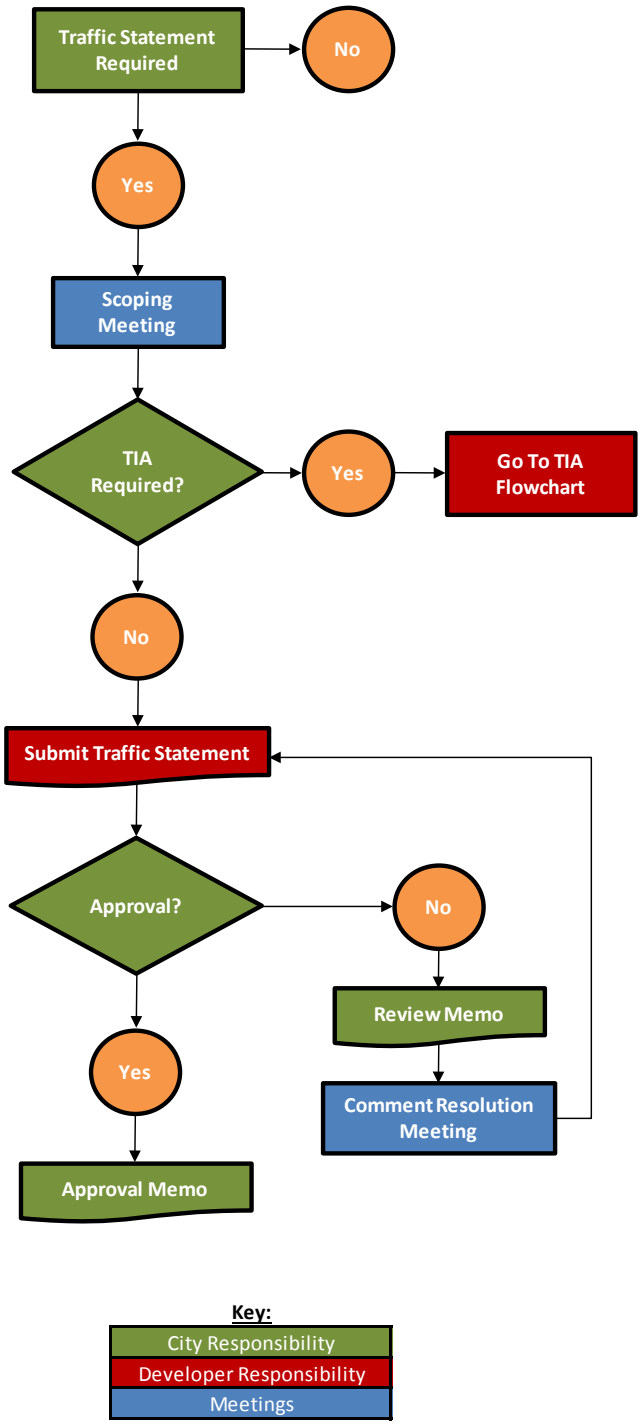

Figure 2. Traffic Statement Review Process

Scope of Analysis

This section describes what size of development or minimum square footages of land uses that warrants the need for a TIA, the levels of categories, and the requirements that must be included in the TIA.

1. Levels of Study

A TIA is required for all projects which generate 100 or more peak hour trips. To quickly estimate if a proposed project will generate enough peak hour trips to require a TIA, please see Table 1. The most recent version of the ITE Trip Generation Manual shall be used for all trip generation calculations in the TIA or Traffic Statement. Rates for additional land uses not listed in Table 1 are found in the ITE Trip Generation Manual. Please be advised that verification of the land use and size, and number of peak hour trips generated, will be required prior to submittal.

This table should be used only to estimate if a TIA may be required and not as the basis for actual trip generation calculations.

Table 1. Traffic Statement and TIA Requirement Thresholds

ITE LUC	Land Use	Trip Rate/unit	Maximum Units For Less Than 100 Trips
	Residential		
210	Single Family	1.02/DU	98 DU
230	Townhomes	0.52/DU	192 DU
220	Apartments	0.67/DU	149 DU
240	Mobile Homes	0.60/DU	166 DU
254	Assisted Living	0.37/Bed	270 Beds
310	Hotel*	0.87/Room	114 Rooms
	Commercial		
911	Walk-in Bank	24.15/1,000 SF	4,140 SF
912	Drive-in Bank	26.70/1,000 SF	3,740 SF
820	Shopping Center*	4.82/1,000 SF	20,740 SF
850	Grocery Store*	18.93/1,000 SF	5,280 SF
851	24-Hour Convenience Store	77.10/1,000 SF	1,290 SF
815	Discount Store*	7.39/1,000 SF	13,530 SF
890	Furniture Store*	0.95/1,000 SF	105,250 SF
812	Lumber Store*	9.58/1,000 SF	10,430 SF
816	Hardware/Paint Store*	11.80/1,000 SF	8,470 SF
841	Auto-Sales*	4.02/1,000 SF	24,870 SF
817	Nursery/Garden Store*	23.39/Acre	4.27 Acres
565	Day Care	0.84/Student	119 Students
843	Auto Part Sales	6.44/1,000 SF	15,520 SF
942	Automobile Care Center	3.51/1,000 SF	28,480 SF
944	Gas Station	15.65/Pump	6 Pumps
491	Racquet Club	4.38/Court	22 Courts
492	Health Club	4.06/1,000 SF	24,620 SF
931	Quality Restaurant*	10.82/1,000 SF	9,240 SF
932	Sit Down High Turnover Restaurant	18.49/1,000 SF	5,400 SF
934	Fast Food with Drive Thru*	72.74/1,000 SF	1,370 SF
	Offices		
710	Office	1.56/1,000 SF	64,090 SF
720	Medical-Dental Office	4.27/1,000 SF	23,410 SF
750	Office Park	1.71/1,000 SF	58,470 SF
770	Business Parks	1.40/1,000 SF	71,420 SF
760	Research & Development	1.90/1,000 SF	52,620 SF

* Weekend peak hour generator

Proposed projects will fall into one of five categories for purposes of TIA's.

LEVEL 1 / TRAFFIC STATEMENT:
If the proposed project generates less than 100 peak hour trips, a traffic statement that addresses trip generation and any site specific issues may be submitted in lieu of a full TIA. These projects are assumed to have impacts only to the adjacent localized transportation system.

LEVEL 2:
The second level includes projects that are deemed to have minor or minimal traffic impacts.

LEVEL 3:
The third level includes projects that have localized and possibly extended impacts to the city's transportation system.

LEVEL 4:
The fourth level includes proposed developments that have significant impacts to the transportation system that extend beyond the vicinity of the site.

LEVEL 5:
The fifth level includes proposed developments that have regional impacts to the transportation system that extend beyond the vicinity of the site, and/or cross jurisdictional boundaries.

These levels are further described below. The study horizon years and study areas are listed in Table 2 and are further described following the table. For those situations where it is questionable as to which level is appropriate, the City Traffic Engineer will make the final determination in writing. The City Traffic Engineer also has the authority to waive the requirement for a TIA for unusual situations that fall outside of the following guidelines, or where the analysis is deemed to be unnecessary based on previous studies or current traffic conditions.

Other issues required to be analyzed in the TIA when applicable include:

- Driveway spacing and design
- Transit – route accommodation, site circulation, and stops
- Pedestrian circulation and/or trail connectivity
- School traffic circulation
- Proximity and potential impacts to nearby residential areas
- Neighborhood connectivity and traffic calming
- Other special conditions and circumstances particular to the development or the transportation system

Table 2. TIA Categories and Study Horizon and Area

TIA Level	Development Characteristic	Study Horizon	Minimum Study Area
1/ Traffic Statement	Development less than 100 peak hour trips	- Opening Year	- Site access drives, if applicable
2	Small development less than 500 peak hour trips	- Opening Year	- Site access drives - Adjacent signal controlled intersections and/or major street intersections without signal control
3	Moderate development 500 - 1000 peak hour trips	- Opening Year - 5 Years after opening	- Site access drives - All signal controlled intersections within 1/2 mile and/or major street intersections without signal control and major driveways within 1/2 mile
4	Large development 1,000 -1,500 peak hour trips	- Opening Year - 20 Years after opening	- Site access drives - All signal controlled intersections within 1 mile and/or major street intersections without signal control and major driveways within 1 mile
5	Regional development greater than 1,500 peak hour trips	- Opening Year - 20 Years after opening	- Site access drives - All signal controlled intersections within 2 mile and/or major street intersections without signal control and major driveways within 1 mile

A NOTE ABOUT TRAFFIC STATEMENTS

A Traffic Statement shall be written and prepared by a registered professional engineer in the State of Arizona with professional traffic engineering experience. The statement can be submitted in letter format, stapled with attachments, and shall be sealed by the registered professional engineer. The statement is required to be submitted with the Development Application package to the Development Services Department and should include the following:

- description of proposed land uses and sizes
- trip generation, daily and peak hour(s)
- driveway design; including location, spacing, access, number of driveways, width, throat length, deceleration lane requirements, number of ingress and egress lanes, etc.
- street description and classification of adjacent streets
- on-site traffic circulation issues and any other traffic safety issues
- impact to traffic signals, if any
- transit, bike and pedestrian facilities and requirements, if applicable

Study Area

The study area will be the roadway segments, intersections, and major driveways as described in Table 2 above. An enlarged study area may be required when the minimum study areas identified in Table 2 do not provide sufficient information to meet the intent of the TIA procedures.

For a Level 4 Regional Development study, the intersections to be analyzed greater than a 1 mile radius within the study area, as described above in Table 2, shall be pre-approved and documented in the Pre-Scoping Form prior to beginning the TIA. To obtain pre-approval, a list of all intersections within the study area will be submitted to the City Traffic Engineer along with a proposed list of intersections to be excluded from study if they are insignificantly impacted by the proposed development.

Study Horizon Years

For the Study Horizon Year, the Opening Year shall mean full occupancy and build-out for single-phase developments. Multi-phase developments may require assessment of horizon year's corresponding to each phase of the proposed project.

For a Level 1, Traffic Statement, the development is assumed to be built out in its opening year, so no horizon year applies.

For a Level 2 study, the traffic analysis will be based on traffic conditions for the build-out or completion year of the development. In some cases, staff may require an additional horizon year if there are significant changes anticipated to the surrounding infrastructure or traffic volumes.

For a Level 3 study, the traffic analysis will be based on traffic conditions for the build-out or completion year of the development, and a minimum 5-year projection from the anticipated build-out date. If the project is a large, multi-phased development, the initial horizon year will be the date that corresponds

to the opening of the first major phase of development. In some cases staff may require an additional horizon year for multi-phase projects or projects with significant changes anticipated to the surrounding infrastructure or traffic volumes.

Level 4 and 5 studies may require that additional years be analyzed for interim phases in addition to the 20-year horizon year.

The study will provide morning and evening peak hour turning movement volumes for each intersection in the study area for the required horizon years. Level-of-service analyses for these peak hour conditions, with and without the site traffic, shall be included in the report.

II. PROPOSED DEVELOPMENT

Introduction

The proposed development should be adequately described so that direct associations with the analysis may be made. The description should "stand alone" from similar descriptions required elsewhere in the development application. As it is anticipated that the evolution of the development proposal and transportation analysis are somewhat iterative, it may be useful to describe some of the site plan adaptations in land use and circulation that have taken place up to the time of submittal.

A. Description of Development

Generally describe the location of the property including parcel numbers and addresses and support this with a vicinity map and site plan/preliminary plat. The vicinity map will show the location of the site within the City. Describe the project in terms of the existing and desired regional plan designation, including area type and place type and/or existing and desired zoning. Provide a table of the expected land uses and intensity and be sure they are in line with the policy and regulatory documents previously described. To conclude this section, describe the different phases and their anticipated timing. Phases should also be illustrated on the site plan/preliminary plat.

B. Description of Study Area Development

Describe the adjacent properties in the same terms. If development proposals are approved but not yet built, site plans/preliminary plats and circulation should be illustrated or referenced.

III. EXISTING AREA CONDITIONS AND PLANNING ENVIRONMENT

Introduction

The applicant is responsible for demonstrating an understanding of the planning and regulatory context in which the development will take place. Further, the applicant will show that development is compliant with those plans and regulations. The applicant will be responsible for obtaining copies of the current Circulation (or Transportation) Element of the Regional Plan for the City of Flagstaff, the City of Flagstaff Engineering Standards, the ADOT Traffic Safety in School Areas manual (as applicable), and any other applicable, governing documents, and report on how the project adheres to the policies and guidelines they contain.

A. Study Area

1. Area of Influence

Refer to Table 2, as modeling may be required by the Engineer. Describe and illustrate the study area. This should include the area of influence as indicated by preliminary expectations for high distribution proportions and large changes in volume on select roadway segments and intersections. Anticipated shifts in traffic patterns influenced by the project's effect on the market could be noted.

2. Area of Significant Impact

Area of significant impact should be identified. These include road segments and intersections anticipated to fall below level of service standards and require mitigation, and those segments and intersections that will drop in level of service but require no mitigation. Also, identify areas where accommodation of any mode is particularly challenging.

B. Study Area Land Use

This is similar in nature to the Site and Adjacent Area descriptions, but takes a more general look at the entire study area.

1. Existing Land Uses

Describe land uses in terms of ITE categories, regional plan categories, area types, and place types.

2. Existing Zoning

Provide a map and general description of the zoning categories that apply to the property.

3. Anticipated Future Development, Land Uses, & Zoning

Provide land use and zoning descriptions for future developments proposed within the area of influence.

C. Transportation Systems and Site Access

Descriptions of transportation systems should be adequate so that the attributes are properly represented in any regional transportation modeling or off-model analysis.

1. Area Roadway System, both Existing and Future

c. Traffic Volumes and Conditions

Describe existing and future roadway systems and their relevant attributes such as classification, number of lanes, and posted speed limit. Provide a general description of the adequacy of the right-of-way to accommodate anticipated improvements. Anticipated improvements should account for pedestrian, bicycle and transit facilities, and any on-street parking. Dedicated public roads that represent on-site and especially through-site circulation should be noted.

The TIA will provide current approach volumes for 24 hours of a typical weekday, and turning movement volumes in 15 minute intervals for the time periods of 7:00 to 9:00 a.m. and 4:00 to 6:00 p.m. for all intersections of streets that are classified as collectors (major or minor) or arterials (major or minor), in the study area. Midday counts may also be required by the City Engineering Department

The report will analyze the peak traffic periods as they occur on the adjacent street system during the morning and evening peak hours. The report will also analyze the peak traffic periods for the development, should these periods occur at different times or on different days from the peak periods of the adjacent street system. Examples include, school impacted sites, sites that have Saturday or Sunday peak hours, etc.

Availability of Background Data: The City of Flagstaff Traffic Engineering Section and Flagstaff MPO conduct annual traffic volume counts and make them available on a state-sponsored website at http://fmpo.ms2soft.com. The applicant will use the most current data, at a minimum. The applicant may not use traffic volume data older than 12 months as current information. If traffic volume data more recent than 12 months is not available, then the applicant is responsible for obtaining the information directly. If data from earlier years is deemed pertinent, the applicant may utilize it to supplement the most recent data.

The City Traffic Engineer will determine the locations of counts. All data will be provided to the City in digital format and is subject to a quality review.

- Peak hour turning movement volumes shall be conducted on Tuesdays, Wednesdays, or Thursdays during weeks not containing a holiday. Counts shall be conducted in favorable weather conditions.
- Counts shall be collected when schools and colleges are in session, but not during the first or last two weeks that the schools and colleges are in session. Counts collected when schools and colleges are not in session shall be approved by the Traffic Engineer, including a methodology for adding historical school traffic volumes to the analysis.
- Turning movement counts shall be collected during AM (7:00 a.m. to 9:00 a.m.) and PM (4:00 p.m. to 6:00 p.m.) peak hours, unless otherwise specified (such as midday or weekend peak periods).
- Counts will include the peak hour factor calculation.
- Roadway volume counts shall be at least 48-hours in duration and include speed and class data.
- A Traffic Consultant shall observe each study intersection during peak hours of analysis and document their observations such as lane utilization, delay, queue lengths in the field, adjacent intersection queues affecting study intersection capacity, etc.

The City has prepared traffic volume projections and can produce interpolations for 5-year increments as needed. This information will be available to the applicant. However, the information will need to be reviewed by the applicant for applicability to the TIA. Adjustment and recalculation may be necessary. In the event that the proposed development is very large (Level 5, in most cases Level 4 and some cases, Level 3) in terms of anticipated traffic generation or in terms of deviation from the Flagstaff Regional Plan land use or zoning designations, comprehensive traffic projection modeling may be necessary.

FUTURE RIGHT-OF WAY BASED ON REGIONAL BUILD OUT DISCUSSION!

The City of Flagstaff, based upon a public records request, will provide copies of approved TIAs prepared for previous proposed developments that may be pertinent to a current analysis. The City will also provide other transportation related reports that may be of assistance. The applicant will be responsible for reviewing these reports and incorporating their data, conclusions, and recommendations where appropriate.

2. Transit and Other Relevant Transportation Systems

a. Transit facilities and services

b. Flagstaff Urban Trails facilities
c. Bicycle facilities
d. Other pedestrian facilities, including crosswalks

Applicant should reference Northern Arizona Intergovernmental Public Transportation Authority (NAIPTA) 5-Year and Long Range Transit Plans, Flagstaff Urban Trail System (FUTS) Masterplan (or latest Regional Plan Map) and expected modal levels of service for the Area and Place Type as they appear in the latest regional plan (**THIS IS PREDICATED ON FRP30 BEING ADOPTED, OTHERWISE THERE ARE NO LOS STANDARDS, JUST THE ENGINEERING STANDARDS RELATED TO THE ROAD).**

IV. SITE TRAFFIC FORECASTING AND TRAFFIC PROJECTIONS

Introduction

This section of the report establishes the estimated and projected traffic volumes created by background traffic and the site. It evaluates which roads the traffic will use and its impact upon them. Site volumes may be adjusted by mode share and other reasons such as anticipated 2nd homes. Mode share is estimated using factors including modal level of service and land use.

A. Site Traffic (Each Horizon Year)

1. Trip Generation

The applicant shall follow the guidelines contained in the most recent edition of the ITE "Trip Generation Handbook: An ITE Recommended Practice." Proposals for deviations from the ITE Recommended Practice should be presented and pre- approved by the City Traffic Engineer prior to conducting the TIA analysis. Generally:

- Rates should be calculated using the average rate or related regression formula when applicable, the latter requiring justification in the report.
- Special consideration should be given for ITE rates based on antiquated data or a small sample and may require additional data collection to determine the appropriate trip generation.
- New rates should be generated using community examples for uses not updated or included in the ITE Trip Generation Manual.
- Trip generation rates other than those included in the ITE Handbook will be required to be studied at three equivalent sites, and compared to similar rates in ITE. Worst case trip generation rates may be required to be used for the TIA analysis.
- All assumptions shall have proper citation and justification for their use in the TIA.
- The use of the 3D's (density, diversity, design) model is allowed to inform project trip generation (and appropriate reductions) from projects in the downtown area, at large TOD's, large activity centers, and at large mixed-use developments.

Occasionally, a development proposal will consist of special or unusual land uses for which typical trip generation rates or equations are not available, or do not apply. Judgment must be applied to identify a land use or combination of land uses that best represent the trip-making characteristics of the site. For any trip generation calculations based on rates not included in the ITE Trip Generation Manual, the reasoning and data used by the applicant in developing a trip generation estimate for a special or unusual generator must be pre-approved by the City Traffic Engineer and explained in the report.

Land Use	ITE LU	Variable	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
			In	*Out*	*TOT*	*In*	*Out*	*TOT*	*In*	*Out*	*TOT*
Retail	820 – Shopping Center	60,000 SF	44	27	71	137	149	285	214	198	412
Supermarket	820 – Shopping Center	140,000 SF	104	63	167	320	347	657	499	461	960
Total Site Generated Trips			148	90	238	457	496	953	713	659	1372
Pass-By Trip Rate			0%	0%	0%	34%	34%	34%	26%	26%	26%
Pass-By Trips			0	0	0	155	169	324	186	171	357
Total Primary Trips			148	90	238	302	327	629	528	488	1015

Figure 3. Example Trip Generation Table

Pass-By Trips: No pass-by trip reductions are allowed unless justified to and approved by the City Traffic Engineer during scoping. It is usually assumed that all trips entering and exiting a new development are new trips that were not made to or through the area prior to the development being completed. However, for some non-residential developments, a portion of these trips may be "captured" from trips already being made to other existing developments on the adjacent street system, or they may be merely passing by on the way from one place to another. The driveway volume for a new development may, therefore, be significantly different from the amount of traffic added to the adjacent street system. For example, retail establishments, restaurants, banks, service stations, and convenience markets attract people from the passing stream of traffic; these are known as pass-by trips.

ITE's Trip Generation Handbook contains discussions and references on the issue of pass-by trips. Because of the limited data available, adjustments for pass-by trips should be applied carefully. If pass-by trips are a major consideration, studies and interviews at similar land uses must be conducted or referenced.

Internal Capture: Internal trip capture is the portion of trips generated by a mixed-use development that both begin and end within the development. The importance of internal trip capture is that those trips satisfy a portion of the total development's trip generation and they do so without using the external road system. Mixed-use developments—single projects that include different integrated, complementary, and interacting land uses such as office, retail, restaurants, entertainment, and/or hotels are a growing trend in land use development. Many mixed-use developments also have increased levels of internal connectivity—walkways or internal streets or drives, and the sharing of parking—use of the same on-site parking lots by users of different buildings. As a result, it is important to know for a mixed-use development how much of the trip generation uses the public street system to reach off-site destinations and how much stays within the development without using external roads. The Institute of Transportation Engineers (ITE) produced its *Trip Generation Handbook* (*1*) in part to aid analysts in estimating trip generation for mixed- and multi-use developments. It is important to note that a single development must contain distinct ITE land uses to qualify for internal capture. Shopping centers and malls have a single ITE code despite multiple uses, so do not quality.

2. Trip Distribution and Assignment

The directions from which traffic will access the site can vary depending on many factors, including:

1. The type of proposed development and the area from which it will attract traffic
2. The presence or absence of competing developments within the same market area
3. The size of the proposed development, and
4. The conditions on the surrounding street system

The influence area of the development needs to be identified for the site. Ideally, the influence area should contain approximately 80% of the trip ends that will be attracted to the site. If a market study is available, it should be used in establishing the influence area. Otherwise, an influence area should be established based on a reasonable documented estimate. See Section III.A Study Area. The influence area will almost always be larger than the Study Area.

The three most common methods for estimating trip distribution are by analogy, model, and surrogate data. In most cases, a surrogate data method can be utilized for developing the trip distribution. Utilizing this procedure involves using socioeconomic and demographic data to establish population or employment land use distributions around the site. In most cases, population can be used as the basis for estimating distribution of office, retail, and entertainment trips; employment is a reasonable surrogate for residential trips, and other trips can be similarly distributed using logical surrogates. For horizon years, land use estimates based on the city's General Plan should be utilized.

For some large-scale developments, a trip distribution model should be utilized to estimate site trip distribution. The gravity model portion of the regional transportation forecasting model is available for this purpose. In the event that the applicant's consulting engineer believes that the specifics of the project will materially change the distribution, then these changes should be justified to and approved by the City Traffic Engineer and documented in the report. A consequence of failing to bring these changes to the attention of the City early in the process may be a delay due to possible rejection of the distribution changes and any work done by the applicant based on those rejected changes.

Assignment of trips to specific roadways can be performed through use of the regional traffic forecasting model or by surrogate data. The latter should consider posted speed limit, current and projected levels of congestion that will influence travel time, and ease of access to the projected distribution areas.

The City in partnership with the Flagstaff MPO maintains a regional traffic model for base year and future forecast conditions. After the project land uses and network changes have been submitted to the City several model runs will be produced. The following describes the models and how, after consultation with the City Traffic Engineer, they may be used to develop the TIA:

- Existing Conditions (base year) – Calibrated against current year traffic volumes, together with traffic and turn movement counts used to assess peak hour LOS analysis and available capacity.
    - Applicable to all TIA categories

    - Off model or after model adjustments may be necessary where model calibration is weak within the Study Area
- Existing plus Project Conditions – The land uses for project build out and network changes will be added to the existing conditions (base year) model. One or more traffic analysis zones unique to the project will likely be added to the model to isolate impacts. Trip generation using rates coded in the model will be applied and trip distribution reported out of the model. When compared to the previous scenario the link level LOS analysis will assist in defining facilities particularly sensitive to the impacts of the project and will be used in defining the Study Area limits.
    - Applicable to TIA categories 2 and above
- Near Term Analysis (Previous scenario plus Approved and Pending Development and Public Capital Projects). Other development projects for which a complete application has been received or which have been reasonably scoped and analyzed plus public capital projects programmed in the next 3-5 years will be added to the model. The results will be used to evaluate changes in trip distribution patterns and cumulative impacts to LOS. Together with the previous analysis proportional shares can be evaluated.
    - Applicable to TIA categories 3 and above
- Horizon Year Conditions – Background Traffic – (Interpolated growth to Horizon Year from base year to Regional Build Out without Project). This will be used to determine the level of background traffic projected to be present at the time of build out of the applicant's project.
    - Applicable to TIA categories 3 and above
- Horizon Year plus Proposed Project Conditions – Project traffic added to the previous scenario and LOS analysis. This will be used to help in the assessment of when capacity poses limits to the proposed development and how and when capacity will be addressed.
    - Applicable to TIA categories 3 and above
    - If any phasing is to take place, then such phasing should be studied at the appropriate build out year in addition to the above scenarios.
    - Trip distribution to affected ADOT freeway interchanges identified in the regional plan shall be evaluated for the proposed project.
- Regional Build Out Model - This model will reflect land use and transportation systems build out in the adopted regional plan including assumptions about external trips. This model serves two primary purposes. First, as the basis for interpolation of Horizon Year background traffic and; second, to aid in determining ultimate system right-of-way needs in, and adjacent to, the project.
    - Applicable to TIA categories 3 and above

Redevelopment Projects: Since the purpose of the impact study is to evaluate a development proposal's impact on the transportation system, redevelopment projects require some special analysis. In the case of redevelopment projects, existing site-generated trips should be subtracted from existing and horizon year off-site traffic. The traffic generated by the proposed development is then added to the adjusted off-site traffic according to the above procedures to determine the impacts on the transportation system.

The applicant will establish the existing site generated trips through the collection of driveway counts. If the redevelopment area is substantial, or for some other reason does not lend itself to the collection of driveway counts for this purpose, trip generation rates may be applied to establish the existing site generated trips.

3. Modal Split

Modal split can be performed through use of the regional transportation forecasting model or through reasonable conclusions drawn from the latest Trip Diary Survey and projected levels of service for other modes serving the site.

B. Background Traffic (Each Horizon Year)

1. Method of Projections
2. Non-Site Traffic for Anticipated Development in Study Area
    a. Method of Projections
    b. Trip Generation
    c. Trip Distribution
    d. Modal Split
    e. Trip Assignment
3. Through Traffic
4. Estimated Volumes

Estimates of non-site traffic are required for a complete analysis of horizon-year conditions. These estimates represent the "base" conditions, that is, without the site development. There are two principle methods of projecting offsite traffic that are acceptable: use of area-wide modeled data and trends or growth rates. Each method has its appropriate use depending on the availability of data and the size of the proposed development.

Growth rates can be determined from historical data. Annual traffic count data in the City of Flagstaff from previous years is available on the state-sponsored website. Modeled data for 20-year projections are available from the Flagstaff Metropolitan Planning Organization (FMPO). In those cases where this data is not available, the City will determine if the data needs to be produced for an adequate analysis, or if a trends analysis will suffice.

Future traffic demand estimates are developed by adding the estimated site generated traffic, all approved (or potential) development in the area, and current traffic volumes adjusted for general growth in the area. The applicant will determine the levels of service in the study area based on the non-site traffic for the horizon year.

The FMPO has traffic volume projections available to the applicant. However, the information will need to be reviewed by the applicant for applicability to the TIA. Adjustment and recalculation may be

necessary. In the event that the proposed development is very large (Level 5, in most cases Level 4, and some Level 3) in terms of anticipated traffic generation or in terms of deviation from the Flagstaff Regional Plan, comprehensive traffic projection modeling may be necessary. All such adjustments should be made in consultation with the City Traffic Engineer or his designee and documented.

V. TRAFFIC ANALYSIS

Introduction

This section describes the analytical techniques used to derive the study findings, conclusion, and recommendations. Capacity analysis must be performed at each of the major street and site access intersection locations (signalized and unsignalized), as well as transportation links located within the study area. In some cases, there may be a need to analyze additional critical intersections or segments located outside the study area. These will be identified in the scoping letter.

A. Level of Service Goals

The City of Flagstaff set a standard level of service (LOS) D as defined by the current edition of the Highway Capacity Manual for intersections and segments. For intersections already performing below LOS D, development impacts may not reduce LOS below E.

B. Level of Service and Capacity Analysis Guidance

1. Guidelines

The evaluation of traffic operating conditions is referred to as level of service (LOS). The assessment of LOS is based on the quantitative effect of factors, such as speed and volume of traffic, geometric features of the roadway or intersection, traffic interruptions and delay, and freedom to maneuver.

The total traffic estimate from the preceding section will serve as the foundation for this analysis. For each analysis period being studied, a projected total traffic volume must be estimated for each segment of the roadway system being analyzed. These projected total traffic volumes will be used in the capacity analyses. The TIA must clearly depict the total traffic estimate and its site and non-site traffic components. Projected daily traffic volumes must be determined for all major streets within the study area as well.

Once the total traffic volume estimate has been established, capacity analyses will be performed. In some cases, the projected demand may be unrealistically higher than the capacity available on the existing or proposed transportation system components. In those cases where improvements are not feasible, an adjustment may be necessary in the site and/ or background traffic to reflect realistic traffic diversion caused by capacity restraint. In such cases, the traffic components on all adjusted segments must be added again to obtain a more realistic total traffic projection. The original traffic estimates and specific reference to trip diversion shall be included in the report as an appendix.

The analysis is intended to show the relationship between operations and geometry and to assess deficiencies, as well as to identify alternatives for further consideration. This requires the identification of impacts, needs, and deficiencies. Capacity Analysis Software that accurately replicates the current HCM computations may be used in lieu of manual computations.

Assumptions should be verified, as well as checking default values. Synchro software is also acceptable where appropriate. Include the full HCM-style report including input and output values in the appendix

C. Traffic Signals and Unsignalized Intersections Capacity Analysis

1. Turn Lanes, both Right and Left Turn Lanes—Include Table of Existing, Required, and Proposed

1. Signalized Intersections

Signalized intersection level of service will be determined utilizing the methods contained in the Highway Capacity Manual (HCM), 2000 or most recent edition. Two methods (operational and planning) are used for the analysis of signalized intersections.

The operational analysis requires detailed information on all prevailing traffic, roadway, and signalization characteristics. It provides for a full analysis of capacity and level of service and can be used to evaluate alternative traffic demands, geometric designs, signal plans, or all three. This analysis should start with the use existing signal timing plans if available.

If not available, then:

- Minimum split time for protected left-turn phase shall not be less than 12 seconds if volumes warrant the need.
- Minimum pedestrian times should be satisfied on all phases with pedestrian phase for signals modeled as coordinated signals.
- For study intersections modeled as actuated, uncoordinated signals, the intersections shall be evaluated with at-least 10 pedestrian calls per hour in the Existing + Project and Future Conditions, if pedestrian projections are not available.
- LOS calculations should be conducted using the natural cycle lengths. The cycle lengths should remain constant for comparison purposes unless the project is changing the character of the intersection and it is noted in the report.
- In instances where signalized intersections are coordinated, coordinated cycle lengths should be determined based on the natural cycle lengths of the coordinated signals and shall be used for evaluation purposes.
- All-Red time(s) shall equal 1.0 second or greater.
- Yellow time shall equal 3.5 seconds, or greater based upon the approach speeds.

Where existing traffic volumes are collected and peak hour factors are available, then LOS calculations for Existing Condition scenarios and the near-term scenario should use available peak hour factors provided the traffic counts are included in the Appendix. For all cumulative scenarios and existing conditions where peak hour factors are not available, factors as per the HCM shall be used and shall be consistent throughout the cumulative scenarios and peak hours.

All assumptions and defaults used shall have proper citation and justification for their use in the TIA. Existing storage lengths shall be entered as input data if LOS calculations are conducted using Synchro.

When more distant horizon years are studied or critical variables are missing, such as when anticipating upcoming planned or assumed development, it may be necessary to conduct a planning analysis.

The planning analysis only addresses capacity because it is not necessary or practical to perform detailed calculations of delay given the accuracy of the data that are generally available for planning purposes. The planning method generates two important products:

(a) a projection of the status of the intersection with respect to its capacity,
(b) an approximation of a signal timing plan,
(c) segment capacity including number of through and auxiliary lanes

Combining this approximation with appropriate values for other parameters used in the operational analysis, it is possible to extend the planning analysis into the level of the operational analysis.

2. Unsignalized intersections

Unsignalized intersection level of service will be determined utilizing the methods contained in the Highway Capacity Manual (HCM), current edition. Procedures have been developed to analyze both 2-way stop controlled intersections and all-way stop controlled intersections. Each of these analysis methods is further divided into analysis of 4-way intersections and T-intersections.

The need for the construction or improvement of turn lanes including an analysis of storage capacities will be determined for all intersections in the study area.

D. Arterial Level of Service

In most cases, the capacity of an arterial street is dictated by the signalized intersections operating along its length. The analysis procedures described in the HCM rely on the results of the analysis methods above as a part of the input. Planning applications may use the entire arterial methodology, in a straightforward but somewhat simplified way, by computing stopped delay using certain default values as outlined in the signalized intersection analysis section. A reasonable estimation of the intended signal timing and quality of progression is vital to this process.

E. Traffic Safety

The applicant will work with the Arizona Department of Transportation Traffic Data Records to obtain the crash data in the study area for the past three-years. The TIA will identify high accident areas, whether development traffic aggravates pre-existing or creates new conditions, and, if so, the means by which the development will address them.

VI. SITE SPECIFIC TRAFFIC ANALYSIS

Introduction

An integral part of an overall traffic impact study relates to basic site planning principles. It is extremely important that off-site roadway improvements be fully integrated with on-site recommendations. In addition to capacity analysis, several other transportation service-related factors shall be considered, including:

- Safety
- Parking needs and circulation patterns
- Traffic control needs
- Turn lanes (left, right, dual, deceleration, etc.)
- Driveways, including spacing, location and design
- Access management strategies
- Transportation demand management
- Neighborhood impacts
- Pedestrian and bicycle circulation including access to transit
- Service and delivery vehicle access and circulation

Approach to Site Planning: Internal design will have a direct effect on the adequacy of site access points. The identification of access points between the site and the external roadway system, and subsequent recommendations concerning the design of those access points, is directly related to both the directional distribution of site traffic and the internal circulation system configuration. It is clear that driveway traffic volumes of varying sizes need to be accommodated on the site in terms of both providing sufficient capacity and queuing space, and of distributing automobiles to and from parking spaces, pick-up/drop-off points, drive through lanes, and adjoining properties where appropriate. An integrated system should deliver vehicles from the external roadway system in a manner that is easily understood by drivers, maximizes efficiency, accommodates anticipated traffic patterns, and ensures public safety. Pedestrian linkages should conveniently and safely connect transit stops, roadway intersections and parking facilities with building entrances. Similar linkages should be provided between buildings.

A. Site Access & Design

Requirements for access to the public street system are detailed in the City of Flagstaff Engineering Standards. Modifications will only be granted according to the process outlined in the Engineering Standards. The Engineering Standards provide requirements for driveway and side street spacing, appropriate sight distances, location, median openings, signal spacing and other access management principles.

Joint access (the sharing of a driveway by two or more properties) is desirable. Such driveways should be located on joint property lines or be accessible via cross - access easements on the private property being served by the joint driveway. Joint driveways may be required to provide two or more parcels appropriate access to the adjacent street system that would otherwise be restricted when full or safe connections to adjacent roadways cannot be provided to an individual parcel.

1. Driveway Design

Analysis should review spacing between driveways, distance to nearest driveways adjacent to and across the street from the site, and spacing of off-set driveways across the street from the site and location with respect to intersections (signalized and non-signalized). Driveway locations should be reviewed for appropriateness and alignment with parking lot layout and intersecting drive aisles. Driveway width should be analyzed for necessary turning radii, truck turning movements, and ingress and egress lanes. Driveway length should be reviewed for minimum throat length needed to accommodate all inbound traffic safely on-site without back-ups of traffic onto the intersecting street, and to accommodate all outbound traffic queued at driveway to exit without blocking intersecting drive aisles, median openings or parking spaces. The effective length of a vehicle shall be measured in increments of 25-feet.

2. Vehicular Queuing Storage

Adequate internal and external vehicle queuing storage is essential to providing safe and efficient access and circulation. Queuing analyses must be included to demonstrate the adequacy of the proposed storage lanes, for all turn lanes, drive-throughs, and drop-off/pick-up zones. The effective length of a vehicle shall be measured in increments of 25-feet. For all right and left turn lanes, a table shall be provided in the TIA that summarizes the existing (if applicable), required (as calculated per the TIA), and proposed storage lengths for all driveways and intersections analyzed.

B. Drive - Through Queuing

Drive-in and drive-through establishments must be provided with adequate queue storage capacity to accommodate normal peak queues. Since many of these businesses have major daily or seasonal variations in activity, peaking characteristics should be carefully evaluated.

C. Deceleration Lane Analysis

At driveways on arterial and collector roadways, deceleration lanes may be required. Additional right-of-way may also be required to accommodate the deceleration lanes. To determine the need for a deceleration lane please refer to Chapter 10 of the Engineering Standards.

At the discretion of the Traffic Engineer or their designee, a deceleration lane may be required regardless of the minimum criteria if site specific conditions warrant the addition of such a lane. In no event shall adjacent driveways be located within the area of the deceleration lane and the required taper lengths unless specifically approved by the Traffic Engineer.

1. Deceleration Lane Length

The length of a deceleration lane shall be based on a queuing length calculated from an average 2-minute period within the peak hour. The minimum queue length shall not be less than space required for two (2) vehicles, where the effective length of a vehicle shall be measured in increments of 25-feet. The total length (taper plus stacking) shall not be less than the minimum length required to accommodate the queuing length plus the braking distance plus the taper length.

The type of vehicles used in the calculation shall depend solely on the type of facility being studied accounting for 10% truck traffic (minimum of one) where applicable.

D. Site Circulation

Internal circulation is the means by which vehicular traffic is delivered between entry points and parking areas, pick-up/drop-off points, and service areas. Internal circulation should permit access between all

areas. This circulation should be designed to safely and efficiently deliver vehicles and pedestrians to their respective destinations. Parking lot layouts and on-site traffic control should be reviewed for safe circulation. Recommendations for traffic control should be made as appropriate.

1. Emergency, Service, and Delivery Vehicles

Emergency, service, and delivery vehicles require separate criteria for movement to and from the site. The applicant will identify the design vehicle. Of particular interest is that adequate turning paths are provided for large emergency and delivery vehicles to allow entry and exit without encroaching upon opposing lanes or curbed areas. In addition, sufficient storage areas and loading zones must be provided so that delivery vehicles do not hinder the use of parking and circulation routes for other visitors to the site. Detail design is not required as part of the TIA but will be required during site plan development.

A minimum of one driveway for all proposed projects with commercial or industrial uses shall be designated as truck delivery access drives and shall meet the minimum turning path needed for the development, without requiring maneuvering into more than one traffic lane within the public roadway. Additional driveways may be required to meet this criteria when determined by the Traffic Engineer based on local conditions.

2. Pedestrian, Transit, Bicycles, and Accessible Facilities

Overall site plans must consider public transportation, pedestrians, bicyclists and those with disabilities. Adequate facilities for parking bicycles shall be included. Transit facilities, park-and-ride, and shuttle bus staging areas should be provided as appropriate for the development. Where provided, these facilities should be located adjacent to the service drive and entrance locations, at key locations along circulation drives, or at major pedestrian focal points along the external roadway system.

Pedestrian connections between these facilities and the site's buildings must be integrated into the overall project design and provide maximum accessibility through the use of sidewalk ramps, etc. These connections must also be provided to the public sidewalk and path or trail systems surrounding the site. Pedestrian connections to nearby trail systems will also be required. Pedestrian circulation should be comprehensive and provide connections between all buildings, and from all streets, signals and transit stops into the site.

- Pedestrians and Bicycles: The site plan should be reviewed to ensure that the internal circulation system and external access points are designed for pedestrian safety and to minimize vehicle/pedestrian conflicts. Locations for transit stops and their associated pedestrian flows to building access points require thorough assessment to ensure safety. Similarly, pedestrian flows to and from parking facilities need careful consideration during site planning, which often requires detailed information on the project's use and layout.

  These considerations should also be addressed for projects expected to generate significant bicycle traffic. Bike racks, long-term bike lockers, and facilities for employees to change clothes and shower should be considered.

- Transit: Transit standards are provided in the Engineering Standards. There are two types of transit stops: bus pull-out bays typically on the departure side of signalized intersections, and bus stop pads where no pull- out bay is required. Specific standards and design details for bus pull-outs are found in the Flagstaff Engineering Standard Details.

E. Schools

For locations where schools are proposed, site specific analysis of the school site plan will be required that includes the following:

- Safe Walking Routes to School
- Crossing Locations
- Traffic Control
- Traffic Calming
- Driveway Locations
- On-Site Drop-off/Pick-up—to maximize effectiveness of on-site queuing and eliminate back-ups onto public streets
- Pedestrian & Bicycle Circulation
- Bus Circulation
- Conformance with the ADOT "Traffic Safety for School Areas" Manual.

These items will be summarized in a separate *School Traffic Management Plan* signed by the school administration and that will remain on file at the City.

F. Traffic Calming

The City of Flagstaff Engineering Standards incorporates traffic calming into the street design elements of residential local streets. When appropriate, however, other traffic calming features may be necessary as a result of physical, property rights, or other constraints. Chapter 10 of the Standards includes a list of traffic calming features that may be used in those instances.

VII. PUBLIC IMPROVEMENTS ANALYSIS

Introduction

In this section the applicant will provide an overview of the general capital improvements program environment within which the site-generated needed improvements will take place. This section will also include a discussion of publicly funded improvements scheduled within the horizon years and reasonably anticipated privately funded improvements within the Study Area. In effect, details on project funding and timing will be provided here that go beyond the "Existing Conditions" section. In addition, the applicant will briefly describe alternative mitigation strategies considered and why they were rejected.

A. Improvements to Accommodate Horizon Year Background Traffic

1. Status of Improvements Already Funded, Programmed or Planned

Provide a description of projects relevant to serving background traffic as they are reported in state and local capital improvement programs and plans. Assess their delivery schedule within the

context of the application's phasing. Relevant improvements to be delivered by private development projects may be listed if bonds or other means exist to guarantee their delivery.

2. Additional Improvements to Accommodate Background Traffic
Identify system improvements needed to address background traffic levels beyond those already programmed. If projects are planned, but not programmed, and are relevant to addressing background traffic or other transportation needs, list those and any information related to anticipated funding sources. Private development proposals that will be required to contribute all or parts of the transportation system but for which no financial assurances exist should be identified here. This should include levels of detail not included in planning documents such as intersection geometry and signal improvements.

NOTE: Applicants may not utilize capacity created by planned, but unfunded, improvements or improvements outside the first year of the city capital improvement program unless cost-sharing arrangements by the applicant are agreed to.

B. Additional Improvements to Accommodate Site Traffic

1. Localized improvements consist of modification, expansion, and in some cases addition of roadway facilities in the immediate vicinity of the proposed development. The scope of these improvements will be consistent with the LOS criteria established above. They will address specific site and through traffic needs, and will be compatible with the city's long-term improvement plans.

2. Network (Off site) improvements recognize that individual developments and increasing traffic volumes are part of the long-term growth of an area. Roadway improvements associated strictly with any given development may not necessarily address the long- term needs of the rest of the region on a systematic basis, and thus not address overall transportation system needs. Therefore, a section of the TIA will address compatibility with the existing and planned infrastructure.

C. Evaluation of Alternative Improvements

Briefly describe alternate solutions considered and the reasons for their rejection. Examples might include intersection solutions like roundabouts versus signalization; pedestrian connectivity treatments such as mid-block, signalized or grade-separated facilities; a variety of access management solutions; other network connections considered.

D. Travel Demand Management Strategies

If adequate transportation improvements cannot be reasonably recommended, consideration should be given to reducing trip generation during problem periods by reducing the project magnitude or altering the land use mix or mode share. For some projects, redevelopment projects in particular, mitigation alternatives may include transportation demand management measures, including, but not limited to transit, bicycle, and pedestrian improvements.

E. Implementation Schedule

Within the final phase of the study, all analyses are reviewed and re-assessed to best respond to the actual transportation needs of the project and the adjacent area. Results must be placed in logical

perspective and sequence. It is important to make recommendations for improvements within the appropriate time perspectives. Recommendations should be sensitive to the following issues:

- Timing of short-term and long-term network improvements that are already planned, scheduled, and/or funded.
- Time schedules of adjacent developments.
- Size and timing of individual phases of development. See notes on "Phased Developments" below:
- Right-of-way needs and availability of additional rights-of-way within appropriate time frames.
- City priorities for transportation improvements and funding.
- Cost-effectiveness of implementing improvements at a given stage of development.
- Necessary lead-time for design and/or environmental, right-of-way and utility clearances if relevant.

1. Phased Development

In high-growth areas, particularly when large developments are being analyzed, it is important to determine the impact of individual phases of the development. This procedure becomes necessary in situations requiring applicant provision of, or contribution to, improvements. In such cases, the following analyses should be completed:

- Levels of service under existing conditions.
- Levels of service for future horizon dates, with anticipated background traffic growth. Committed City improvements should be included for each horizon year in the analyses. Additional improvements necessary to attain minimum LOS D for base conditions should be identified (by others or by City)
- Levels of service including site generated traffic for horizon years without proposed additional improvements to local and regional roadways beyond those identified in step 2.
- Levels of service including site generated traffic for horizon years with proposed additional improvements to local and regional roadways beyond those identified in step 2.

VIII. DEVELOPING CONCLUSIONS & RECOMMENDATIONS

Introduction

Purpose and End Uses: The purpose of the TIA is to identify and measure the effects of a proposed development on the surrounding transportation system, and determine appropriate measures necessary to mitigate those impacts. The applicant will also be able to utilize the report to evaluate their development proposal and site plan design. The City will also utilize the report in reviewing the impacts of proposed developments in conjunction with requests for annexation, land subdivision, zoning changes, building permits, or other development reviews.

The results and recommendations of the TIA should be reviewed by the owner and applicant prior to submitting to the City of Flagstaff with the development package, and ensure that the recommendations and improvements are included in the proposed project and the site plan. In most cases, results of the TIA impact the design of the development, and are required to be incorporated as an integral part of the site development.

Please follow the sample report outline at the end of this document and any instructions provided by the Transportation Engineering Program staff when completing the analysis and report. Incomplete reports will be returned to the applicant for completion prior to a full review of the analysis.

This section is a summation of the previous sections and follows this outline:

TIA Report Section Outline

Section VIII. CONCLUSIONS & RECOMMENDATIONS

A. Summary of Findings
    1. Traffic Impacts
    2. Need for Improvements
    3. Compliance with Applicable City of Flagstaff Requirements and Codes
B. Site Accessibility/Circulation Plan
C. Roadway Improvements
    1. On-Site
    2. Off Site
    3. Phasing, if Applicable
    4. Summary of Improvements Based on Background Traffic vs. Based on Site Generated Traffic
D. Other Transportation Mode Systems

Sample Report Outline: A sample outline structure may be found at the end of the document. It provides the framework for a Transportation Impact Analysis Report. Studies that follow this outline will be easily documented; however, additional sections may be warranted because of specific issues to be addressed and/or the results of the study. Likewise, inapplicable sections listed in the outline may be noted as "not applicable" in the report, but the outline format should be retained.

Appendices: All appendices and attachments must be included as hard copies with the report. Appendices should be separated by labeled tabs.

TIA REPORT OUTLINE

I. EXECUTIVE SUMMARY

II. PROPOSED DEVELOPMENT
- A. Description of On-Site Development
  - 1. Location
  - 2. Site Plan/Vicinity Map
  - 3. Zoning
  - 4. Land Use and Intensity
  - 5. Phasing and Timing
- B. Study Area Development

III. EXISTING AREA CONDITIONS AND PLANNING ENVIRONMENT
- A. Study Area *NOTE: Clearly state what Level TIA*
  1. Area of Influence
  2. Area of Significant Impact
- B. Study Area Land Use
  1. Existing Land Uses
  2. Existing Zoning
  3. Anticipated Future Development, Land Uses & Zoning
- C. Transportation Systems and Site Access
  1. Area Roadway System, both Existing & Future
     - a. Roadway classifications & Posted Speed Limits
     - b. Right-of-Way, existing and required
     - c. Traffic Volumes and Conditions
  2. Transit and Other Relevant Transportation Systems, both Existing & Future
     - a. Transit facilities and services
     - b. Flagstaff Urban Trails facilities
     - c. Bicycle facilities
     - d. Other pedestrian facilities, including crosswalks

Section IV. SITE TRAFFIC FORECASTING AND TRAFFIC PROJECTIONS
- A. Site Traffic (each Horizon Year)
  1. Trip Generation
  2. Trip Distribution and Assignment
  3. Modal Split
- B. Through (or Background) Traffic (each Horizon Year)
  1. Method of Projections
  2. Non-Site Traffic for Anticipated Development in Study Area
     - a. Method of Projections
     - b. Trip Generation
     - c. Trip Distribution
     - d. Modal Split
     - e. Trip Assignment
  3. Through Traffic

4. Estimated Volumes

Section V. TRAFFIC ANALYSIS

A. Level of Service Goals
B. Arterial Level of Service and Capacity Analysis Guidance
C. Traffic Signals and Unsignalized Intersections
    1. Turn Lanes, both Right and Left Turn Lanes—Include Table of Existing, Required, and Proposed
D. Arterial Level of Service
E. Traffic Safety

Section VI. SITE SPECIFIC TRAFFIC ANALYSIS

A. Site Access & Design
B. Drive-through Queuing and Stacking Requirements—Include Table if needed
C. Deceleration Lane Analysis—Include Table of Required and Proposed Lanes
D. Site Circulation, On-Site Traffic Control, Parking
E. Schools
F. Traffic Calming

Section VII. PUBLIC IMPROVEMENTS ANALYSIS

A. Improvements to Accommodate Horizon Year Background Traffic
B. Additional Improvements to Accommodate Site Traffic
C. Evaluation of Alternative Improvements
D. Travel Demand Management Strategies
E. Implementation Schedule

Section VIII. CONCLUSIONS & RECOMMENDATIONS

A. Summary of Findings
    1. Traffic Impacts
    2. Need for Improvements
    3. Compliance with Applicable City of Flagstaff Requirements and Codes
B. Site Accessibility/Circulation Plan
C. Roadway Improvements
    1. On-Site
    2. Off Site
    3. Phasing, if Applicable
    4. Summary of Improvements Based on Background Traffic vs. Based on Site Generated Traffic
D. Other Transportation Mode Systems