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SECTION 2 – TRAFFIC IMPACT ANALYSIS

2.1.0 GENERAL

The following guidelines for a (TIA) are intended to supplement the requirements of Chapter 11, Zoning, City of Round Rock Code of Ordinances, 1995 edition.

2.2.0 ADMINISTRATIVE REQUIREMENTS

The applicant is responsible for contacting the Transportation Services Department before a development application is submitted to determine the proposed trip generation for the site and confirm whether a TIA will be required. Trip generation shall be calculated based on the criteria in Section 2.3.2A. below.

If a TIA is required, a preliminary meeting must be held to discuss the scope of the TIA and the requirements for TIA content and format.

The applicant is responsible for submitting five (5) copies of the TIA report at the time that a development application is submitted. Up to fifteen (15) additional copies may be required if needed for the Planning and Zoning Commission or other review boards.

If the applicant fails to comply with the technical requirements and the scope of study outlined in the preliminary meeting, the applicant will be advised in writing that an addendum is needed. An addendum must be submitted eighteen (18) working days or twenty-six (26) calendar days prior to the date on which the project is scheduled for consideration by the City of Round Rock Planning and Zoning Commission. If the TIA addendum is not submitted within this time frame and the staff does not have adequate time to review the report and submit comments to be included in the Commission agenda packet, the development request may be postponed to the next scheduled Commission meeting.

After the TIA and any addenda have been approved by the staff, three (3) copies of the final version of the TIA incorporating all corrections and additions must be submitted as a permanent file record. A final TIA for a zoning case must be submitted before the first reading of the rezoning by the City Council. A final TIA for a site plan must be submitted before release of the site plan.

2.3.0 TECHNICAL CRITERIA AND REQUIREMENTS

Technical requirements have been established to standardize the format by which a TIA is prepared and to ensure that the content and quality of the TIA will result in an accurate and useful analysis. The Transportation Services Department will review a TIA based on these criteria and may require an addendum for those reports which are incomplete or inaccurate.

There are five (5) major elements or activities in preparing a TIA.

- A. Determine the scope of the TIA.
- B. Estimate and distribute site-generated traffic.
- C. Forecast future non-site related traffic.
- D. Analyze the capacity and projected operation of roadways and intersections.
- E. Recommend land use and/or appropriate traffic engineering modifications to mitigate traffic impacts and maintain an acceptable level of service.

2.3.1 Scope of the TIA

The study area or scope of a TIA shall be determined by the Director of the Transportation Services Department. Applicants are responsible for contacting Transportation Services Department to determine the scope of the TIA and to discuss all requirements before any studies are conducted. If a proposed development consists of several phases, a scope must be determined for each phase.

2.3.2 Site Generated Traffic

The following procedures are accepted practice in the City's Transportation Master Planning and should be addressed in each report: trip generation, trip distribution and traffic assignment.

A. Trip Generation.

Trip generation shall be based upon the proposed land use and density. A.M. peak, P.M. peak and total daily site-generated traffic must be calculated using an independent variable or determinant which has been confirmed by the City's Transportation Services Department before the TIA is prepared. The applicant must identify and justify the applicability of the trip rates used. Gross square footage is the usually accepted determinant for office and gross leasable square footage is the usually accepted determinant for retail projects. The number of dwelling units is the most often accepted determinant for residential uses. A table of proposed land uses must also be included in each TIA report for review.

Trip generation rates shall be adopted from the references listed below. The second and third references may be used only when the information is not available in the first reference. If none of these sources contains appropriate trip rates for the proposed land use, other sources may be used at the discretion of the Director of the Transportation Services Department, if adequately documented.

1. Trip Generation: An Informational Report, the 5th edition, Institute of Transportation Engineers, 525 School St., SW, Suite 410, Washington DC, 20024.

2. Quick-Response Urban Travel Estimation Techniques and Transferable Parameters, NCHRP Report 187, latest edition, Transportation Research Board, National Academy of Science, 2101 Constitution Avenue, NW, Washington DC, 20418.
3. San Diego Traffic Generators, San Diego Association of Governments and CALTRANS District 11, January 1990.

Average weekday trip rates shall be used in estimating total daily trips generated unless otherwise indicated by staff in defining the scope of study. Weekend or other trip rates shall also be required if the peak hour does not occur on an average weekday. The average trip rate for peak hour of adjacent street traffic shall be used to estimate A.M./P.M. peak hour traffic entering and exiting the site. Guidelines in the Trip Generation manual shall be used for determining whether to use average trip rates or equations.

If the TIA is filed in conjunction with a site plan review, trip generation shall be based upon the uses and intensities identified on the site plan. If a site plan is not available, trip generation shall be based upon the maximum allowable density for the most intensive use. In such cases, the trip generation rates listed in [Table 2-1](#) shall be applied, unless the applicant is willing to accept a density limitation as a condition of zoning or can document the fact that flood plains or other factors limit the developable area of the site.

The rates provided in [Table 2-1](#) are based on the maximum build out allowed for each zoning district. The trip rates assume the most permissive land use, the maximum floor area ratio, the maximum building height and structure parking. For residential categories, the trips per acre are based on the number of units that are allowed for each zoning district.

Reductions for internal capture, pass-by traffic and transit usage should be discussed with the staff in defining the scope of study and must be supported by adequate documentation. No reductions in trip rates may be made for driveway turning movements unless it can be documented that certain trips will not use the driveway. Guidelines contained in the Trip Generation manual or other approved sources shall be used to document internal capture and pass-by trips.

B. Trip Distribution.

Percentages for directional distribution of the site generated traffic must be well referenced. The basis for directional attraction shall largely rely on the following information:

1. Marketing Study
2. Subarea Transportation Study
3. City or State Travel Demand Estimation

If the above information is not available, a traffic study for determining directional attraction is required to address the area that is surrounded by the nearest arterial streets. The traffic study must be consistent with the procedures established for calculating trip distribution in Quick-Response Urban Travel Estimation Techniques and Transferable Parameters, NCHRP 187, latest edition, Transportation Research Board, National Academy of Science, 2101 Constitutional Avenue, NW, Washington, DC, 20418.

**TABLE 2-1
TRIP GENERATION (BY ACREAGE)**

Residential Development				
Zoning Classification	Maximum Units/Acre	Most intense Use (ITE Code)	Trip Rate/Unit	Trip Rate/Acre
SF-R	0.5	SF (210)	9.55	5
SF-1	4.36	SF (210)	9.55	42
SF-2	6.70	SF (210)	9.55	64
TF	12.45	Duplex (NCHRP)	7.0	87
TH	12.0	SF (210)	9.55	115
MF	20	Low-rise (221)	6.6	132
SOURCE: Institute of Transportation Engineers, <u>Trip Generation</u> , 5 th Edition (1991); Transportation Research Board, <u>Quick Response Urban Travel Estimation Techniques and Transferable Parameters</u> (1978).				

Table 2-1 (Cont'd)
Trip Generation (by Acreage)

Commercial and Employment Districts					
Zoning	Permitted Intensity F.A.R.	Maximum s.f. / acre	Most Intense Use (ITE Code)	Trip Rate/ 1000 s.f.	Trip Rate/ Acre
C-1	5.00	217,800	*	*	*
C-2	2.00	87,120	Med. Office (Code 720)	36.13	#
OF	1.00	43,560	Med. Office (Code 720)	36.13	1488
BP	5.00	217,800	Indust. Park (Code 130)	6.96	63.11
LI	2.00	87,120	Light Indust. (Code 110)	6.97	51.8
I	1.00	43,560	Heavy Indust. (Code 120)	1.50	6.75
* Trip Rate to be determined on basis of proposed uses. # Rate varies with acreage or building space square footage.					
Source: Institute of Transportation Engineers, <u>Trip Generation</u> , 5th Edition (1991) Transportation Research Board, <u>Quick Response Urban Travel Estimation Techniques and Transferable Parameters</u> (1978).					

Table 2-1 (Cont'd)
Trip Generation (by Acreage)

Special Purpose Zoning Districts					
Zoning	Permitted Intensity F.A.R.	Maximum s.f. / Ac.	Most Intense Use (ITE Code)	Trip Rate/ 1000 s.f.	Trip Rate/ Acre
PF	*	*	Med. Office (Code 720)	#	#
SR	*	*	*	#	#
MI	*	*	*	#	#
OS	*	*	*	#	#
PUD	*	*	*	#	#
<p>* Trip Rate to be determined on basis of proposed uses, as approved by the Director of Transportation Services. # Rate varies with acreage or building space square footage.</p>					
<p>Source: Institute of Transportation Engineers, <u>Trip Generation</u>, 5th Edition (1991) Transportation Research Board, <u>Quick Response Urban Travel Estimation Techniques and Transferable Parameters</u> (1978).</p>					

C. Traffic Assignment.

This is the assignment of site generated traffic according to the percentages of distribution determined in the previous step. Traffic assignments shall be clearly illustrated with roadway and intersection geometry. The proposed roadway network shall conform to the City of Round Rock Transportation Master Plan, March 2004, as amended, or other approved design by the Transportation Services Department.

2.3.3 Forecasting Future Non-site Traffic

Non-site related traffic must be estimated for the proposed build-out year of the project. In forecasting future traffic, the following factors must be considered:

- A. Existing traffic.
- B. Existing and proposed street network.
- C. Traffic growth rates, using historic trends.
- D. Traffic from any site plan within or adjacent to the study area of the TIA.
- E. A reasonable portion of traffic from any project with a preliminary plat or recorded subdivision plat within or adjacent to the study area of the TIA.
- F. A reasonable portion of traffic from any project with approved zoning within or adjacent to the study area of the TIA, unless there is reason to believe that the project is unlikely to be built within the time frame covered in the TIA.

Traffic growth rates and projects to be considered in background traffic should be determined in the scoping meeting. Existing 24-hour traffic counts and A.M./P.M. peak hour intersection turning movement counts are needed as input. A copy of the traffic counts with the date and time they were conducted must be provided. Annual traffic growth rates must be well documented. A comparison should be made with other recent forecasts where available.

2.3.4 Capacity Analysis and Traffic Impact Assessment

Levels of service for roadways and intersections must be calculated before and after the proposed development. The acceptable methodologies for calculating levels of service are:

- A. Operational Analysis from the Transportation Research Board Special Report 209, Highway Capacity Manual, latest edition.
- B. PASSER III-90 from the Texas Transportation Institute.
- C. The TEXAS model, version 3.0, from the University of Texas.
- D. Other methodologies approved by the Director of the Transportation Services Department or his designee.

For diamond interchanges, the use of either PASSER or the TEXAS model is mandatory.

In a multi-phased development, levels of service must be evaluated before and after each new phase. Unless otherwise indicated by staff in defining the scope of study, Level of Service D shall be the minimum acceptable standard. In addition, the following characteristics shall be addressed when evaluating capacity and level of service:

- A. Physical Configuration - intersection and roadway geometry.
- B. Traffic Characteristics - peak hour factor.
- C. Traffic Control - signalized and unsignalized control.
- D. Environmental Condition - topography, sight distance and other safety hazards.
- E. Capacity - as determined in the latest edition of the Highway Capacity Manual, Transportation Research Board.

The applicant must indicate all assumptions used in the analysis, including cycle length, phasing, G/C ratios, etc. Default values must be used for percent of heavy vehicles, peak hour factor, arrival type, etc. (see Table 9-3 of the Highway Capacity Manual) unless the applicant can document other values through field data.

A capacity analysis must be performed for key intersections within and adjacent to the site, as well as major intersections determined in the scope of the TIA. Volume/capacity ratios for the critical movements (X_C) must be provided for each intersection analyzed. If the overall level of service is D or worse, volume/capacity ratios must also be provided for each movement within the intersection.

The TIA must present conclusions regarding the impacts of the proposed development on the roadway system. These conclusions should be expressed in quantitative terms whenever possible. The report must specifically address any adverse traffic impacts (worse than level of service D) which cannot be avoided if the development occurs. Transit-related issues should also be discussed if applicable.

2.3.5 Recommendations on Roadway Improvements and Traffic Control Modifications

The TIA must include specific recommendations to mitigate the transportation impacts of site-generated traffic on roadways and intersections to an acceptable level of service. Various traffic control improvements or land use decisions can be used to mitigate traffic impacts on adjacent roadways and intersections. These include, but are not limited to, the following:

- A. **Roadway Improvements.**
 - 1. Lane addition
 - a. through traffic lane
 - b. right turn lane
 - c. left turn lane
 - 2. Sight distance improvement
 - 3. Grade separation

4. Geometric or alignment improvements
- B. Traffic Control Modifications.**
 1. Stop sign control
 2. Signal controls
 - a. new installation
 - b. upgrade existing traffic signal
 3. Other improvements
 - a. restricted turns
 - b. channelized islands
- C. Land Use Controls.**
 1. Reduce density
 2. Alter proposed land use
- D. Alternative Modes and Demand Management Options.**
 1. Transit Incentives
 2. Ridesharing Incentives
 3. Flexible Work Hours
 4. Other Options

In some cases, a combination of the above strategies may be necessary.

The TIA must clearly identify in the recommendations any roadway improvements (including geometric changes), traffic control modifications (including signal retiming), or other measures necessary to mitigate site-generated traffic impacts.

2.3.6 Certification Statement

The TIA must contain the following statement, signed by the person responsible for the contents of the document:

"I hereby certify that this report complies with Ordinance requirements and applicable technical requirements of the City of Round Rock and is complete and accurate to the best of my knowledge."

2.4.0 SUBMITTAL REQUIREMENTS

This section provides a flow chart for conducting a TIA and a checklist of submittal requirements for TIAs submitted for zoning cases and site plans (see [Figure 2-1](#), in [Section 2.5.0 of this Manual](#)).

2.4.1 TIA Submittal Requirements for Zoning Cases

A. Scope of TIA.

1. Study area (as defined in consultation with staff).

2. Target year for project build-out.
- B. **Trip Generation.**
 1. Proposed land use or zoning district for each tract.
 2. Generation rates based on proposed land use intensity (if known) or most intense use permitted.
 - a. Daily
 - b. peak hour (A.M., P.M., other)
- C. **Trip Distribution.**
 1. Percentages for directional distribution.
 2. Sources of information.
- D. **Traffic Assignment.**
 1. Roadway network in study area (existing and proposed).
 2. Access points (conceptual).
- E. **Traffic Forecast.**
 1. Existing 24-hour A.M./P.M. peak traffic, including copies of field data.
 2. Assumptions on annual growth rate or other source of future background traffic at time of build-out.
 3. Projected site, background and total traffic for 24-hour, A.M./P.M. peak at time of build-out.
- F. **Capacity Analysis for Street Intersections.**
 1. Intersection/roadway geometry (existing and proposed).
 2. Traffic control (signalized or unsignalized).
 3. Traffic characteristics (turn movements, percent trucks and buses).
- G. **Traffic Impact Assessment.**
 1. Impacts expressed in quantitative terms.
 2. Adverse impacts which cannot be avoided.
 3. Transit issues (if applicable).
- H. **Recommendations.**
 1. Roadway improvements.
 2. Traffic operation modifications.
 3. Limitation of land use intensity.
- I. **Certification Statements (as provided in Section 2.3.6 above)**

2.4.2 TIA Submittal Requirements for Site Plans*

- A. Scope of TIA.**
 - 1. Study area (as defined in consultation with staff).
 - 2. Target year for project build-out.
- B. Trip Generation.**
 - 1. Proposed land use by square footage for each tract.
 - 2. Generation rates based on proposed square footage.
 - a. Daily
 - b. Peak hour (A.M., P.M., other)
- C. Trip Distribution.**
 - 1. Percentages for directional distribution.
 - 2. Sources of information.
- D. Traffic Assignment.**
 - 1. Roadway network in study area (existing and proposed).
 - 2. Driveways.*
- E. Traffic Forecast.**
 - 1. Existing 24-hour, A.M./P.M. peak traffic, including copies of field data.
 - 2. Assumptions on annual growth rate or other source of future background traffic at time of build-out.
 - 3. Projected site, background and total traffic for 24-hour, A.M./P.M. peak at time of build-out.
- F. Capacity Analysis for Street Intersections and Driveways.***
 - 1. Intersection/roadway geometry (existing and proposed).
 - 2. Adverse impacts which cannot be avoided.
 - 3. Transit issues (if applicable).
- G. Traffic Impact Assessment.***
 - 1. Impacts expressed in quantitative terms.
 - 2. Adverse impacts which cannot be avoided.
 - 3. Transit issues (if applicable).
- H. Recommendations.***
 - 1. Roadway improvements.
 - 2. Traffic operation modifications.
 - 3. Limitation of land use intensity.

I. **Certification Statement (as provided in Section 2.3.6 above)**

- * Note: If a TIA has previously been reviewed for a zoning case on the same project, a TIA addendum is required for the site plan only if some items listed above have not been fully addressed or the scale of the project has changed significantly. If the previous TIA was accepted by the staff as adequate for the zoning case and there has been no significant change in the anticipated target year, trip generation, trip distribution, background traffic or funded improvements, the TIA addendum need only address the items indicated by an asterisk. In such cases, the level of detail needed should be discussed with the staff in defining the scope of the TIA.

2.4.3 TIA Submittal Requirements for Subdivision Platting*

A. **Scope of TIA.**

1. Study area (as defined in consultation with staff).
2. Target year for project build-out.

B. **Trip Generation.**

1. Proposed land use by square footage for each tract.
2. Generation rates based on proposed square footage.
 - a. Daily
 - b. Peak hour (A.M., P.M., other)

C. **Trip Distribution.**

1. Percentages for directional distribution.
2. Sources of information.

D. **Traffic Assignment.**

1. Roadway network in study area (existing and proposed).
2. Driveways.*

E. **Traffic Forecast.**

1. Existing 24-hour, A.M./P.M. peak traffic, including copies of field data.
2. Assumptions on annual growth rate or other source of future background traffic at time of build-out.
3. Projected site, background and total traffic for 24-hour, A.M./P.M. peak at time of build-out.

F. **Capacity Analysis for Street Intersections and Driveways.***

1. Intersection/roadway geometry (existing and proposed).
2. Adverse impacts which cannot be avoided.

3. Transit issues (if applicable).
- G. **Traffic Impact Assessment.***
1. Impacts expressed in quantitative terms.
 2. Adverse impacts which cannot be avoided.
 3. Transit issues (if applicable).
- H. **Recommendations.***
1. Roadway improvements.
 2. Traffic operation modifications.
 3. Limitation of land use intensity.
- I. **Certification Statement (as provided in Section 2.3.6 above)**

* Note: If a TIA has previously been reviewed for a zoning case or for a site plan on the same project, a TIA addendum is required for the site plan only if some items listed above have not been fully addressed or the scale of the project has changed significantly. If the previous TIA was accepted by the staff as adequate for the zoning case and there has been no significant change in the anticipated target year, trip generation, trip distribution, background traffic or funded improvements, the TIA addendum need only address the items indicated by an asterisk. In such cases, the level of detail needed should be discussed with the staff in defining the scope of the TIA.

2.5.0 FIGURES

Figure 2-1 Flow Chart for Traffic Impact Analysis

