

# Transportation Impact Analyses for

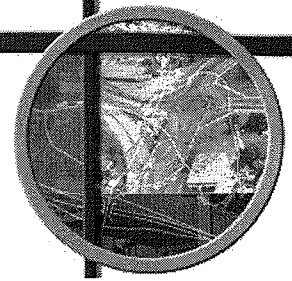
## Site Development

**ite**

Institute of Transportation Engineers

An ITE Proposed Recommended Practice

## 2. Initiating Transportation Impact Studies



### Guidelines for Studies

In considering the transportation aspects of land development, it is important to determine early in the process if and when a transportation impact study is needed.

Transportation impact studies are currently being addressed in a variety of ways by jurisdictions throughout the continent. A cross sampling of data collected by ITE shows the following situations or thresholds that commonly trigger a requirement for a transportation impact analysis:

- When development will generate a specified number of daily trips (the data collected by ITE found examples of 500, 750, 1000, 2000 and 3000 vehicle trips per day, with 1000 vehicle trips per day predominating);
- When development will generate a specified number of peak-hour trips (examples include 20, 30, 50, 75, 100, 150, 200 and 500 vehicle trips per peak hour, with peak-hour trips in the 50-100 range predominating);
- When a specified amount of acreage is being rezoned (examples include a wide variety of acreage based on type of land use; (see Florida Department of Transportation, 1997 and Georgia Department of Community Affairs, 2002 for specific examples);
- When development contains a specified number of dwelling units or amount of square footage (examples include a wide variety of units and square footages based on type of land use; see Florida Department of Transportation, 1997 and Georgia Department of Community Affairs, 2002 for specific examples);
- When financial assessments are required and the extent of impact must be determined;
- When the development will require a significant amount of transportation improvements;
- When a previous transportation impact analysis for a site has been deemed out of date;

- At the judgment or discretion of staff, based upon unusual circumstances; or
- When development will occur in a sensitive area.

There is little consistency in specific threshold quantities for the first four criteria. Study requirements should be related to the cause of transportation needs and impacts, such as trips generated during peak or design hours.

A quantitative threshold for requiring a site transportation impact study should be established by each agency based on local needs, issues and policies. The threshold level may vary among agencies in response to local conditions and priorities. *In lieu of other locally preferred thresholds*, it is suggested that a transportation impact study be conducted whenever a proposed development will generate 100 or more added (new) trips during the adjacent roadways' peak hour or the development's peak hour. This site trip generation threshold is appropriate for the following reasons:

- An additional 100 vehicles per hour can change the level of service or appreciably increase the volume-to-capacity ratio of an intersection approach; and
- Left- or right-turn lanes may be needed to satisfactorily accommodate site traffic without adversely impacting through (non-site) traffic.

It should be noted, however, that many jurisdictions in more densely populated areas tend to use lower thresholds for initiating a transportation impact analysis. These thresholds fall in the range of 30 to 100 vehicles for peak-hour, nondirectional traffic.

Judgment must also enter into the process. In some cases, although a development might generate fewer trips than the established threshold, a localized safety or capacity deficiency may necessitate a study for one or more of the following reasons:

- Existing transportation problems in the local area, such as a high crash location, complex



intersection geometrics, or an intersection in need of a traffic signal;

- Significant impacts to the current or projected level of service or the operational characteristics of the roadway system adjacent to the development;
- Sensitivity of the adjacent neighborhoods or other areas that may be perceived as being impacted;
- Proximity of site driveways to other driveways or intersections;
- Ability of the adjacent existing or planned roadway system to handle increased traffic, or the feasibility of improving the roadway system to handle increased traffic;
- Need for pedestrian and bicycle access and safe movement;
- Initiation of transit service with stations that generate traffic and pedestrian volumes; or
- Other specific problems or deficiencies that may be affected by the proposed development, or that affect the ability of the development to be satisfactorily accommodated.

Tables 2-1 and 2-2 contain suggested baseline guidelines, as well as information indicating how the baselines could be met, for urban and suburban site transportation impact studies. Table 2-2 describes the extent of development that might be expected to generate 100 peak-hour vehicle trips and 500 peak-hour vehicle trips. The 500-trip threshold is suggested as a definition of a "moderate size" development as described in subsequent sections of this report. In some instances, thresholds for rural areas and small cities may need to be lower than for urban areas. These guidelines can be used to help decide when and how such a study should be performed. *They should, however, be adjusted for each study area to reflect circumstances previously discussed in this chapter.* To help property owners and developers better understand the issue, local agencies should consider creating tables of development units that are equivalent to trip generation study threshold warrants. These should be based on current ITE trip generation equations or rates or on locally approved equations and rates, and they should be updated as new information becomes available.

## Extent of Study

A decision process similar to that used to determine *when* a transportation impact analysis should be performed should be used to determine *how extensive* a transportation study should be. The responsibility for this process should be shared by both those conducting and reviewing the study.

The first step of the process should be to identify the issues and needs of the particular situation. The following series of questions should be asked to help identify the appropriate magnitude of scope and the level of detail for transportation impact analyses:

- What components of a full site transportation impact study are needed to address issues associated with the site, proposed development and nearby transportation system?
- How detailed an analysis is needed for the trip generation forecast? Should standard equations and rates be used, or is a special study needed? Should modal split be considered? Should pass-by and/or captured traffic be analyzed? Is an internal/external analysis warranted, and if so, how detailed should it be?
- How large should the study area be? What is the area of influence of the project?
- Are traffic counts needed? Which days and hours should be counted?
- How should adjacent developments be considered in the study? How should areawide growth estimates and future traffic assignments be used?
- How should planned or programmed transportation improvements be accounted for?
- Should the various stages of multiphased development be analyzed individually? Which horizon years should be used?
- Which traffic distribution and assignment methods should be used? How detailed should traffic distribution and assignment be?
- Which roadway sections and intersections and driveways should be analyzed? What proposed roadway and transit improvements should be considered?
- Which capacity analysis technique should be used? How many iterations of capacity analysis should be performed?
- To what extent will nonautomobile modes of travel, such as walking, bicycling and transit,

Table 2-1. Suggested Baseline Guidelines for Transportation Impact Studies

Guideline <sup>a</sup>	Suggested Threshold <sup>b</sup>
Need for Study	Locally established guideline based on trip generation, development size, other development or area characteristics, or localized conditions. In lieu of another locally preferred guideline, development generation of 100 added vehicle trips during the adjacent roadway's peak traffic hour or the development's peak hour is suggested.
Study Area Limits	All site access drives, adjacent roadways, and adjacent major intersections, plus the first signalized intersection in each direction from the site up to a distance determined locally. Additional areas may be added based on development size and specific site or local issues and policy.

a. Additional guidelines are discussed in other chapters.

b. Starting point for deciding when and how a study should be performed; should be adjusted based on recommended guidelines discussed earlier in this chapter.

Table 2-2. Land Use Thresholds Based Upon Trip Generation Characteristics

Land Use	≤ 100 Peak-Hour Trips	≤ 500 Peak-Hour Trips
Residential:		
Single Family Home	90 units	550 units
Apartment	150 units	880 units
Condominium/Townhouse	190 units	1,320 units
Mobile Home Park	170 units	870 units
Shopping Center (GLA)	6,000 sq. ft.	71,000 sq. ft.
Fast-Food Restaurant with Drive-In (GFA)	3,000 sq. ft.	N/A
Gas Station with Convenience Store (fueling positions)	7 fueling positions	N/A
Bank with Drive-In (GFA)	2,000 sq. ft.	11,000 sq. ft.
General Office (GFA)	67,000 sq. ft.	376,000 sq. ft.
Medical/Dentist Office (GFA)	29,000 sq. ft.	164,000 sq. ft.
Research and Development Facility (GFA)	71,000 sq. ft.	497,000 sq. ft.
Light Industrial/Warehousing (GFA)	185,000 sq. ft.	464,000 sq. ft.
Manufacturing Plant (GFA)	144,000 sq. ft.	657,000 sq. ft.
Park-and-Ride Lot with Bus Service	160 parking spaces	640 parking spaces

**NOTES:**

Rates/equations used to calculate above thresholds, for all uses but park-and-ride lot with bus service, are from *Trip Generation* for the p.m. peak hour of the adjacent street. For the park-and-ride lot with bus service, the a.m. peak hour of the adjacent street was used. Vehicle trip generation rates for most land uses decrease as the size of the development increases. Thus, the size of a development generating 500 trips is expected to be more than five times the size of a development generating 100 trips.

GLA = gross leasable area

GFA = gross floor area

N/A = not available

SOURCE: Stover and Koepke 2002 (adjusted to reflect rates and equations in *Trip Generation*, 2003).

be affected? Will the site generate sufficient nonautomobile traffic to warrant off-site improvements? Will the automobile traffic generated by the site adversely affect the level of service for nonautomobile modes?

- Are other analyses needed, such as crash, sight distance, weaving, gap and queuing analyses?
- What types of improvements should be considered?
- How detailed should the recommendations be? How should improvement phasing and timing be addressed?
- What are potential funding sources to implement the recommendations?

The preceding questions represent only a small part of the decision process that must be considered by the study preparer and the reviewing agency prior to determining how extensive a transportation impact study will be required. For each question, an appropriate level of detail must be addressed.

The study preparer, prior to initiating work, should meet with the study reviewer to discuss all these needs and assumptions. In situations where several agencies must approve a development or are responsible for affected transportation systems (such as city or county departments of public works and state departments of transportation), the study preparer should contact all agencies to determine issues to be addressed, study scope, etc. (merely talking to one agency reviewer in this situation will not be sufficient). This will foster improved coordination and reduce the potential for revisions to the study.

Figure 2-1 provides a flowchart of the overall transportation impact analysis process. It sets the broader context, showing how the transportation impact analysis fits into the overall development of the site plan and the transportation-related needs for the site.

### Study Area

In large part, the contents and extent of a transportation impact study depend on the location and size of the proposed development and the conditions prevailing in the surrounding area. Large developments proposed in congested areas or in areas with poor access obviously require more extensive transportation analysis, whereas smaller sites may only require a minimal analysis of traffic on site and at immediately adjacent intersections. One key component to the determination of the extent of the study

area is how the study will be used (i.e., for internal planning, site plan review, or rezoning).

An inappropriately large analysis area may unnecessarily increase costs and time for the developer, study preparer and reviewer. Any site transportation study analyzing off-site access needs and impacts should include at least all site access points and major intersections (signalized and unsignalized) adjacent to the site. It is suggested that the first signalized intersection on each street serving the site also be analyzed, if it is within a specific locally determined distance of the site (for example, 0.25 mile or 0.5 mile). Beyond this area, the review agency (with input from the preparer) should determine any additional area to be included, based on local or site-specific issues, development size, or local policy. Sound judgment should be used to determine if residential areas are likely to be significantly impacted and, if so, whether they should be analyzed. The study area boundaries may also be influenced by impacts other than pure capacity relationships (such as shortcuts, traffic noise).

For multiphase projects, the study area size may be based on cumulative traffic generated up through the phase being reviewed.

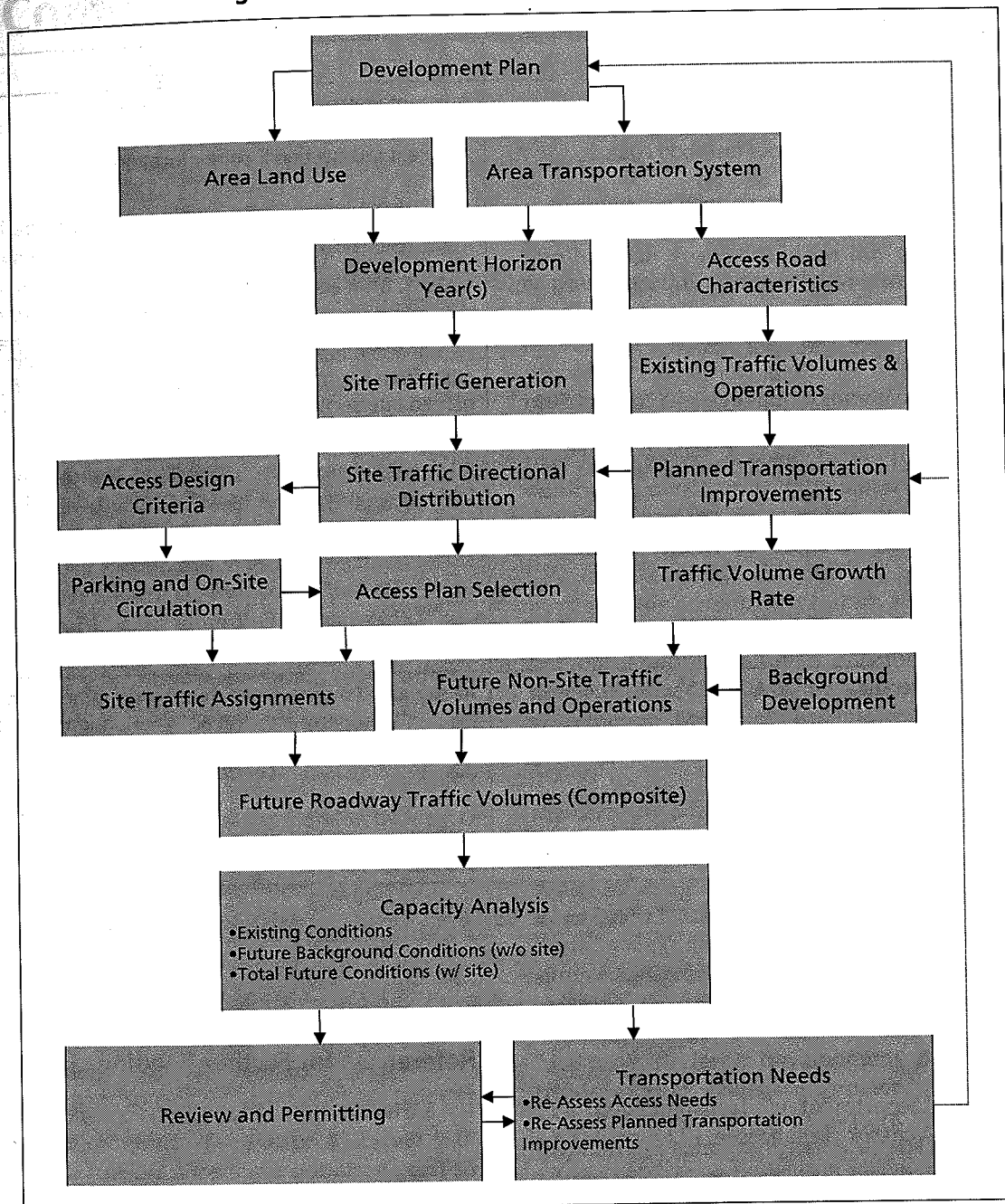
Care should be taken to include in the study all known congested locations that may be adversely impacted by the proposed development. Table 2-3 provides some guidelines for determining study area limits based on the size, type and trip-producing characteristics of a number of land uses.

### Initiating the Process

It is critical that the study preparer discuss the project with the reviewing agency's staff engineer early on in the planning process. An understanding as to the level of detail and the assumptions required for the analysis can be determined at that time. In addition to learning the study issues, coverage and detail level, the preparer should obtain or verify the following information:

- Available traffic counts;
- Information about nearby transit, bicycle and pedestrian facilities and usage;
- Committed and planned roadway improvements and timing;
- Approved development and background traffic data;

Figure 2-1. Transportation Impact Analysis Process



SOURCE: Adapted from Stover and Koepke 2002.

- Applicable agency codes and policies;
- Existing congested locations in study area;
- Crash data for locations with high crash rates;
- Traffic signal systems;
- Any neighborhood sensitivities; and
- Any temporary anomalies in the current road system that will influence the data or the outcome of the analysis.

**Table 2-3. Suggested Study Area Limits for Transportation Impact Analyses**

Development	Study Area
Fast-food restaurant	Adjacent intersection if corner location
Service station, with or without fast-food counter	Adjacent intersection if corner location
Mini-mart or convenience grocery with or without gas pumps	660 ft. from access drive
Other development with fewer than 200 trips during any peak hour	1000 ft. from access drive
Shopping center less than 70,000 sq. ft. or Development w/peak-hour trips between 200 and 500 during peak hour	All signalized intersections and access drives within 0.5 miles from a property line of the site and all major unsignalized intersections and access drives within 0.25 miles
Shopping center between 70,000 and 100,000 sq. ft. GLA or Office or industrial park with between 300 and 500 employees or Well-balanced, mixed-use development with more than 500 peak-hour trips	All signalized and major unsignalized intersections and freeway ramps within 1 mile of a property line of the site
Shopping center greater than 100,000 sq. ft. GLA or Office or industrial park with more than 500 employees or All other developments with more than 500 peak-hour trips	All signalized intersections and freeway ramps within 2 miles of a property line, and all major unsignalized access (streets and driveways) within 1 mile of a property line of the site
Transit station	0.5-mile radius

SOURCE: Adapted from Stover and Koepke 2002 and Barbara M. Schroeder.  
GLA = gross leasable area

## Works Cited

Florida Department of Transportation. 1997. *Site Impact Handbook*. Tallahassee, FL: Florida DOT. pp. 13-15.

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## References for Further Reading

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