

8 Approaches for Estimating Trip Generation

Trip Generation Manual (TGM) is a periodic publication from ITE—A Community of Transportation Professionals (ITE), developed through a staff-led process using voluntarily submitted data from ITE members and the transportation community. More information about the Manual and its development is provided in Chapter 1, *Introduction*.

Separately, ITE also develops a supplemental resource, *Trip Generation Handbook* (TGH), which offers guidance on how to use and interpret the data in TGM. The most recent edition of TGH is the 3rd edition, published in September 2017. TGH is an ITE Recommended Practice, developed through a formal, consensus-based process and designed to provide clear procedures and best practices for transportation professionals. Because ITE Recommended Practices are developed through a formal review and consensus process, TGH offers practitioners detailed procedures and applications. In contrast, TGM serves as an informational resource and does not prescribe specific methodologies.

This chapter introduces TGH content that may aid TGM users when conducting trip generation analyses, including:

- Key factors for estimating person trips
- Key factors for estimating truck trip generation
- Key considerations for evaluating trip generation in mixed-use developments, urban infill or redevelopment projects, and transit-friendly developments
- The use of local data to estimate trip generation
- Considerations related to the application of pass-by and diverted trips

Person Trips

When available, TGM includes data for each mode (vehicle, walk, bicycle, transit, truck) as well as person trips. If person trips are not available, analysts may need to adjust baseline vehicle trip generation to account for multimodal travel, particularly in suburban or rural areas. Chapter 5 of TGH outlines how to estimate person trips for non-urban sites when person trips are not available.

Truck Trip Generation

The technical appendices in TGM provide truck trip generation plots by land use for land uses where data are available. These appendices are accessible through the ITETripGen web app. When truck trip generation data are unavailable for a given land use, analysts can apply the procedures detailed in Chapter 11 of TGH. This method, based on the National Cooperative Freight Research Program (NCFRP) Report 26: *Guidebook for Developing Subnational Commodity Flow Data*¹, suggests use of a “playbook” to facilitate appropriate selection and analysis of truck trip generation data.

¹ Cambridge Systematics, Inc., K. Casavant, A. Goodchild, E. Jessup, and C. Lawson. NCFRP Report 26: *Guidebook for Developing Subnational Commodity Flow Data*. Washington, DC: Transportation Research Board, 2013.

Trip Generation for Mixed Use, Urban Infill/Redevelopment, and Transit-Friendly Developments

Applying baseline trip generation rates to mixed-use or multimodal sites in suburban or rural areas without making appropriate adjustments may lead to an overestimation of vehicle trips. TGH provides guidance for evaluating:

- Mixed-use developments
- Urban infill/redevelopment projects
- Transit-friendly developments

Mixed-Use Development

A mixed-use development typically combines two or more land use types (each corresponding to an ITE land use code) within a single real-estate development, allowing internal trips between uses without accessing the external road system. When multiple land uses are present on a single site, there is potential for interaction among those uses—referred to as internal capture trips—particularly when trips can be made on foot. As a result, the total number of external trips (i.e., trips entering or exiting the site) may be lower than the simple sum of trips generated by each individual land use.

Chapter 6 of TGH presents the recommended procedure for estimating trip generation at mixed-use developments, as developed in NCHRP Report 684: *Enhancing Internal Trip Capture Estimation for Mixed-Use Developments*². The NCHRP report details the development of the recommended estimation procedure, its underlying data, and validation of the internal trip estimation procedure. It includes a summary of past research on trip generation and internal trip capture at mixed-use developments, and reviews alternative trip capture methods that analyst may consider.

Important caution: Internal capture adjustments should not be applied to individual ITE land uses that inherently reflect mixed-use characteristics (e.g., shopping center, Land Use 820). For example, a shopping center typically contains uses other than general retail such as restaurants, banks, and offices. However, because data have been collected directly from stand-alone shopping center developments, shopping centers are considered a single land use in the TGM. The associated trip generation data presented in TGM already reflects the effects of internal capture and the mixed-use nature of the center, and no further adjustments are needed.

Trip Generation for Urban Infill/Redevelopment

An infill site is one where the surrounding area within a one-half mile radius is mostly developed (typically more than 80 percent). An infill site can be in or around a central business district, urban core, suburban business district, or any other area that is substantially developed.

If urban-specific data are not available in TGM for a particular land use, Chapter 7 of TGH presents the recommended procedure for estimating person and vehicle trip generation for compact, urbanized, mostly developed areas where walking, bicycling, and transit are viable modes of transportation. The approach draws from the research findings and was selected for its ease of application and likelihood of widespread acceptance.

² Bochner, B., K. Hooper, B. Sperry, and R. Dunphy. NCHRP Report 684: *Enhancing Internal Trip Capture Estimation for Mixed-Use Developments*. Washington, DC: Transportation Research Board, 2011.

Trip Generation for Transit-Friendly Development

TGM presents transit trip generation information for some land use categories. If data are not available, Chapter 8 of TGH presents a recommended approach for forecasting the number of transit trips generated by a proposed development.

For TGH purposes, a transit-friendly development (TFD) is any development that is directly connected, immediately adjacent to, or directly oriented toward a rail or rapid transit station or stop (including heavy rail, light rail, streetcar, commuter rail, or bus rapid transit) or a multi-route bus transit center with high-frequency service. Although the more common term in research and ordinances is transit-oriented development (TOD)—and the precise definition does vary—TGH uses TFD to maintain a consistent, clearly defined term applicable across its guidance.

Use of Local Data to Estimate Trip Generation

Chapter 4 of TGH presents a recommended process for assessing the appropriateness of TGM data for estimating trip generation for a specific site. Chapter 9 presents a recommended procedure for estimating trip generation using local trip generation data.

TGH emphasizes that the premise of this guidance is the assumption that sites in one metropolitan area will generally have trip generation characteristics comparable to those of a development site in another metropolitan area if the site settings are similar. In contrast, two development sites in the same state or same local jurisdiction may have different trip generation characteristics because of significant differences in their settings. For example, TGH explains that the analyst should expect vehicle trip generation characteristics to be different between sites located in a downtown setting versus sites located in a suburban setting. Likewise, a site located near and with accessibility to major transit service can exhibit a lower vehicle trip generation rate than a similarly located site with no transit service.

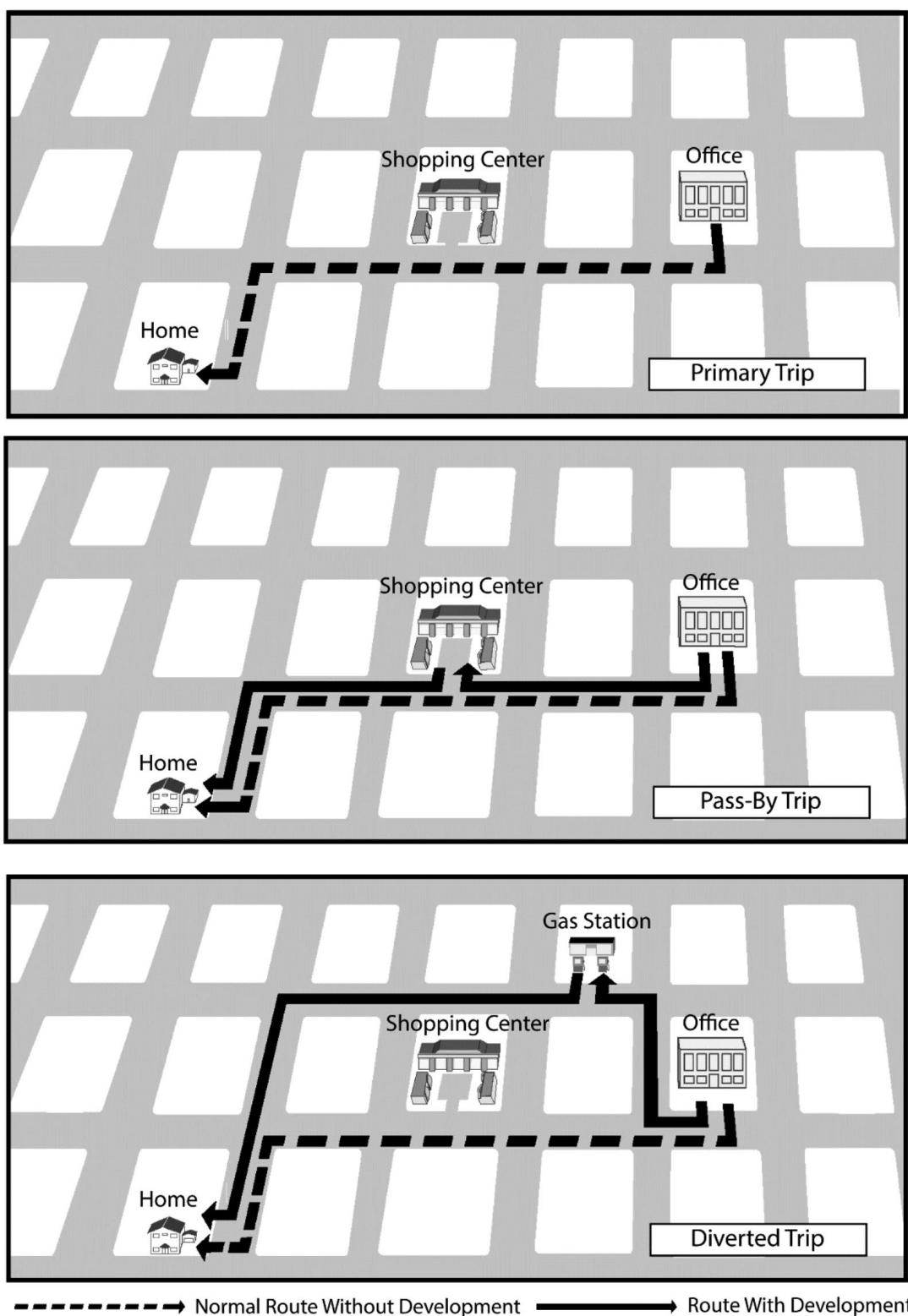
Primary, Pass-By, and Diverted Trips

Not all traffic entering or exiting a site driveway is new traffic added to the street system. The actual amount of new traffic depends on the purpose of the trip and the route taken from its origin to its destination. For example, retail-oriented developments—such as shopping centers, discount stores, restaurants, banks, service stations, and convenience markets—are often located adjacent to busy streets specifically to attract travelers already on the street system passing by for other purposes. As a result, a portion of the trips generated at these sites, known as pass-by trips, are drawn from existing traffic rather than creating new vehicle trips on the adjacent street system. As such, pass-by trips can be subtracted from the total external trips generated by a study site.

Vehicle trips generated by a site can be separated into two major categories: pass-by trips and non-pass-by trips. In some transportation impact analysis applications, it is necessary to further subdivide non-pass-by trips into primary trips and diverted trips. These trip types are illustrated in Figure 2.

Chapter 10 of TGH presents the recommended procedure for assigning primary, pass-by, and diverted trips, along with specific definitions for these terms and supporting data tables for pass-by, diverted link and primary trips. It should be noted that the data tables originally contained in TGH have been updated, and the current versions are now presented in the appendices of TGM, accessible through the ITETripGen web app.

Figure 2. Primary, Pass-By, and Diverted Trips



Source: *Trip Generation Handbook, 3rd Edition*, Institute of Transportation Engineers, Washington, DC, 2017.