TRANSPORTATION

CHAPTER 16

Our modes of travel — private car, taxi cab, subway/rail, bus, ferry, bicycle, and by foot — form the basis of New York City's extensive and interrelated transportation infrastructure and system. A positive effect on one mode of travel may negatively impact another, while a negative effect on travel modes may negatively impact several aspects of the transportation system. The objective of the transportation analyses is to determine whether a proposed project may have a potential significant impact on traffic operations and mobility, public transportation facilities and services, pedestrian elements and flow, safety of all roadway users (pedestrians, cyclists, transit users and motorists), on- and off-street parking, or goods movement.

As with each technical area assessed under CEQR, it is important for applicants to work closely with the lead agency during the entire environmental review process. As appropriate, the New York City Department of Transportation (DOT), the Metropolitan Transportation Authority (MTA), its affiliates and subsidiary agencies, should also work with the lead agency during the CEQR process to provide information, technical review, recommendations and approvals relating to transportation and any required mitigation. It is recommended that the lead agency consult with expert agencies as early as possible in the environmental review process. The level and extent of consultation may vary based upon the in-house technical expertise of the lead agency. Section 700 further outlines appropriate coordination with these agencies.

This chapter describes each technical area to be addressed in a transportation assessment, and outlines the general elements needed for any transportation assessment. Should a detailed analysis be needed, this chapter also discusses each specific technical area separately, beginning in Section 340, "Detailed Traffic Analysis." A proposed project and any recommended improvement or mitigation measures should, to the extent practicable, be guided by the policies of *Sustainable Streets: Strategic Plan for the New York City Department of Transportation 2008 and Beyond*, which seeks to promote efficient means of travel with emphasis on "alternative modes" like transit, pedestrians or bicycles. The specific DOT guidelines applicable to mitigation measures are discussed in greater detail in Section 510.

100. DEFINITIONS

The transportation analyses should address the following major technical areas:

TRAFFIC FLOW AND OPERATING CONDITIONS, including the traffic volume expected to be generated in the future with the proposed project in place and the impact of the project-generated volume on traffic levels of service. The purpose of this assessment is to evaluate the traffic operating conditions and ability of roadway elements to adequately process the expected traffic flow under the future With-Action condition.

RAIL AND SUBWAY FACILITIES AND SERVICES, including the capacity of subway lines (known as "line haul" capacity), station platforms, stairwells, corridors, and passageways, station agent booths/control areas, turnstiles, and other critical station elements to accommodate projected volumes of passengers in the future with the proposed project in place.

BUS SERVICE, including the ability of existing routes and their frequency of service to accommodate the expected level of bus demand without overloading existing services. MTA has two agencies that operate bus service in New York City: New York City Transit (NYCT) and MTA Bus Company (MTABC). In addition to these entities, Westchester County buses, Nassau County buses and privately operated fixed-route service should be included in these analyses to the extent known.

PEDESTRIAN FACILITIES, which include three elements – sidewalks, crosswalks and intersection corners (corner reservoirs). The purpose of the assessment is to evaluate the capacity of these elements to safely and conveniently process or store the volume and activities of pedestrians expected to be generated by the proposed project.

PEDESTRIAN, BICYCLE AND VEHICULAR SAFETY ASSESSMENTS, which principally focus on the effect of the proposed project's generated demand at existing high-crash locations or at locations that may become unsafe due to the proposed project.

PARKING CONDITIONS, which include occupancy levels of parking lots and garages (public and accessory) as well as curbside parking utilization. The purpose of the on- and off-street parking assessment is to determine what effect the proposed project may have on parking resources in the study area.

GOODS DELIVERY, which includes the capacity of proposed loading areas to accommodate the expected volume of deliveries and the ability to do so without interfering with vehicular, pedestrian and bicycle traffic or compromising safety.

CONSTRUCTION PHASE IMPACTS, which include projected impacts on transportation (traffic, pedestrian, parking, *etc.*) during a proposed project's construction phase. Guidance for conducting the transportation analyses for construction activities is presented in Chapter 22, "Construction Impacts."

To analyze each of these technical areas, specific technical methodologies, databases, and procedures have been developed and are referenced in this chapter. It is also important to note the interrelationship between the traffic analysis, and air quality and noise studies, which should be kept in mind during the course of the data collection and analysis stages. Both the air quality and noise analyses may call for extensive traffic information; therefore, traffic information should be collected and formatted in a way that can be easily used for the other analyses. It may also be necessary to assess transportation impacts on residential streets as part of the neighborhood character studies.

200. DETERMINING WHETHER A TRANSPORTATION ASSESSMENT IS APPROPRIATE

While interrelationships between the key technical areas of the transportation system — traffic, transit, pedestrians, and parking — should be taken into account in any assessment, the individual technical areas are separately assessed to determine whether a project has the potential to adversely and significantly affect a specific area of the transportation system. Consequently, each area is discussed separately.

It is possible that detailed transportation analyses may not be needed for projects that would create low- or low- to moderate-density development in particular sections of the City. Before undertaking any transportation analysis, reference should be made to Table 16-1 in conjunction with Map 16-1 (CEQR Traffic Zones) to determine whether numerical analysis is needed.

Table 16-1
Minimum Development Densities Potentially Requiring Transportation Analysis

Development Type	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Residential (number of new dwelling units)	240	200	200	200	100
Office (number of additional 1,000 gross square feet (gsf))	115	100	100	75	40
Regional Retail (number of additional 1,000 gsf)	30	20	20	10	10
Local Retail (number of additional 1,000 gsf)	15	15	15	10	10
Restaurant** (number of additional 1,000 gsf)	20	20	10	10	10
Community Facility (number of additional 1,000 gsf)	25	25	25	15	15
Off-Street Parking Facility (number of new spaces)	85	85	80	60	60

With the following zone definitions:

Zone 1: Manhattan, 110th Street and south; Downtown Brooklyn.

Zone 2: Manhattan north of 110th Street, including Roosevelt Island; Long Island City; Downtown Flushing; Fort Greene; Park Slope; Portions of Brooklyn Heights; Greenpoint-Williamsburg; Jamaica; all areas within 0.25 miles of subway stations (excluding Staten Island, Broad Channel and the Rockaways, Queens); South Bronx (south of 165th Street).

Zone 3: St. George (Staten Island); all other areas located within 0.5 miles of subway stations (except in Staten Island, Broad Channel and the Rockaways, Queens).

Zone 4: All areas in Staten Island located within 0.5 miles of subway stations; all other areas located within one-mile of subway stations (except in Staten Island, Broad Channel and the Rockaways, Queens).

Zone 5: All other areas.

Map 16-1 (CEQR Traffic Zones) shows the zone boundaries.

**In all zones, fast food restaurants of 2,500 gsf or more potentially require transportation analyses.

The development thresholds cited in Table 16-1 were determined by applying typical travel demand factors (*i.e.*, daily person trips, temporal distribution, modal split, vehicle occupancy, *etc.*) for the land uses cited in the table for each of the zones, up to a development density at which vehicle, transit, and pedestrian trip generation would not likely cause significant adverse impacts, based on a review of prior Environmental Assessment Statements (EASs) and Environmental Impact Statements (EISs) conducted under the CEQR process. The development densities cited in Table 16-1 generally result in fewer than 50 peak hour vehicle trips (with "trips" referring to trip-ends), 200 peak hour subway/rail or bus transit riders and 200 peak hour pedestrian trips, where significant adverse impacts are generally considered unlikely. Should the proposed project involve a mix of land uses, it is appropriate to conduct a preliminary trip generation assessment (see Levels 1 and 2 Screening Assessment in Section 300) for each land use or use a weighted average to determine whether the total site generated trips exceed the threshold for analysis. If the proposed project would result in development densities less than the levels shown in Table 16-1, further numerical analysis would not be needed for any of these technical areas, except in unusual circumstances. Conversely, if a proposed project surpasses these levels, a preliminary trip generation analysis, described below in Section 300, is needed.

300. ASSESSMENT METHODS

If Section 200 indicates that an analysis is warranted, a preliminary trip generation assessment and Travel Demand Factors (TDF) memorandum should be prepared following the two-tier screening process described below to determine whether a quantified analysis of any technical areas of the transportation system is necessary:

LEVEL 1 (PROJECT TRIP GENERATION) SCREENING ASSESSMENT determines the number of person trips by mode as well as vehicle trips for all analysis peak hours. Except in unusual circumstances, a further quantified analysis would typically not be needed for a technical area if the proposed development would result in fewer than:

- 50 peak hour vehicle trip-ends;
- 200 peak hour subway/rail or bus transit riders; or
- 200 peak hour pedestrian trips.

If the threshold for traffic is not surpassed, it is likely that a parking assessment is also not needed. The methodologies available for use in determining trip generation involve either: (a) utilizing approved available trip generation rates for the type of land use proposed and available modal split characteristics for the site of the proposed project; or (b) obtaining these data from new surveys at a comparable facility in the same (or comparable) part of the City. The methodologies are presented below in Section 310.

LEVEL 2 (PROJECT GENERATED TRIP ASSIGNMENT) SCREENING ASSESSMENT assigns the trips to specific intersections, bus routes, subway lines, or parking spaces. If the results of this level of analysis conclude that the proposed development would generally result in intersections with 50 or more vehicle trips, pedestrian elements with 200 or more pedestrian trips, 50 or more bus trips in a single direction on a single route, or 200 or more passengers at a subway station or on a subway line during any analysis peak hour, further detailed analysis may be needed for a particular technical area. Guidance for conducting detailed assessments is located in Section 330.

310. LEVEL 1 (PROJECT TRIP GENERATION) PRELIMINARY SCREENING ASSESSMENT

A TDF memorandum should be submitted to the lead agency and DOT for review and approval, identifying the land use types (dwelling units for residential uses; square feet for commercial, retail and other land uses; seats for movie theaters; beds for hospital facilities; *etc.*), trip generation rates, modal splits, vehicle occupancy rates, temporal distribution, *etc.* The memorandum summarizes and presents generated person and vehicle trips for all peak hours. In addition, the memorandum cites all sources used in developing the TDF memorandum. Each element of the Level 1 preliminary screening assessment is described below.

311. Trip Generation

Trip generation analyses provide the estimated number of person trips expected to be generated by the proposed project over the course of the entire day, as well as during the peak analysis hours. The classification of a proposed project's daily trip-ends by hour of the day is also referred to as its temporal distribution. There are several options available for obtaining the trip generation information:

- Use of existing information based on previously researched/approved trip generation rates provided in Table 16-2 as well as recently approved EISs and EASs, where the sources cited in the travel demand factors are based on a recent survey of a similar land use with comparable travel characteristics and are considered appropriate to be used in the trip generation analysis;
- In the absence of existing information, the preferable option is to conduct original trip generation and modal spilt surveys of the same land use in a comparable setting of the City; and
- If a comparable survey site cannot be identified within the City, the rates in the most recent edition of the Institute of Transportation Engineers (ITE) *Trip Generation* (the "ITE Trip Generation Report") may be used in consultation with DOT. However, care must be exercised in using the ITE *Trip Generation Report* since most of its trip generation rates are based primarily on surveys conducted in suburban settings and need to be adjusted for New York City conditions.

Additional guidance for calculating trip generation rates follows in Subsections 311.1 through 311.3.

311.1. Use of Previously Researched/ Approved Trip Generation Rates

There has been considerable trip generation analysis work done in the City to date as part of prior environmental reviews and studies and rates for certain specific land use types in specific parts of the City have been defined and approved for use on these projects. Table 16-2 presents a list of previously researched and approved trip generation rates that may be used provided that the proposed project being analyzed matches the building(s) or land uses surveyed.

Table 16-2
Examples of Previously Approved and Researched Trip Generation Rates (Weekday and Saturday)

		Weekday Peak Hour Percentage				
Land Use	**Weekday Daily Person Trips**	**AM**	**Midday**	**PM**	**Saturday Daily Person Trips**	**Saturday Peak Hour Percentage**
Office (multi-tenant type building)	18.0 per 1,000 sf	12	15	14	[illegible].9 per 1000 sf	[illegible]
Residential (3 or more floors)	8.075 per DU	10	5	11	[illegible].6 per DU	8
Residential (2 floors or less)	12.6 per DU	10	5	11	13.7 per DU	8
Hotel	9.4 per room	8	14	13	9.4 per room	9
Home Improvement Store	72 per 1,000 sf	7	7	8	90.4 per 1,000 sf	10
Supermarket	175 per 1,000 sf	5	[illegible]	10	231 per 1,000 sf	9
Museum	27 per 1,000 sf	1	16	13	20.[illegible] per 1,000 sf	17
Passive Park Space*	44 per acre	3	5	6	32 per acre	6
Active Park Space*	139 per acre	3	5	6	196 per acre	6
Local Retail	205 per 1,000 sf	3	19	10	240 per 1,000 sf	10
Destination Retail**	78.2 per 1,000 sf	3	9	9	92.5 per 1,000 sf	11
Fast Food Restaurant***	1,746 per 1,000 sf	[illegible]	11	11	418 per 1,000 sf	35
Public School (Students)	2 per student	49.5	N/A	49.5	N/A	N/A
Public School (Parents)	4 per student	23.6	N/A	24.7	N/A	N/A
Public School (Staff)	2 per student	40	N/A	40	N/A	N/A
Academic University	26.[illegible] per 1,000 sf	16	NA	26	13.5 per 1,000 sf	16
Cineplex	3.26 per seat	1	3	8	6.25 per seat	5
Health Club	44.7 per 1,000 sf	4	9	5	26.1 per 1,000 sf	9
Television Studio	10 per 1,000 sf	12	15	11	NA	NA
	Daily Vehicle Trips				**Saturday Daily Vehicle Trips**	
Truck						
Local Retail	0.35 per 1,000 sf	8	11	2	0.04 per 1,000 sf	11
Office	0.32 per 1,000 sf	10	11	2	0.01 per 1,000 sf	11
Residential	0.06 per DU	12	9	2	0.02 per DU	9

NOTES: NA = Not Available; DU = Dwelling Unit
These trip generation rates are for all boroughs.
The truck trip generation rates are based on the use of a 50-50 directional split.
*Temporal distributions for Passive and Active Park Uses are based on 18-hour operation. If fewer or different hours, please contact DOT.
**The trip generation rates for Destination Retail Land Use account for linked trips, so no linked trip credit can be applied.
*** The Fast Food trip generation for a weekday is based on a 12-hour period and Saturday is based on a 3-hour period.

Trip generation rates should be based on information for generally similar facilities. There may also be a condition specific to the proposed project being analyzed that makes its trip generation expectations significantly different from those listed in Table 16-2. For example, the trip generation rate cited for midtown office space may not be appropriate for back-office space outside Manhattan, or even within Manhattan, since back-office space generally does not generate the same number of visitor and business trips that general office space does.

Should the survey for the source cited be considered "stale" by the lead agency, in consultation with DOT, it is recommended that an original survey be conducted for the same land use in a comparable setting of the City. In addition, all findings from this survey should be provided to the lead agency and DOT.

It is also appropriate to determine the number of truck and van deliveries generated by a proposed project separately from the trip generation/modal split analyses. In order to obtain accurate truck trip generation rates for a proposed project, it is recommended that original surveys of a similar existing facility be conducted. Truck trip generation rates cited in the 1969 Wilbur Smith and Associates' Motor Trucks in the Metropolis and the Federal Highway Administration's 1981 Curbside Pick-up and Delivery Operations and Arterial Traffic Impacts have been used previously in EASs/EISs, but are not recommended for use due to the staleness of the information. For projects that generate predominantly heavy vehicles, such as trucks and/or buses, the Passenger Car Equivalent (PCE) factors should be applied to determine the number of new vehicle trips (see Table 16-3). Examples of these types of projects include a warehouse, waste transfer facility, freight or bus terminal, *etc.*

311.2. Conduct of Original Surveys

As indicated previously, if usable trip generation rates are not listed in Table 16-2 and are not available from other surveys, or the available trip generation rates are considered "stale," conducting original surveys in comparable settings is the recommended course of action. Although conducting such a survey may seem rather straightforward, it often calls for considerable judgment. In general, it is not easy, or necessary, to find a survey target that is perfectly comparable to the proposed project in its study area. Due to the many variables of a survey, the lead agency should submit the scope and format to DOT prior to conducting the survey. Factors to consider in selection of a survey site and proper use of survey data include:

- Is the facility to be surveyed comparable to the proposed facility?
- Is the site of the facility to be surveyed comparable in its transit service availability and its modal split characteristics to the site of the proposed project?
- Is the size of the site to be surveyed comparable to that of the proposed project, and does any difference in size play a role in trip-making to and from the site?
- Are the hours and operation of the survey site similar to those of the proposed project?
- Is the on-site parking area of the site to be surveyed comparable to that of the proposed project?

For example, if a project would facilitate creation of a hospital on Queens Boulevard, it may be possible to find another hospital along the same corridor that is equivalently sited with regard to bus and subway service. However, if there is not a similarly sited hospital along the same corridor, the survey could be conducted at a hospital located in another neighborhood that may be assumed to have similar modal split characteristics to those of the proposed project.

In determining whether that hospital is appropriate to survey, a number of other factors should be considered. For example, is the hospital to be surveyed of a comparable size to that of the proposed project? Does the hospital to be surveyed have functions and health care facilities generally comparable to the one being proposed? If one is a teaching hospital while the other is not, the former may generate more or fewer trips during key periods of the day.

It may also be necessary or advisable to survey more than one facility deemed potentially comparable to the proposed project in order to make a reasoned judgment as to where the proposed project would fit within the available range of data.

In conducting a trip generation survey, there are several important considerations to keep in mind:

- The survey should be conducted for two typical midweek days throughout the normal business hours and, if applicable, include a weekend day for the type of facility being surveyed. If the data from the survey are not consistent, then a third midweek day survey may need to be conducted to confirm the appropriate trip generation.
- All entry and exit points should be covered--not just the main entrance/exit location--so that all trips are recorded.
- All person and vehicle trips should be recorded separately at their respective entries and exits in 15-minute intervals throughout the survey period, since they are eventually translated into arriving and departing person and/or vehicle trips.
- Vehicle occupancy should be recorded for each entry and exit vehicle.
- Weather conditions should be noted along with any other occurrences that may affect the volume of trip-making on the survey day, since adjustments may be needed afterward.

The survey methodology, data, significant findings and assumptions should be summarized in a memorandum for submission to the lead agency and DOT. Often this body of information serves as supporting documentation for the analyses and may subsequently be used by others.

311.3. *Use of the ITE Trip Generation publication*

If a comparable survey site cannot be identified within the City, the rates in the ITE *Trip Generation Report* may be used. The ITE *Trip Generation Report* contains auto trip generation rates for a wide range of land uses, but most of these rates reflect nationwide averages based on surveys conducted in suburban settings, often with little or no available public transportation. Therefore, these rates may not be appropriate for the urban character of New York City. However, the rates may be useful for interpolating rates or factors that are not available (such as deriving Saturday rates when only Sunday and weekday rates are available or certain temporal distributions), provided the rates are adjusted for New York City conditions. In using the ITE trip rates, which are usually presented as vehicle trips rather than as person trips, the data should be adjusted for local modal split characteristics in the proposed project's study area. Therefore, it is recommended that the lead agency consult with DOT before using the ITE *Trip Generation Report*.

311.4. *Linked and Pass-By Trips*

The determination of a proposed project's generation of person trips may need to recognize that a percentage of its trip generation may be considered either "linked trips" or "pass-by trips" for certain types of development, particularly retail or commercial. Linked trips are trips that have multiple destinations, either within the proposed development site or between the development site and existing adjacent sites. However, a linked trip that goes from a primary point to a single destination and back again to the same primary point is considered two primary unlinked trips. Pass-by trips are trips that are already present on the adjacent network, have direct access to the site and enter the site only as an intermediate stop on the way to their final destination. If it can be clearly demonstrated that there would be a proportion of true 'pass-by' trips that are already on the network, then these trips may be deducted from the total site-generated vehicle trip-ends for the development.

For example, a proposed retail component in a mall would be expected to generate vehicle trips to it on the basis of its expected trip generation rate, yet a portion of these trips may not be newly generated because some of the vehicle trips to the mall's retail component may be trips that are already made from another component in the mall and may now include an additional “link” to it. This phenomenon may be reflected in the analyses by either a higher "walk" modal split percentage for the proposed project or by dividing the project's overall trip generation into "linked" and "non-linked" components and assigning them separately to the study area network. Up to 25% of “linked and/or pass-by” trip credit for retail developments is allowed, unless valid information based on an original survey support a higher linked and/or pass-by trip credit. Care must be exercised in determining whether the linked trip credit should be applied to the total person trips or to a specific mode of travel.

312. Modal Split

Modal split analyses provide information on the travel modes likely to be used by persons going to and from the proposed project, including autos, taxis and livery services, subways, buses, ferries, commuter rail, bicycles, and walking. These modes are considered in terms of percentages—*i.e.*, what percent of the total number of people traveling to and from the site would travel by that particular mode. The modal split percentages are then applied to the hourly trip generation estimates to determine the number of persons traveling to and from the site by each mode for each of the analysis peak hours. It is important to remember that pedestrian trips refer not only to walk trips (people who walk all the way from/to their starting point to/from the project site), but also to the pedestrian component associated with walking between the site and other modes of travel, such as the subway station, bus stop, or parking facility (unless on-site parking is provided). Thus, the number of pedestrian trips to be included in the pedestrian analysis should include the combined assignments of all pedestrian trips (which include pure walk trips as well as the pedestrian component of all other modes).

A subsequent step applies to both traffic and transit. For traffic, an average vehicle occupancy factor is applied to the number of persons using autos or taxis/livery services to determine the number of vehicles that the proposed project would generate for each peak hour. For transit, bus trip generation also considers subway-to-bus transfers for sites substantially distant from the nearest subway station.

For many combinations of land use types and geographic locations within the City, there are previously researched modal splits available for use. For other combinations, there are sources of information that may be investigated. Similar to the previous discussion on trip generation, there is a significant body of data available from previous EASs/EISs, as well as other databases including the U.S. Census Bureau’s American Community Survey (ACS) and the New York Metropolitan Transportation Council (NYMTC) Household Interview Survey (HIS). Census data, described below, provides substantial data on mode choice for journey-to-work/reverse journey-to-work trips in different parts of the City and is useful for analysis of both residential and office uses. The HIS provides a snapshot of typical household travel patterns for all purposes (work and discretionary travel). However, care should be exercised prior to using this information since the data set includes the travel patterns of the suburban counties surrounding New York City; it is recommended that the lead agency consult with DOT prior to using this data. Sometimes, an original survey is needed. It is emphasized that the City has undergone a noticeable mode shift resulting in a higher transit ridership, walk, and bicycle trips. Therefore, it is recommended that a trip generation survey with an emphasis on modal split be conducted to verify the modal split used in previous EASs/EISs. In no case should modal split data more than ten years old be used.

312.1. Use of U.S. Census Bureau’s American Community Survey

As mentioned above, an important source of modal split information is the U.S. Census Bureau’s American Community Survey, which contains data on journey-to-work trips by mode for each census tract in the City. Therefore, journey to work modal split percentages can readily be obtained for residential projects for any study area. It is also possible to obtain reverse journey-to-work information for a particular census tract, which provides information on how people travel to a workplace. These data are used to determine modal split characteristics for residential and/or office spaces proposed in a given area. Updated census data may be obtained from the New York City Department of City Planning (DCP). U.S. Census transportation data by New York City census tract is available on the DCP website. These data are also available on the U.S. Census website.

312.2. Use of Previously Accepted Modal Splits

Because there has been a considerable amount of survey and analysis work done on previous studies, researched modal splits are available for use for various combinations of proposed projects in certain parts of the City. If the survey for the source cited is considered "stale" by the lead agency, in consultation with DOT, it is recommended that an original survey be conducted.

In certain cases, previously accepted modal splits may need to be adjusted if there is a special aspect of the proposed project that calls for its modal split to be significantly different. For example, journey-to-work modal splits for high-rise residential buildings in Midtown Manhattan may be obtained from the U.S. Census Bureau's American Community Survey. If a project proposes a similar type of building to be the residence of foreign consuls or diplomats, it may be appropriate to modify the modal split to reflect a heavier reliance upon vehicular travel because a significantly higher use of autos, taxis, livery and limousines services is expected in lieu of mass transit for this population.

In other cases, recent initiatives by the City, including Select Bus Service (SBS); expansions to the bicycle route network; and improvements to public transportation, pedestrian and bicycle facilities, are expected to change modal splits in affected areas and should be reflected in the travel demand factors.

312.3. Conduct of Original Surveys

In the absence of previously accepted modal splits, it is recommended that original surveys of modal splits for the same type of land use as the proposed project be conducted in the same or comparable setting. When a proposed project is similar to land uses that currently exist in the study area, this is relatively straightforward task. If not, a similar study area with similar travel characteristics and mass transit availability should be identified in preparing an appropriate modal split survey. This is generally the case when the proposed project includes a land use that is either unique (*e.g.*, an amusement park), unique to the proposed project's study area (*e.g.*, a hotel in the downtown section of St. George, Staten Island), or the survey source cited for the modal split for the land use is considered "stale." If this is the case, the guidance regarding the conduct of trip generation surveys in Subsection 301.2 is also appropriate here.

In conducting modal split surveys, it is important to determine the mode of travel both to and from the site being surveyed. For several land use types, there may be a tendency for people to travel there by one mode and leave by another. For example, a proposed restaurant, concert hall, or entertainment facility in midtown Manhattan may cater to a primarily transit and walk-in population when patrons arrive at 6:00 p.m. or 7:00 p.m., but may be significantly more taxi-oriented for their departures later at night.

The same facility may also have different modal split and vehicle occupancy characteristics by time of day. For the same midtown eatery/entertainment facility cited above, the heavy walk-in trade during the daytime may be replaced by a significantly higher auto-oriented clientele at nighttime. Daytime arrivals by taxi may be mostly single individual arrivals, while nighttime arrivals may be more multi-person groups.

Consequently, it is important that surveys consider the nature of the facility being surveyed, as well as how its activity patterns, clientele, surrounding area and transit services change by time of day for the analysis hours being studied.

Many of the same guidelines cited in Subsection 342 for the selection of traffic count days are also appropriate for trip generation and modal split surveys. Days and hours of operation typical for that facility should be chosen for survey. Consultation with the lead agency and DOT is recommended prior to conducting the survey.

Other factors to consider when preparing for, and conducting, modal split surveys include:

- Survey staff should be properly positioned. For example, if people traveling to a particular building by subway typically approach the building from its west side, positioning survey staff on the east side of the entrance to the building may result in missing several or many subway trips.
- All entry and exit points should be surveyed. Although a building's rear door may look inconspicuous, it may in fact be used by a substantial number of people who get off the subway on that side of the building or people who park in a garage on that street.
- Weather conditions should be noted since they may play a significant role in the decision of how to travel to work, particularly on days with inclement weather.
- Survey staff should be directed not to approach people selectively, *i.e.*, to avoid a tendency to approach people based on their age, race, or sex, since this may bias the findings of the survey. One acceptable strategy is to approach every second or third person in order to not statistically bias the survey.

It is recommended that trip generation and modal split surveys be conducted concurrently. This helps to provide an understanding of whether the particular modal split characteristics surveyed represent a particularly busy day or light day at the site. It is possible that for major trip generators, choice of travel mode may be influenced by the patrons' expectations of travel to the site and to the area.

Studies have found that some people would use bicycles to travel to work if bicycle facilities were available at their place of work. Such facilities may include bicycle storage areas (*e.g.,* racks, bicycle lockers, storage room), locker rooms, and showers. Use of bicycles depends on the distance that a person must travel. As part of PlaNYC, DOT promotes bicycle use by designing and installing new bicycle lanes and racks throughout the City. In addition, DCP has approved a zoning text amendment, [Article II, Chapter 5, Section 25-80](), requiring on-site bicycle parking facilities.

312.4. Use of the NYMTC Best Practices Model

For projects that would cause major changes in regional and Citywide travel patterns (*i.e.*, Congestion Pricing), it may be appropriate to use NYMTC's *Best Practices Model* (BPM) to determine shifts in travel patterns and mode choice arising from the proposed project. It is recommended that the lead agency consult with DOT if the BPM is proposed to be used for analysis of mode shift or traffic diversions.

312.5. Determination of the Trips by Travel Mode

Once the modal split characteristics of a proposed project have been determined on a percentage basis, the number of trips by mode is determined by multiplying the number of person trips to be generated in each analysis hour by the modal split percentage. This yields the number of persons traveling by each mode (*i.e.,* auto, taxi, bus, subway, walk and bicycle and, for certain projects in unique settings, by rail or ferry). To determine the number of vehicles (*i.e.*, autos and taxis) generated in the analysis hours, an average vehicle occupancy factor is applied. This factor differs for different land uses and in different parts of the City.

At the conclusion of this analysis element, it is advantageous to summarize in a table the number of person trips by mode (*i.e.*, auto, taxi, subway, bus, walk, bicycle, and others) and vehicular trips by characteristic (*i.e.*, auto, taxi and truck) for each of the analysis peak hours, both to document the number of trips generated and to facilitate the subsequent trip assignment task. For projects requiring an air or noise analysis, further categories of vehicles would likely be needed.

313. Determining Whether Further Analysis is Necessary

This subsection, based on the above trip generation and modal split assessments, determines whether further study of any of the following technical areas of the transportation system is necessary:

313.1. Traffic

If the proposed project would generate fewer than 50 peak hour vehicle trip-ends, the need for further traffic analysis would be unlikely. A trip-end is defined as a vehicle (*i.e.*, auto, taxi, truck, *etc.*) traveling to or from a site. Should the vehicle travel to and from the site within the same peak hour (*i.e.*, auto pick-up/drop-off, taxi-trip, *etc.*), two trip-ends (one in, one out) are included. However, it should be emphasized that proposed projects affecting congested intersections have at times been found to create significant adverse traffic impacts when their trip generation is fewer than 50 trip-ends in the peak hour, and therefore, the lead agency may require further analysis of such intersections of concern.

For proposed projects that generate a significant number of trucks and/or buses, which are considered to be "equivalent" to more than one car, such vehicle trips should be converted to Passenger Car Equivalents (PCEs) to determine if the 50 peak hour vehicle trip-end threshold is exceeded. Table 16-3 lists the suggested PCE factors.

Table 16-3
Passenger Car Equivalents (PCEs)

Vehicle Type	PCE Factor
Personal Auto	1.0
Trucks/Buses with 2 Axles and Waste Collection Vehicles*	1.5
Trucks/Buses with 3 Axles	2.0
Trucks with 4 or more Axles	2.5

* PCE factor for waste transfer trailers should be determined based on number of axles.

It should be noted that an auto trip to a parking garage or lot is considered one trip-end, whereas a drop-off by auto is two trip-ends (one in, one out). Similarly, most taxi trips are two trip-ends. However, in the Manhattan Central Business District (CBD) (south of 60th Street) a 50 percent taxi overlap (inbound full taxis are assumed to be available for outbound demand) is a standard practice, whereas all other taxi movements are empty taxis. Further, in the vicinity of inter-modal facilities (such as the Grand Central Terminal, the Port Authority Bus Terminal, Penn Station, the South Street Ferry Terminal, *etc.*) up to a 75 percent taxi overlap would be applicable. For Manhattan north of 60th Street and other CBDs, a 25 taxi overlap is acceptable. In all other areas of the City, the taxi overlap assumption is not permitted.

If the combination of projected trip generation (50 or more vehicle trip-ends per peak hour) and location of the proposed project indicates the potential for a significant traffic impact, a Level 2 Screening Assessment, described in Section 320, should be conducted before undertaking a quantitative traffic analysis.

313.2. Transit

According to general thresholds used by MTA agencies, if the proposed project is projected to result in fewer than 200 peak hour subway/rail or bus transit riders, further transit analyses are not typically required as the proposed project is considered unlikely to create a significant transit impact. For generic projects that affect more than one neighborhood, the 200-rider threshold would generally be applied on a per-neighborhood basis. If a generic project would result in an increase of fewer than 200 riders per neighborhood, but the combined ridership impact on a single subway or bus route is 200 or more riders, an assessment is still required.

For example, consider that a generic project affecting the neighborhoods of Prospect Heights and Park Slope in Brooklyn would result in an increase of 199 transit riders in each neighborhood. Based on the location of the project, it is expected that all of the transit riders from both neighborhoods would use the 7th Avenue Station of the B/Q Lines. In this example, although on a per-neighborhood level the programmatic project would fall below the threshold, the cumulative impact on a single subway station would be 200 or more riders, and further transit analysis would be required.

It is also possible that higher transit trip projections would not be expected to impact transit services, especially for stations, bus or subway routes that are not heavily patronized today. Should the projected transit ridership be deemed clearly unlikely to produce significant impacts, this finding should be documented and further analyses would not be needed. If the proposed project might have a significant impact, a Level 2 Screening Assessment should be conducted before undertaking a detailed transit analysis.

313.3. Pedestrian

For pedestrian elements, pedestrian trips include not only "walk" trips, but also trips of other modes that usually have a pedestrian component. For example, subway trips have a walk component from subway stations, bus trips from bus stops, and vehicle trips from parking facilities (except where on-site parking is provided). If the proposed project would result in fewer than 200 pedestrian trips during the analysis peak hours, a further detailed analysis would be unnecessary. However, under all circumstances, if the project proposes to remove or reduce capacity of a pedestrian element (for example, reducing the width of a sidewalk), then further analysis is necessary. Should the proposed project result in 200 or more pedestrian trips during the analysis peak hours, a Level 2 Screening Assessment should be conducted before undertaking a detailed pedestrian analysis.

The above thresholds for pedestrian elements assessment do not apply for new or expanded schools, for which detailed pedestrian analyses are typically required. These analyses should concentrate on safety and operations of pedestrian elements (*i.e.*, intersections with high number of pedestrian accidents, uncontrolled pedestrian crossing(s), narrow sidewalks, non ADA-compliant pedestrian ramps, *etc.*) along principal access routes to/from the school. For example, the route between a new high school and the nearest subway station(s) should be assessed. This analysis should be coordinated with the traffic analysis.

313.4. Parking

An on- and off-street parking analyses may be needed if the proposed project exceeds the development densities identified in Table 16-1 and a quantified traffic analysis is necessary based on the Levels 1 and 2 Screening Analyses.

320. LEVEL 2 (PROJECT GENERATED TRIP ASSIGNMENT) SCREENING ASSESSMENT

When a proposed project exceeds 50 peak hour vehicle trip-ends or 200 peak hour pedestrian or transit trips as determined by the Level 1 Screening Assessment, a Level 2 Project Generated Trip Assignment Screening Assessment should be prepared to determine whether a detailed assessment of any technical areas is warranted. Project generated vehicle and pedestrian trips should be assigned to the traffic network for all peak hours in which the proposed project exceeds the Level 1 Assessment. Project-generated transit trips should be assigned to specific stations and lines and specific entrances within each station. Bus trips should be assigned to specific bus routes (by direction) and bus stops.

321. Trip Assignment

This element of the assessment entails the routing, or "assignment," of vehicular and/or pedestrian trips by each travel mode to specific roadways; subway/rail lines and stations; bus routes; sidewalks, crosswalks and intersection corners; and bicycle and parking facilities en route from their origin to their destination. To estimate which roadways, transit services, pedestrian elements, or parking facilities are likely to be used and the extent to which each of these facilities/services would receive project-generated trips, origin-and-destination (O&D) studies should be used. Prevailing vehicular, transit, and pedestrian traffic volume patterns in the area should be reviewed and may be used as a guide in developing the origin-destination patterns. If the proposed project would generate truck trips, the trucks should then be assigned to designated truck routes.

321.1. Trip Origins and Destinations

The first step in the trip assignment process is to determine the extent to which trips to the project site would be made from various parts of the metropolitan region. The best source of this information, if available, is origin and destination (O&D) data, or information about the location where a trip began and the location where it would end. Such data may be readily available for certain parts of the City that have been previously studied or surveyed. An example of this is Midtown Manhattan office space, for which there exists a body of information on what percentage of Midtown's employees typically come from Manhattan, the other boroughs, New Jersey, Long Island, *etc.* This information has been derived from the U.S. Census (*i.e.*, reverse journey-to-work data) or other O&D surveys. The U.S. Census also contains information on where residents of individual census tracts work, which gives the same information for journey-to-work trips. Yet, it is also important to note that the O&Ds—or regional distribution—of transit trips may be very different from that for traffic activities. For example, a project located in Midtown Manhattan may draw 30 percent of its total trips, or even 30 percent of its transit trips, from the borough of Manhattan, but only 1 or 2 percent of its auto trips from that same borough because Manhattan residents are unlikely to drive to work in the same borough.

Another potentially useful source of general information about regional O&D patterns and trends is the NYMTC Household Interview Survey (HIS). Additionally, O&D data may be extracted from NYMTC's BPM for any appropriate analysis year, via such procedures as Subarea Extraction and/or Select Link Analysis for affected roadways. However, it is recommended that the lead agency consult with DOT before this approach is taken to ensure that any use of the BPM is appropriate.

It is also possible to survey O&D patterns of a comparable site, similar to the types of surveys outlined regarding trip generation and modal split. Such surveys would ask travelers where their trip originated from (*i.e.*, for surveys conducted at a work site for a commercial project) or where their trip was destined to (*i.e.*, for surveys conducted at a residential building for people en route to their work places). The survey would also ask the trip purpose because there may be important differences identified between work trips and recreational, educational, or other trips.

Many of the same survey guidelines discussed previously are followed, such as finding and surveying a similar type of facility in the same study area as the site of the proposed project. In this case, the O&D data to be obtained and applied to a proposed residential building in Flushing should be obtained via surveys of a residential building in Flushing, and not in Astoria, because the choice of traffic routes are different. On the other hand, a more unique type of proposed project, such as an amphitheater in the Coney Island area of Brooklyn, may not have a comparable survey location in the same area. In this case, information could be drawn from either similar types of facilities elsewhere in the City or different types of recreational/entertainment facilities in Brooklyn or Queens to make a reasonable and reasoned judgment for the specific proposed project being analyzed.

For certain projects, the sponsors or developers of the project may have conducted market studies that indicate the likely distribution of its users. Such studies may be used as a surrogate for new O&D

studies. Once such O&D or market analysis data have been obtained, these may be used as the basis for the more specific traffic assignments that follow, which are presented below.

As part of many larger regional transportation studies, travel models have been developed that simulate the routes expected to be used by projected future projects. These studies may use one of several models that are currently in use nationally. The objective of these models is to define the travel characteristics of individual links in the regional roadway network to simulate how people decide to use specific routes and, thus, to predict how future trips would likely be made. They are generally beyond the means or required scope of the type of analyses covered in this Manual, unless the proposed project's sponsor/analyst team independently chooses to develop such a model. The analyst should contact DOT, NYSDOT, DCP or NYMTC to identify whether any recent studies have such modeled O&D information available for public use.

321.2. Assignments

Once the trip origins and destinations have been established, the assignment of both vehicular trips to specific streets and through specific intersections, transit trips to specific subway/rail commuter and/or bus lines, and walk trips to particular pedestrian elements is conducted. This assignment is generally accomplished using the judgment of an experienced traffic professional.

The standard method for assigning trips is described in the following sections. In some cases, it may be appropriate to supplement professional judgment with the use of a microsimulation model (Section 321.1.5) that captures the routing of traffic under complex, congested conditions.

321.2.1. STANDARD METHOD FOR TRAFFIC ASSIGNMENTS, USING PROFESSIONAL JUDGMENT

First, the major routes available to approach or depart the study area from each of the major trip origins or destinations are identified. For example, if the proposed project is a shopping center in downtown Flushing and available O&D sources indicate that 30 percent of the traffic would likely come from Long Island, the westbound Long Island Expressway and Grand Central Parkway would be identified as the major routes available to these travelers.

Next, the traffic assignment process identifies the "target" for which motorists would aim to park their cars. If this is an on-site parking garage, the most direct routes to it would be identified for each arriving vehicular component. In some cases, there may be a single desirable route to the site, while for other cases there may be two or more reasonably equivalent alternatives. The site-generated traffic would be assigned to each of these likely routes (percentage-wise) to the extent deemed appropriate.

A proposed project may have multiple parking facilities available to it, both on-site and off-site. In this case, the assessment considers how specific arrival routes could link up with the different parking sites via a reasoned judgment as to where motorists coming from different directions are likely to park. If a site has multiple parking facilities available to it, more cars cannot be assigned to any of them than its capacity can accommodate. If the proposed project were a corporate headquarters office, for example, there may be assigned parking spaces, or employees may be expected to "learn," for example, that after 8:30 a.m. the closest garage always fills up and that those arriving at 8:45 a.m. or 9:00 a.m. do not touch the site but, in fact, go directly elsewhere to park. Also, note that parking lots and garages that are occupied at 98 percent of their capacity in the existing or future No-Action conditions should be considered to be “at capacity,” and therefore would be unable to attract new vehicles to the parking facility.

There are a multitude of factors that, with the motorists' point of view in mind, should be carefully considered. This traffic assignment step is the major determinant in selecting study intersections, where a proposed project could have significant impacts. Again, factors for consideration include, but are not limited to, the following:

- Where are trips to the site of the proposed project expected to originate? To where would return trips go?
- What are the major roadways expected to be used by these motorists from their individual trip origins (and to their respective destinations)?
- Which streets are most likely to be used by motorists in getting to the project site? How do they link to the facilities at which project-generated trips would park?
- Would traffic destined for the project site be accommodated at the site's primary parking facility, or would it be necessary for project-generated trips to circulate through the study area in search of hard-to-find parking? How may such a travel pattern be "modeled" in the traffic assignment?

The definition of vehicular traffic assignments may also account for pass-by trips and diverted-linked trips in addition to a site's primary trips. The incorporation of an adjustment factor in the analyses to account for these phenomena is generally most applicable for major retail projects. Primary trips are trips made for the specific purpose of visiting the trip generator. Pass-by trips, on the other hand, are made as intermediate stops on the way from an origin to a primary trip destination. They are attracted to the site from traffic passing the site on an adjacent street that contains direct access to the generator. Diverted-linked trips are trips attracted from streets near the site but that require some diversion from one street to another to gain access to the site. The ITE Trip Generation publication presents an excellent elaboration on accounting for these trips, including a range of pass-by and diverted-linked trip percentages surveyed at shopping centers and other land uses across the country. The estimates of the percentages to be used should reflect the extent of retail activity already in the vicinity of the site and volumes on adjacent and nearby roadways.

In addition to auto trip assignments, taxi and truck trips are also assigned to the street network. It is important to note that project-generated taxi and truck trips may have a very different assignment than auto trips, especially in Manhattan where most taxi trips are local. It is also important to note that all taxi trips assigned "in" to the site should also be assigned away or "out" of the site, regardless of whether they are occupied or unoccupied. DOT has recently compiled new data on the taxi O&D patterns in the Manhattan CBD. It may be helpful to consult with DOT to obtain this data.

Project-generated truck trips are routed on designated truck routes, as per DOT truck route regulations. These regulations require trucks to use designated routes for the majority of their trips until they must move onto a street not designated as a truck route to reach their final destination. NYSDOT regulations also preclude trucks and commercial traffic from using certain regional highways—generally those designated as "Parkways" or "Drives."

At the conclusion of these trip assignment steps for autos, taxis, and trucks, the assessment has a percentage assignment of the project's trip generation by each mode by roadways in the study area network. At this point, these percentage assignments are reviewed to determine whether they reasonably represent expected traffic patterns to the site, and whether there are any locations that should be included in the assessment because they would likely receive a significant amount of project-generated trips.

The last step in the trip assignment process is to multiply the project's expected total vehicle trip generation by the percentages assigned to each link and intersection in the network to determine the number of vehicular trips likely to use the area's street network. These volumes would be added to the future No-Action traffic volumes to prepare balanced future With-Action traffic volume maps for each analysis hour.

321.2.2. STANDARD METHOD FOR TRANSIT ASSIGNMENTS, USING PROFESSIONAL JUDGMENT

To assign transit trips, the subway lines that are available in each borough to serve these travelers should be reviewed to assign rail trips to the most logical routes. In cases where more than one subway line is available in a given area, appropriate percentages may be assigned to each of the lines, keeping in mind details such as the project's distance to each station, typical frequency of service for each line, proximity to express stations, proximity to key transfer stations and proximity of bus routes to which subway passengers can transfer. NYCT should agree with the assignment so it is recommended to consult with NYCT Operations Planning. Once rail trips have been assigned to particular lines and stations, the passenger arrivals and departures are then routed through the station to the exit or exits most likely to be used to access the proposed project site. This routing typically encompasses all levels of a station and thus covers the various platforms, street, mezzanine and platform stairwells, passageways or corridors, turnstile banks, and token booth/control areas extending between the subway car and the street level. The congestion on a given stairwell or through a given bank of turnstiles is less likely to affect a subway rider's choice of movement through the station than a vehicular traffic "choke" point would affect motorists' decisions on routes to their destination. Therefore, the most direct paths are generally used for transit trips.

In assigning rail trips as part of the platform and line-haul analyses, such trips are generally not allocated evenly to all cars or all sections of the platform while awaiting the arrival of incoming trains, but only to those platform zones and subway cars that may reasonably be expected to be used. These platform and per-car assignments reflect the entry points to the station that would be used by project-generated trips, the location of stairwells on the platform, and possibly even the destination of riders at the end of their trip.

A similar approach is used for bus trips. The assessment considers the particular routes stopping near the project site and assigns bus riders to these routes in accordance with their general destinations. It is usually possible to review the general service areas of the various bus routes serving a project site and make a general percentage assignment of bus travelers to the various routes. In addition, the bus assignment should also consider subway transfers when sites are located some distance from the nearest subway station. Bus assignments should be reviewed to ensure that the proposed number of buses could physically be operated in the study area.

321.2.3. STANDARD METHOD FOR PEDESTRIAN ASSIGNMENTS, USING PROFESSIONAL JUDGMENT

The trip assignment for pedestrians basically picks up where the traffic and transit assignments leave off. For the weekday AM and PM peak hour (and weekday or Saturday midday peak hour for certain land uses) arrivals and departures of persons to the project site by auto, taxi, and transit, as well as pedestrian trips from parking facilities, subway or rail stations, and bus stops are traced to the main entrances of the site, and through the sidewalk, crosswalk, and corner reservoir areas that are evaluated as part of the impact analyses. There may be additional all-walk trips that need to be assigned through the area as well. The most logical walking paths should be used.

For midday peak hour trips, it is more likely that pedestrian trips focus on local eateries, shopping facilities, and other retail establishments. For this set of analyses, connectivity to parking lots and garages and to subway stations and bus stops are far less pronounced. Therefore, a broader-brushed assignment of these off-peak pedestrian patterns may be made as part of the midday assessment.

321.2.4. STANDARD METHOD FOR PARKING ASSIGNMENTS, USING PROFESSIONAL JUDGMENT

The traffic assignments also determine the number of peak hour trips that are attracted to and depart from each of the parking facilities within the study area. An hourly parking utilization analysis should be conducted for these facilities based on observations, available data, and interviews with the parking operator to ensure that these peak hour trips to each parking facility would not exceed 98 percent of the number of spaces identified as available at that time of the day.

321.2.5. ALTERNATE METHOD: USE OF MICRO-SIMULATION MODELS

For larger proposed projects that would be located in a CBD-type area or in sensitive areas (*i.e.*, schools, parks, hospitals, *etc.*), a micro-simulation model may prove useful to assign traffic to the network if the project is expected to cause the re-routing of traffic across a broad study area. Before undertaking a micro-simulation analysis, the lead agency should consult with DOT to determine whether this analysis technique is appropriate for the project. Generally, any simulation models used for CEQR analysis should follow these guidelines:

- The underlying O&D trip table should be consistent with a generally accepted model (NYMTC BPM or an existing DOT-approved micro-simulation such as the Lower Manhattan model).
- The operating conditions (lane widths, curb conditions, *etc.*) shown in the model should match the real physical operating environment.
- The model should produce Measures of Effectiveness (MOEs) that are consistent with the MOEs described elsewhere in this chapter (*e.g.,* level of service (LOS) and average vehicle delay).
- The process should follow recent Federal Highway Administration (FHWA) guidance for the calibration and validation of simulation models. This ensures that model outputs do not under- or over-estimate intersection volumes.

322. Determining Whether a Detailed Analysis is Necessary

Based upon the results of the screening analyses, the lead agency determines whether a detailed traffic, transit, pedestrian or parking analysis is required. Based upon the vehicle trip assignment, intersections with fewer than 50 vehicle trips during the analysis peak hour may likely be screened out, and no further analysis would be needed for those intersections. However, it should be emphasized that proposed projects affecting congested intersections and/or lane groups have at times been found to create significant traffic impacts when the assigned trips are fewer than 50 vehicles in the peak hour. Therefore, the lead agency, in close consultation with DOT, may identify congested intersections (generating fewer than 50 vehicle trips in the peak hour) to be included in the analysis based on safety and/or operational concerns. This determination should occur at the time the TDF memo is being finalized by the lead agency. If a detailed traffic analysis is warranted, a detailed parking analysis may likely be warranted.

If, based upon the screening analysis, a proposed project would result in 50 or more bus passengers being assigned to a single bus line (in one direction), or if it would result in an increase in passengers at a single subway station or on a single subway line of 200 or more, a more detailed bus or subway analysis would be warranted.

Based upon the Level 2 Screening Assessment, projected pedestrian volume increases of less than 200 pedestrians per hour at any sidewalk, crosswalk or intersection corner would not typically be considered a significant impact and would not require a detailed analysis because that level of increase would not generally be perceptible. However, detailed analysis is necessary if the project results in pedestrian volume increases of 200 or more pedestrians per hour at any sidewalk, crosswalk, or intersection corner, or proposes to remove or reduce capacity of a pedestrian element (*e.g.*, reducing the width of a sidewalk).

330. DETAILED ANALYSIS METHODS

The following provides background information on technical areas that require a detailed analysis, guidance regarding the extent of the analysis, approaches to conducting the analyses, and specific methodologies available for use. The detailed analysis utilizes elements and methodologies that are necessary to identify the traffic, transit, pedestrian, and parking study areas, to determine the project's peak analysis hours and the required existing or new data collection for the peak analysis hours, to prepare and summarize the data into acceptable formats that reflect existing, future No-Action and With-Action conditions, and to represent the primary components of the levels of service analysis.

In some cases, surveys and analyses may overlap in two or more of these technical areas. If warranted based on the nature and extent of surveys to be conducted and technical assumptions to be made, it may be necessary to coordinate these analyses. A discussion of factors to be considered in determining significant impacts, the approach to identifying and evaluating appropriate improvement/mitigation measures, and approaches to developing and evaluating alternatives that reduce or avoid impacts follows. It is important that facilities being analyzed, the assessment methodologies, and technical assumptions be outlined and documented as much as possible and get concurrence from the lead and other involved agencies. For some aspects of the analyses, it is possible to be fairly specific about the methodologies to be used, such as the selected capacity analysis methodology.

The discussions on the various components of the transportation analyses are categorized by component and located, respectively, on pages 16-19 to 16-32 for traffic, pages 16-33 to 16-45 for transit, pages 16-45 to 16-49 for pedestrian, pages 16-49 to 16-50 for vehicular and pedestrian safety, and pages 16-50 to 16-52 for on- and off-street parking.

331. STUDY AREA DEFINITION

The information requested above is critical for proceeding to the next step--determining the Study Area and selection of analysis locations, including, but not limited to, streets, intersections, highway ramps, pedestrian and bicycle facilities, truck loading/unloading and parking facilities. The identification of locations and facilities to be studied and the extent of the coverage (*e.g.*, one block, one-half mile, or one mile from the site) is a function of the proposed project, its geographical setting, its size and its scale. It could very well range from one block to an entire neighborhood or sub-area of the City. Defining the study area calls for considerable judgment. For certain projects, there may be a need to define a primary study area and a secondary study area, with the primary area being the focus of intense analysis and the secondary area being the focus of a more targeted and less intense analysis. Specific guidance for determining the study area and analysis locations for each transportation element is discussed below in that area's assessment section.

332. DETERMINATION OF PEAK PERIODS

After the study areas are determined, the next step is the determination of peak periods, which depend on the type of project. Generally, the same peak period is used for all transportation analyses. Each peak period is typically two to four hours. However, the actual analysis is performed for a shorter time period within the peak period, such as a peak hour or peak 15 minutes, depending on the technical area (traffic, parking, rail transit, bus transit, and pedestrian). The "Analysis of Existing Conditions" section of each technical area describes the procedure for determining the analysis time period (*i.e.,* peak hour or peak 15 minutes) within the peak periods.

For example, for residential land uses, the weekday AM and PM peak periods should suffice. For some projects, an analysis of midday traffic conditions should also be included if impacts during the midday period could be significant. For most types of retail, weekday midday, weekday PM and Saturday and/or Sunday midday peak periods should be considered. The typical weekday peak periods are 7:00 a.m. to 10:00 a.m., 11:00 a.m. to 2:00 p.m., and 4:00 p.m. to 7:00 p.m. The weekend peak period is dependent upon the proposed project's site-generated trips and adjacent roadway traffic volumes.

The standard weekday peak hours in Zone 1, as defined in Table 16-1, are 8:00 a.m. to 9:00 a.m., 12:00 p.m. to 1:00 p.m., and 5:00 p.m. to 6:00 p.m.

Other types of proposed projects (*e.g.*, shopping centers, parks, arenas) are more likely to require traffic analyses at other times of the day and/or on weekends. A proposed sports arena or concert hall may also require a pre-and post-event analysis for a weeknight event, a Friday night or Saturday night event, and a weekend afternoon event. A solid waste facility may generate traffic during other off-peak periods—*e.g.*, earlier in the morning and afternoon than conventional peak commuter hours.

The setting of the proposed project also plays a role in determining the peak periods. For projects located near stadiums, peak periods on game days may need to be considered. A movie theater located in the Manhattan CBD may require a "conventional" weekday or Friday late afternoon/early evening analysis as well as a Friday night or Saturday night analysis, since even a moderate level of movie-going activity on a Friday at 5:30 p.m. to 6:30 p.m. may overlap with background commuter travel peaks, and, when compared to the future No-Action and future With-Action conditions, would create a significant adverse impact necessitating mitigation.

340. DETAILED TRAFFIC ANALYSIS

For proposed projects requiring the preparation of a traffic analysis, the study areas to be analyzed, assessment methodologies, and technical assumptions are outlined and documented as much as possible. Typically, such documentation outlines at least the following:

- Study areas to be analyzed for potential traffic impacts. The study area(s) is based on the Level 2 (Project Generated Vehicle Trip Assignment) Screening Assessment.
- Availability and appropriateness of existing data, and the expected need (if any) to collect new data via field surveys and counts. Existing traffic data should not be more than three years old assuming no operational, geometric or land use changes have occurred since the time data was collected (See Section 730 for the sources of existing data).
- The technical analysis methodologies to be used and key technical assumptions such as trip generation rates, modal splits, average vehicle occupancies—including a preliminary projection of the number of trips to be made by travel mode during the proposed project's peak travel hours—and a first-cut trip assignment that helps to identify (preliminarily) potential significant impact locations.
- The data assembly effort and the subsequent analyses reflecting the need for close coordination of traffic, air quality, and noise analyses.

The text and tabular sections that follow provide the technical guidelines for conducting a traffic analysis.

341. Traffic Study Area

Definition of an appropriate traffic study area is probably the single most critical decision to be made, and the one in which hard guidelines are most difficult to formulate. In this work element, it is important to cover key potential impact locations with the understanding that the study area should be appropriately sized to include potential impact locations. The traffic impact analysis should consider several primary factors in defining the study area:

- How many new vehicle trips would be generated or diverted by the proposed project in its peak hours? Since the magnitude of the projected trip generation is one guide to be considered in defining the extensiveness of the study area, this information is derived from the Travel Demand Factors memorandum prepared as part of the Level 1 Screening Assessment.
- What are the most logical traffic routes for access to and from the site (*i.e.*, its "traffic assignment")? These are traced on a map and used to identify potential analysis locations along them. This information is derived from the Level 2 Screening Assessment.
- What are the existing and/or potential problem locations (*i.e.*, congestions, excessive delays, high vehicular and/or pedestrian accident history, complex intersections, *etc.*) along these routes or next to these routes that could be affected by traffic generated by the proposed project? It is useful to review information available from previous reports and databases regarding problem locations, and it is very important to drive or walk the area during peak travel hours to make an informed determination.

The traffic study area may be either contiguous or a set of non-contiguous intersections combined into a study "area." The traffic study area could extend from a minimum of one to two blocks from the site to as much as one-half mile or more from the site. It is defined by the logical direct routes along which traffic proceeds to and from the site, and typically includes major arterials and streets along the most direct routes to the project site as well as significant alternate routes. Multi-legged intersections and other problem locations along these routes should generally be incorporated into the traffic study area. Consequently, the study area need not have a particular shape--it could be rectangular, a long and narrow area extending along a major route to the project site, *etc.*

Although it is difficult to outline the number of analysis locations encompassed within the study area for a detailed traffic analysis, in most cases it would range from a low of six to eight intersections or analysis locations to a high of about 30 or more such locations. The six to eight analysis location guideline reflects analyses at the four corners of a typical square block site plus additional analysis location(s) along approach route(s) to the site. The 30 or more analysis location guideline reflects the potential to cover two or three avenues or streets on each side of the site, as well. It should be noted that each project is different, and the appropriate number of intersections to be selected for study should be based on the Level 2 Screening Assessment trip assignments. A small-scale project that would generate a modest volume of peak hour trips in a congestion-free area could require even fewer than the six to eight analysis location guideline. Similarly, a major development project in a congested section of the City could require significantly more than 30 analysis locations; "mega-projects" could encompass traffic study areas with 100 or more intersections. However, in the event that the study area appears to be very large and encompass significantly more than 50 analysis locations, care should be exercised so that some of the intermediate locations within the area—but not on a direct route to the site—are not included unnecessarily. It is advisable to use a knowledgeable traffic expert to ensure that the traffic study area is appropriately defined.

The completion of the TDF memorandum (Level 1 Screening Assessment) and the Project Generated Trip Assignment (Level 2 Screening Assessment) provides a sound basis for defining the traffic study area. It is also possible to "screen out" several analysis locations at this stage of the work effort, provided that the preliminary trip generation estimates and the preliminary traffic assignments are close to their final versions. Generally, intersections with fewer than 50 vehicle trips in a peak hour may be screened out. However, the analysis should include those intersections identified as problematic (in terms of operation and/or safety) or congested, even though the assigned trips are less than the established threshold. It is also possible that once the preliminary trip assignments have been completed, the initially defined traffic study area may need to be enlarged to encompass other intersections. This is typically the case when several intersections at the outer edges of the study area are likely to be significantly impacted. However, the study area should only be expanded in consultation with the lead agency and DOT.

In addition to the above operation-based guidelines, the traffic study area should also consider intersections or locations that may be problematic from the safety viewpoint. High-crash locations, if any, should be identified in consultation with DOT and the traffic study area should include these intersections. A high crash location is one where there were 48 or more total crashes (reportable and non-reportable) or five or more pedestrian/bicycles injury crashes in any consecutive 12 months of the most recent 3-year period for which data is available (for details see Section 370, "Assessment of Vehicular and Pedestrian Safety Impacts").

342. ANALYSIS OF EXISTING CONDITIONS

Once the study areas have been defined, the analysis of existing conditions becomes the building block upon which all impact analyses are based. The objective of the existing condition analysis is to determine existing volumes, traffic patterns, and LOS as a description of the setting within which the proposed project would occur. It is important that existing conditions be defined precisely since this is a reflection of activity levels that actually occur today and serve as the baseline for future condition analyses that require at least some projection.

The guidelines provided below require coordination with the assessments of other transportation components if the surveys to be conducted would overlap two or more of these technical areas. This way, if different individuals are responsible for traffic, transit, and pedestrian analyses, they should each be involved in understanding the nature and extent of surveys to be conducted and technical assumptions to be made so that there are no internal conflicts within the different analyses.

The analysis of existing traffic conditions entails three key steps: (a) the assembly and/or collection of traffic, pedestrian and bicycle volume, speed-and-delay data, physical inventory, official signal timing, *etc.* needed for the analyses; (b) the determination of volume-to-capacity ratios, average vehicle delays, and level of service at the traffic analysis locations within the study area; and (c) consideration of the traffic accident history in the study area.

342.1. Determination of the Peak Hour for Analysis Purposes

The first step in the analysis of existing conditions is the determination of the peak travel hours to be analyzed. For most proposed projects, the peak analysis hours are the same as the peak travel hours already occurring on study area streets, *i.e.*, the specific one hour within the morning home-to-work and the late afternoon/early evening return trip rush hour.

The traffic analysis considers the peak activity hours for the proposed project, the peak hours for background traffic already existing in the study area, and which combinations of the two may generate significant impacts. It might involve the busiest hours of the proposed project superimposed on light, moderate, or heavy traffic hours that already exist. It might involve more moderate activity hours of the proposed project superimposed on the heaviest existing traffic hours. Or, it might involve both. To determine prevailing peak hours in the study area, the source of existing traffic volumes may either be available through 24-hour Automatic Traffic Recorder (ATR) machine counts or new counts obtained from installed ATR machines.

One means of quantitatively determining the peak analysis hours is to prepare a table showing existing hour-by-hour traffic volumes at a set of representative intersections within the area or at a cordon line around the area, side by side with hour-by-hour projections of the expected trip generation of the project. A comparison of the two sets of volumes would indicate: a) which travel hours are likely to be the busiest in the future; and b) at which hours the influence, or impact, of the proposed project's trip making levels would likely be the greatest. From this comparison, potential significant impact hours—and thus the peak traffic hours to be analyzed—may be identified. Should there be multiple projects in the study area, it is recommended that common peak analysis hours be used. The lead agency and DOT should be consulted if there are multiple projects in the study area.

In some cases, the peak condition to be analyzed is obvious because the peak hour of the project's trip generation would coincide with the existing peak hour. In other cases, the two peak hours may be very close, and it may be proper to use the existing peak hour and later, during the impact analysis stage, to superimpose the peak trip generation of the proposed project onto the peak existing condition. In yet other cases where the two peaks are not coincidental (or nearly coincidental), a screening analysis is needed to determine which of the two peaks (the existing peak or the proposed project's peak) would reflect the worst impact condition, or whether both hours require detailed study.

342.2. Assembly and Collection of Traffic Volumes, Street Network Characteristics, and Speed and Delay Data

USE OF AVAILABLE DATA

Once the peak analysis hours have been determined, the next step in the existing traffic condition analysis is to define the volume of traffic operating within the study area, and to create traffic volume maps to be used in analyzing roadway and intersection capacities and levels of service. In starting this task, it may be helpful to review available traffic data on DOT's Traffic Information Management System (TIMS) including traffic volume data, particularly available ATR machine counts in the area (perhaps the count data used to determine the peak analysis hours), as well as intersection turning counts and vehicle classification counts (*i.e.*, a breakdown of the total volume by auto, taxi, truck, bus, *etc.*).

A second source of data that may be reviewed very early in the analysis effort are completed CEQR documents—EISs, EASs, or other traffic impact studies conducted for projects in the study area that are available for public review through the Mayor's Office of Environmental Coordination (MOEC).

The most important criteria to be used in considering whether available traffic volume data may be used concerns the age of the volume data and the nature of changes, if any, in the street network, adjacent land uses, or traffic patterns, as discussed below:

- In most parts of the City, volume data that are more than three years old are generally inappropriate for use in traffic studies. It is only in unusual cases where such data might be usable, such as data for a section of the City that has undergone very little change in land use and/or activity levels since the data were collected. Consultation with the lead agency and DOT is recommended prior to using any such data. The key factor is whether available data are reasonably representative of existing conditions. It is also important that the data were collected at an appropriate time of year, for a typical mid-week day, and within a full peak hour (as opposed to spot counts). The older the data are, the more necessary it should be that they comply fully with the parameters that follow below under "New Data Collection." Volume data available for a previous year may need to be adjusted to reflect conditions in the "existing" year of the study.
- Available data less than three years old are generally appropriate for analysis purposes if there have not been substantive changes in adjacent or nearby land uses or in traffic patterns and operations, that would affect traffic volumes within the study area. For example, if a major development project has been built within a few blocks of the site of the proposed project and generates a significant amount of traffic during the peak travel hours, new traffic counts are likely needed. If a nearby street has been converted from two-way operation to one-way operation or has been closed, or if a new highway ramp has been built that affects traffic volumes or patterns in the study area, new traffic counts are also likely needed. In addition, conditions in the study area at the time the available traffic counts were conducted need to be researched. If the available traffic volumes were collected at a time when traffic patterns were atypical—for example, at a time when a nearby bridge or viaduct was closed or partially closed for reconstruction—either new traffic counts are likely needed or the data collected needs to be adjusted to reflect typical conditions (it may be helpful to consult with DOT regarding the adjustment of such volume data). These examples are not intended to be all-inclusive, but should indicate that if conditions at the time of analysis are materially different from those at the time available volume data were collected, new counts are likely needed. Furthermore, new traffic counts are likely needed if new truck routes, Select Bus Service and bicycle lanes, *etc.* have been added or removed from the network since the collection of this data.

NEW DATA COLLECTION

If the decision is made to collect new traffic volume data, several guidelines are presented below to help ensure that appropriate, representative traffic data are collected. The traffic data collection task is one of the most important steps in the traffic analysis process because it is of paramount importance that existing conditions be accurately portrayed. It usually takes a week or more to define the scope of the traffic count program, organize it properly (including setting up the field data sheets), and plan for any potential contingencies. This is one step of the overall impact analysis process in which major errors that are not caught in time may cause nearly all subsequent work to be redone. Field survey crews should be adequately trained prior to conducting the counts, and monitored during the counting effort to ensure a high quality data collection effort.

- Traffic counts should reflect typical conditions at the locations being analyzed. Traffic counts taken during periods of the year within which traffic volumes or patterns are unusually low or high do not provide representative traffic data. Time periods in which traffic counts should not be taken include the weekend before Thanksgiving through mid-January and the last week of June through mid-September (coinciding with Department of Education (DOE) summer vacation). For instance, a proposed office project should not have its traffic counts conducted during the summer months when many people tend to take vacation time from work and when traffic volumes are typically lower than during the remainder of the year. Exceptions to this guideline may be considered if the peak trip generation of a proposed project coincides with one of these periods. For example, a proposed water park, marina, or amusement park should have its traffic counts taken during the summer months when traffic patterns are likely to be representative of future background conditions. A development in a recreational area such as Coney Island or the Rockaways should also be analyzed under summer conditions. It should be noted that this seasonal analysis precludes the need for a typical period analysis.

  Although it is possible to adjust field-collected traffic counts for seasonal variation, such adjustments are not necessary if the traffic counts have in fact been collected on typical days within a typical period of the year for that land use. It usually is preferable to rely on typical day counts rather than on seasonally adjusted counts.

- Weekday traffic counts should generally not be taken on a Monday or Friday, since there is a tendency for volumes to be different on those days than on more typical weekdays, *i.e.*, Tuesdays, Wednesdays, or Thursdays. Traffic counts should neither be taken on any holiday where traffic may historically be lower or higher than on typical days, nor on the day before or day after that holiday because people tend to take an extra day off or leave work early on those days. National holidays such as Memorial Day, Labor Day, Independence Day, *etc.*, are included on this list as are others that are significantly observed in New York, such as Martin Luther King, Jr. Day and Rosh Hashanah (Jewish New Year). Some judgment should be exercised for holidays that are not considered major. Traffic counts also should not be conducted during periods when extensive construction work or bad weather significantly alters traffic patterns, unless reasonable adjustments to the count data may be made.

  Traffic counts should not be collected during special events, such as street fairs that impact vehicle, pedestrian and bicycle traffic in the study area. It may be helpful to consult with DOT to confirm any scheduled upcoming street closures due to special events.

- Manual traffic counts should also not be conducted on days when inclement weather influences people's driving patterns. For example, traffic counts on snow days or on days for which snow has been predicted (even if it does not materialize) should be avoided. Rainy day counts should also be avoided, but if the counts are already under way once it has begun raining, the volumes collected may be generally considered acceptable since the weather has probably not influenced a significant number of people to drive or not to drive. However, if the counts are collected for air quality analysis, care should be exercised as speed data collected under wet roadway surface conditions may not be useful since drivers exercise caution and tend to drive at lower speeds.

- Weekday traffic counts should be conducted over a sufficient number of days to be considered representative of a typical day. Historically, weekday traffic counts have generally been taken over three mid-week days to ensure that a representative day is reflected in the traffic volume analyses, and so that any abnormality in a given day's worth of counts may be identified and adjusted (or discarded). For example, three mid-week days of counts may be taken in one of two ways: a) three days of manual counts that are subsequently averaged to reflect a typical day; or b) one day of manual counts collected concurrently with a nine-day 24-hour Automatic Traffic Recorder (ATR) machine count (to collect two weekends of data where necessary), from which adjustments to the one-day manual count may be made. In the latter example, it is advisable to collect validation manual counts at one or more control intersections (but no more than 20 percent of the intersections in the study area) on a second day. ATRs should be placed at sufficient number of locations covering all major street approaches as well as representative minor street approaches. Generally, ATRs should be placed on the approach leg(s) of an intersection rather than the departure leg(s).

Before adjusting one day of manual counts to reflect several days of ATR counts, the entire body of data collected should be reviewed to make sure that there was no "event" going on at the time the counts were taken that would significantly alter the accuracy of the counts. Such events could include the malfunctioning of the ATR machine for a period of time, vandalism to the ATR machine, a street opening for utility repairs that would narrow the number of lanes available and therefore limit the volume of traffic that passed through the area, *etc.* This need not be a lengthy review providing that the proper agencies and/or news services have been contacted to determine that nothing unusual was planned for the count day or occurred on that day. It should be noted that ATR counts taken during constrained or congested traffic conditions or on wide roadways carrying more than three lanes may give inaccurate and misleading results and should be field verified and/or calibrated.

- Weekend traffic counts should be conducted for more than a single day to be considered reasonably representative of a typical weekend day. However, one weekend day of manual counts could be sufficient if the ATR data collection is conducted over a nine-consecutive day period including two full weekends. For those types of proposed projects with activities that extend at generally equal levels over several hours, and for which a particular peak hour is not easily discernible, the manual count period should extend over all hours that could potentially comprise the peak hour for the study area and/or the proposed project.

- Manual traffic counts taken at study area locations for the purposes of determining the volume of through and turning traffic should be conducted over the course of the full peak period, from which the peak hour is derived. Manual counts should not be conducted for a shorter period of time and then factored upward to reflect the peak hour worth of data. The counts should generally be taken over a minimum of two full hours per peak period, overlapping the projected peak hour plus at least 30 minutes on each side of the peak (*i.e.*, 7:30 a.m. to 9:30 a.m. for a projected 8:00 a.m. to 9:00 a.m. peak hour), to ensure capturing any peaking that could occur at the beginning or end of the peak hour. The additional 30 minutes of data on either side of the peak allow confirmation that the peak hour has been covered.

- Manual traffic counts taken at study area locations for the purpose of identifying the mix of vehicles (autos, taxis, buses, trucks, bicycle *etc.*)—also referred to as "vehicle classification counts"—may be taken for less than the two hours discussed above because vehicle mixes at a given location are usually not subject to wide fluctuations over the peak hour. Vehicle classification counts should be conducted for each movement per approach for a minimum of one hour in 15-minute intervals.

- If an air quality or noise analysis is required, more detailed vehicle classification counts would be necessary. See Chapter 17, "Air Quality," and Chapter 19, "Noise," for more details on the required classifications. The New York City Department of Environmental Protection (DEP) should also be consulted. It should be noted that the peak hours of noise analysis may not coincide with the peak hours of traffic.

- Vehicle occupancy needs to be determined for transit-related projects (for example, Select Bus Service) which may include person-delay by approach to demonstrate project benefits (see Subsection 331.3 for person-delay). For some locations this information may already be available (such as for Midtown Manhattan from the NYMTC Hub-Bound report).
- All traffic data collected for the preparation of a CEQR traffic analysis should be provided, in tabulated form, to the lead agency and DOT and delivered in accordance with TIMS compliance. Volumes collected by Automatic Traffic Recorder (ATR) devices should be delivered per the certified NYSDOT format, with station numbers and GPS coordinates to identify the count location.

PREPARATION OF PEAK HOUR TRAFFIC VOLUME MAPS

Once all of the traffic volume data have been assembled and/or collected, the next step is to prepare traffic volume maps for each of the peak hours for which the proposed project is evaluated. As described previously, the preliminary choice of peak periods (from which the peak hours are derived) is generally made at the very outset of the project when study areas are defined.

Once the data collection effort is complete, the analysis returns to the initial identification of the peak hours to be analyzed, reviews the data collected and then determines the precise peaks to be analyzed. For traffic, these peak hours are usually identified to the nearest 15 minutes, *i.e.*, 7:15 a.m. to 8:15 a.m. rather than simply 7:00 a.m. to 8:00 a.m. Then, all of the peak hour volumes are plotted on a map of the study area, including all through and turning volumes at each location counted to present a total picture of traffic volumes throughout the study area. These traffic volumes, rounded to the nearest five, may then be "balanced" so that volumes at adjacent intersections are consistent with one another. For example, if the northbound through volume on Sixth Avenue at 43rd Street in Manhattan is 2,000 vehicles per hour (vph) and there are 200 vehicles turning onto Sixth Avenue from westbound 43rd Street, the northbound volume on Sixth Avenue at 44th Street should be exactly 2,200 vph, provided that there are no parking garage entrances or other places for vehicles to leave the street network between 43rd and 44th Streets. Midblock activities such as driveways, parking garages/lots, *etc.*, should be identified and factored into the traffic volume maps. These activities are known as "sinks" and "sources."

These balanced traffic volume maps are key inputs for determining volume-to-capacity (v/c) ratios, average vehicle delays, and levels of service (LOS) for the study intersections.

STREET GEOMETRY AND PHYSICAL INVENTORY

As part of the overall data assembly/data collection effort, information on the street network is needed. This provides a description of what the area's traffic network "looks like" and how it is sized to accommodate traffic flow. Field verified (not aerial dependent) geometric and operational information should be presented graphically and be legible and neatly prepared as it becomes an additional set of inputs to the determination of street capacity and traffic levels of service. Information to be included in a physical inventory should be consistent with the requirements of the Highway Capacity Manual. For example, the Highway Capacity Manual requires hourly parking maneuvers within 250 feet upstream from the stop line, a near-side or far-side bus stop within 250 of the stop line (upstream or downstream), length of turning bays, etc. Data to be collected varies depending on the capacity analysis methodology used, but generally includes the following:

- The lane widths, number of travel lanes, bicycle lanes, bus lanes, parking lanes, cross walks, stop bars, turn bays and turn prohibitions, designated truck routes and direction of each street in the study area and along the major routes into the study area. The location of traffic control devices, such as traffic signals, stop signs, yield signs, turn prohibitions, *etc.*, should be illustrated graphically. For signalized intersections, signal cycle length, phasing, and timing are needed to conduct capacity analyses. Official signal timing data should be obtained from

DOT and field-checked; consultation with DOT is advisable should there be discrepancies between the two sets of timings.

- Restricted lanes, such as part time bus lanes, rush hour travel lanes, etc.
- General on-street parking regulations as well as parking maneuvers in the area and on the blocks leading to and away from the intersections being analyzed (more detailed parking inventories are needed for the parking analyses and are outlined later). The presence of bus stops and fire hydrants is accounted for in the traffic and parking capacity analyses. General pavement or alignment conditions along the major roadways in the area that affect traffic flow, *e.g.*, poor pavement conditions, difficult vertical or horizontal geometries that affect traffic flow, or other like conditions should be noted.

TRAVEL TIME AND DELAY RUNS

Travel time and delay runs are generally collected for use in the mobile source air quality analyses, and should be collected concurrently with the traffic count program. In particular, the running time of the traffic, stopped delay at intersections, vehicle classifications, roadway geometrics, and signal timing data is required (see Chapter 17, "Air Quality"). These data are collected concurrently to correlate travel time to traffic volumes and calculated vehicle delays for air quality analysis purposes. If there is no need for travel time data for air quality purposes, there is likely no need to collect these data at all. If air quality analyses require this information, it is important to coordinate traffic and air quality analysis locations and their data needs (including the length of the corridor along which travel time data are needed for the air quality analysis) so that the data collection process may be conducted more efficiently.

Travel time and delay runs are generally best collected via the "floating car technique," in which the survey car seeks to travel at the speed of a typical car in the traffic stream. A driver and data recorder are dispatched in a car and travel a route (or routes) through each of the air quality analysis sites, recording travel time and delay information for each approach to each site.

For the purposes of the field work, it is advisable to create a form noting the points along the route so that the elapsed time may be recorded as well as the location, extent, and type of delays. By comparing the elapsed time it takes to go from point to point to the distance between the two points, actual travel speeds may be quantified. As noted above, the travel time and delay runs should progress at the same time as the traffic counts, *i.e.*, over the same time period and number of days. A total of at least six to nine runs per link for each analysis hour are generally necessary to replicate typical conditions. At times, it may be necessary to dispatch more than one team to complete the required number of runs at the required number of air quality analysis sites.

In addition to the floating-car technique, other proven and generally accepted technologies, such as those based on the use of electronic toll collection readers and GPS, may also be considered. It is advisable to consult with the lead agency, DOT and DEP before employing such techniques.

322.3. Analysis of Roadway Capacity and Level of Service

After the preparation of balanced traffic volume maps, the determination of the capacity and levels of service (LOS) of the study area's roadways and intersections is the next critical step in the overall traffic analyses. The key to evaluating urban area traffic conditions is the analysis of its intersections, since the capacity of an urban street is typically controlled by the capacity at its intersections with other streets. At times, the linkages between a highway and the study area street network may also play a critical role in the analysis. In general, the capacity of an intersection—*i.e.*, the maximum number of vehicles that can pass through it—depends on several factors and may be evaluated by one of several available methodologies. Use of one of these methodologies produces the capacity for each lane group and is compared with the volume of that lane group and its operating conditions.

The resulted Measures of Effectiveness (MOEs) are expressed in terms of volume-to-capacity (v/c) ratio, average control delay and LOS.

In addition to the above performance measures, for certain projects, calculations of person-delay should be performed when determining more efficient use of street space among competing users (such as autos, buses, bicycles, or pedestrians). Projects that require calculation of person-delay are:

- The proposed project, or its mitigations, increase surface transit capacity, *e.g.* a Bus Rapid Transit (BRT) project, by dedicating one or more traffic lanes on a roadway for the exclusive use of buses for some part of the day; or
- The proposed project, or its mitigations, decrease surface transit capacity through the complete or partial removal of an existing bus lane.

For example, if a Select Bus Service (SBS) is proposed on Second Avenue, and one of the available travel lanes is converted to "Bus Only" lane, then person-delay should be calculated to demonstrate the project benefits in addition to the vehicle-based delay that may show adverse effects on vehicular traffic operation.

The lead agency should consult DOT to review the person-delay calculations. This review ensures that surface transit operations would be enhanced, or not impacted, by the proposed project or its improvement/mitigation measures.

HIGHWAY CAPACITY MANUAL METHODOLOGY

The Highway Capacity Manual (HCM), developed by the Transportation Research Board (TRB), contains procedures for analyzing signalized and unsignalized intersections and is considered an appropriate analysis tool for use in New York City. The HCM is continually being updated and it is recommended the lead agency contact DOT to ascertain the most appropriate approved version of the Highway Capacity Software (HCS) for use.

SIGNALIZED INTERSECTIONS

According to the HCM, the capacities of signalized intersections are based on three sets of inputs: 1) geometric conditions, including the number of lanes, the length of storage bays for turns, the type of area the analysis locations are situated in (*e.g.*, central business district and others), the existence of parking or bus stop activity at the curb, *etc.*; 2) traffic conditions, including volumes by movement, vehicle classification, parking maneuvers, the nature of vehicular platooning in arrivals at the intersection, pedestrian and bicycle conflicts, *etc.*; and 3) signalization conditions, including signal cycle length, timing and phasing, signal coordination, and the existence of signal actuation capabilities by either vehicles or pedestrians.

Based on all of these and other inputs, the HCM model then calculates the ratio of the volume on the street to the street's capacity (v/c ratios), average vehicle delays, and LOS, where LOS is defined in terms of the average control delay per vehicle for lane groups, intersection approaches and the intersection as a whole. According to the HCM, the conditions that the driver is likely to encounter at each LOS for signalized intersections are as follows (the definitions of LOS are included in the Appendix):

- LOS A describes traffic operations with very low delay. This occurs when signal progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all.
- LOS B describes operations with low but increased delay. This generally occurs with good progression and/or short cycle lengths. Again, most vehicles do not stop at the intersection.

- LOS C describes operations with moderate delay. These higher delays may result from fair progression and/or longer cycle lengths. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
- LOS D describes operations with heavy delay. At LOS D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines substantially.
- LOS E describes very heavy delay. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios near capacity.
- LOS F typically describes ever increasing delays as queues begin to form. This is considered to be unacceptable to most drivers. This condition often occurs with oversaturation, *i.e.*, when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios with cycle failures. Poor progression and long cycle lengths may also be contributing to such delays.

The procedures to be used in conducting the capacity analyses are contained and fully described in the HCM and its Highway Capacity Software (HCS). It should be noted that the HCM provides for two alternative means of obtaining selected inputs to the capacity analyses--detailed field information and default values. The detailed field verified information of inputs, such as lane widths, peak hour factor, arrival type, number of parking maneuvers, number of conflicting pedestrians and bicycles, *etc.*, are used for operational level analyses. The use of "default" values specified in the HCM are permitted only for planning level analysis for which the actual field surveys cannot be obtained. It should also be noted that any changes to the HCS estimated adjustment factors may not be acceptable unless supported by verifiable and quantifiable surveys/field observations. Please see Appendix for guidance on the HCS adjustment factors.

UNSIGNALIZED INTERSECTIONS

Capacity analyses for unsignalized intersections are based on the use of "gaps" in a major traffic stream by vehicles crossing through or turning into that stream. At unsignalized intersections, "Stop" or "Yield" signs are used to assign the right-of-way to one street while controlling movements from the other street(s). This forces drivers on the controlled street (usually the "minor" street approach to the intersection) to use judgment when selecting gaps in the major street flow through which they may enter and turn into the intersection, or cross entirely through the intersection. The minor street traffic also has to yield to pedestrians in that approach.

The capacity analysis method used for unsignalized intersections under the HCM generally assumes that major street traffic is not affected by minor street flows. Left turns from the major street are assumed to be affected by the opposing or oncoming major street flow. Minor street traffic is obviously affected by all conflicting vehicular and pedestrian movements.

In analyzing the ability of traffic to use gaps in the major street traffic flows, the HCM recognizes that certain movements are more able to use these gaps than others. Right turns from the minor street are most able to use available gaps, since they need to be concerned only with gaps in one direction of major street traffic and/or conflicting pedestrians. Left turns from the major street are the next movement most able to use available gaps, followed by through movements and then left turns from the minor streets (which must recognize and negotiate their way through gaps in two directions of major street flows, for a two-way street). This is important to understand because it reflects the frequent capacity shortages for vehicles seeking to make left turns from a minor street onto a major street.

The key input data required to analyze unsignalized intersections include geometric factors and volumes. Geometric factors include the number and use of lanes, channelization, percent grades, curb radii and approach angles, sight distances, and pedestrian flows. The capacity computations result in a determination of volume-to-capacity ratio and delays and LOS. The LOS table containing all of the definitions is included in the Appendix.

Any highway or highway ramp/local street merge or weave conditions should also utilize HCM procedures. All methodologies, data needs, and procedural steps are detailed in full in the HCM. The intersections of highway ramps with adjacent service roads and streets, however, would follow the procedures outlined above for signalized and unsignalized intersections.

OTHER ANALYSIS METHODOLOGIES

Other software (*i.e.*, Synchro, TRAFFIX) or simulation models (*i.e.*, CORSIM, SimTraffic, AIMSUN) may be employed for use in the particular study area only if they may be proven appropriate and are compatible with air quality models. However, it should be emphasized that the concurrence of the lead agency, in consultation with DOT, regarding the use of such models is required before they are employed. The lead agency must certify that any alternative analysis method (including micro-simulation) meets the following criteria:

- Provides the same performance measures as the HCM outputs described above (*i.e.*, levels of service, delays, queues, *etc.*); and
- Demonstrates consistency with the traffic engineering principles and theories of traffic flow as described the HCM.

342.4. Overview of Level of Service Determinations

The definitions of the various levels of service and the criteria for determining whether given lane groups of a study intersection operate at LOS A, B, C, D, E or F are described in the previous section. According to generally accepted practice in New York City, LOS A, B, and C reflect clearly acceptable conditions; LOS up to mid-D reflects the existence of delays within a generally tolerable range; and LOS above mid-D, E and F indicate levels of congestion.

Once the capacity analyses have been completed, and v/c ratios, delays and LOS have been preliminarily defined for each lane group, approach and overall intersection, these findings should be reviewed and compared to conditions observed in the field, as well as to information that is also available from other sources such as travel speed and delay runs. Please note that the existing condition v/c ratio of a lane group should not exceed a value of 1.05. It is often possible that the computed v/c ratios, delays, queues, or LOS do not accurately reflect field conditions.

It is possible that congestion occurring at an upstream intersection does not allow traffic to proceed to the next intersection in a normal manner. To illustrate, if there is construction activity that narrows southbound Fifth Avenue at 45th Street to only two lanes as opposed to its normal five or six lanes, only a small volume of traffic can pass through the 45th Street intersection, which then accelerates as it passes through a full-width Fifth Avenue at 43rd Street. Without observing this in the field and understanding this traffic issue, an erroneously low volume could be used at 43rd Street that would lead to a determination that the intersection is operating at a clearly acceptable level of service, when under normal conditions at 45th Street, the intersection at 43rd Street would not operate that well.

It is also possible that the occurrence of double-parking activities or truck loading/unloading activities may create LOS conditions that are worse than those projected via the capacity analysis methodology employed. There are many such potential field conditions that should be understood and considered during the development of traffic volume maps, conduct of capacity analyses, and determination of an intersection's typical LOS. All available information should be weighed before finally determining level of service and defining which intersections operate in a problematic manner. The lead agency should consult with DOT with regard to LOS calibration or HCS adjustment factors if the v/c ratio for a lane-group is greater than 1.05 under the existing condition.

343. Future No-Action Condition

The future No-Action condition accounts for general background traffic growth within or through the study area, plus trip-making expected to be generated by anticipated projects that are also likely to be in place by the proposed project's build year. Background growth rates and the methodologies used in accounting for trips from expected development projects are presented below.

343.1. Annual Background Growth Rates

The development of the annual background growth rates follows the general trends in traffic and growth prevalent through various sections of the City over a number of years. It reflects the general long-term trend rather than quick deviations from the general trend. Several sources of information are generally used to develop this projection, including bridge and tunnel volume counts that are collected and monitored by DOT, as well as general development trends throughout the City. Such information, and land use and population data, is available from DCP.

For transportation analyses purposes, the following compounded annual background growth rates are recommended:

Table 16-4
Annual Background Growth Rates

Section of the City	1 to 5 years	Year 6 and beyond
Manhattan	0.25%	0.125%
Bronx	0.25%	0.125%
Downtown Brooklyn	0.25%	0.125%
Other Brooklyn	0.50%	0.250%
Long Island City	0.25%	0.125%
Other Queens	0.50%	0.250%
St. George (Staten Island)	0.50%	0.250%
Other Staten Island	1.00%	0.500%

It is recommended to use these factors when determining a suitable growth rate. For example, if a development is proposed in St. George, Staten Island with a base year of 2010 and a build year of 2020, a compounded annual background growth rate of 0.5 percent is applied until 2015 and a 0.25 percent compounded annual growth rate is used thereafter.

Since traffic growth is influenced by land use trends, market conditions, modal split changes, auto ownership rates, and other factors, these rates may change over time. Further, it should be noted that the above growth rates reflect peak travel hour expectations rather than daily figures. In some areas, daily traffic growth may in fact be significantly greater or less than the rates above, while peak hour growth is constrained by the presence of traffic capacity bottlenecks during the peak periods. It should also be noted that these are recommended rates; other rates may be researched, calculated, and used if there are data to substantiate them (documentation of the assumptions and/or data used to make these calculations are required). For example, the use of a micro-simulation model based on a future-year subarea trip table from the NYMTC Best Practice Model (BPM) would be acceptable because the model itself contains accepted assumptions about population and employment growth that are consistent with regional efforts to comply with the Clean Air Act.

The use of other rates may be appropriate for proposed No-Action projects with peak travel hours at non-peak times, such as a concert hall or amusement park that is to be active on weekends and/or during summer months.

For projects with horizon years beyond a 10-year period, the lead agency, in consultation with DOT and DCP, should determine the applicability of the annual background growth rate percentages described above.

343.2. No-Action Development Project Trip-Making

In addition to the compounded annual background growth rate that is applied evenly throughout the study area (*i.e.*, at all intersections for the traffic analysis), the analysis also accounts for trips to and from major development projects that are not assumed to be part of an area's general annual growth. Here, too, the determination of whether a proposed No-Action project should be considered part of the general background or superimposed on top of the general background growth calls for considerable judgment. At a minimum, it is advisable to consult with DCP or MOEC for a full No-Action project listing.

Another means of determining whether or not proposed No-Action development projects would be appropriately considered as part of the background is to calculate the total amount of peak hour trip-making expected from all of the projects and then calculate the percentage increase in traffic this constitutes within the study area. If the calculated percentage is less than the recommended growth rates enumerated in Table 16-4, it may generally be assumed that each of the developments fall within the background growth rate and do not need to be superimposed on it.

There are several ways to determine the amount of trip-making associated with a No-Action project. The best way is to use the trip projections cited in that project's traffic impact analysis, if such an analysis exists. If such trip projections are not available, the methodologies for trip generation, modal split and trip assignment described above in Section 300 may be used. This second means of determining No-Action trip-making entails additional work beyond just using available projections.

If it is necessary to conduct independent trip-making estimates of No-Action projects, the same procedures cited for the future With-Action analysis may be used. However, if there are numerous No-Action development projects, the future With-Action trip generation methodologies are followed but it is possible to use a condensed method of assigning the traffic trips to the street network. However, consultation with DOT regarding use of the condensed methodology is recommended. The analysis may determine the total volume of new vehicle trips expected, compare that volume with the existing volume at a representative "cordon line" around the study area, determine the percentage increase from the new trips, and then apply that percentage to all intersections and roadway links to be analyzed. This process could also be used for assigning parking trips.

343.3. Preparation of Future No-Action Volumes and Levels of Service

Balanced traffic volume maps and traffic level of service analyses are prepared to reflect No-Action conditions, adhering to the same methodologies outlined in the existing condition analysis. Text and tables provide a full description of future No-Action conditions and include text and tabular comparisons of how conditions are expected to change from the existing condition to the future No-Action condition.

This assessment accounts for any programmed geometric changes that could affect traffic flow or levels of service, such as any mitigation measures that are incorporated in the approvals for a development project considered in the No-Action condition. As another example, if DOT plans to program the widening of a particular street in the study area by the proposed project's build year, changes to intersection capacity and the resulting levels of service would be included as part of the No-Action analysis. Other examples may include street direction changes, signal timing, bicycle lanes, pedestrian improvements, street closures, and possibly even major changes outside of the study area (such as a permanent viaduct closure) that would affect travel within the study area. These should be confirmed with DOT.

344. FUTURE WITH-ACTION CONDITION

The objective of the analysis is to determine projected future With-Action conditions with the proposed project in place and fully operational. These future With-Action conditions are then compared with the future No-Action conditions to determine whether or not the proposed project would have a significant impact on the study area's traffic facilities, therefore requiring mitigation.

The assessment of projected future With-Action conditions consists of a series of analytical steps derived directly from the Level 1 (Travel Demand Factors) and the Level 2 (Project Generated Vehicle Trip Assignment) Screening Assessments—trip generation, modal split, and trip assignments, discussed in detail in Subsections 311 through 321 of this chapter.

Once these steps have been completed, a capacity and level of service (LOS) analysis, described below, is conducted. This analysis evaluates conditions within the study area with project generated trips superimposed on the future No-Action traffic volumes, as a representation of the projected future With-Action traffic volumes. After the LOS analysis is complete, a determination of significant impacts—based on a comparison of future With-Action conditions with future No-Action conditions and with thresholds of acceptability—may be made.

344.1. Preparation of Future With-Action Volumes and Levels of Service

Balanced traffic volume maps are prepared for future With-Action conditions, using the same methodologies outlined previously. It is important that these traffic volume maps be balanced, and that there are no unexplainable increases or decreases in traffic volume from one block to the next.

Capacity and level of service (LOS) analyses are then completed as part of the assessment of future With-Action traffic conditions. The methodologies to be used are the same as described previously, with certain special considerations.

Within the traffic analyses, the traffic assignment process may, for example, result in significant increases in the percentage of turns at specific intersections, and it may be appropriate to re-compute relevant capacity analysis input factors in consultation with DOT (*i.e.*, pedestrian LOS analysis should consider added conflicting vehicles). Should there be a shortage of parking spaces in the area, some project-generated traffic may need to be assumed to re-circulate through the area in search of available parking.

Also, as part of the proposed project, changes may be proposed for specific streets that produce changes in their capacities. For example, should a street closure or street direction change be a part of the proposed project, the future With-Action traffic should be diverted accordingly.

The future With-Action analyses culminate with the preparation of balanced traffic volume maps and a full set of capacity and LOS analyses (including 85th percentile queue, v/c ratios, average control delay per vehicle and LOS for each lane group, intersection approach and overall intersection) for traffic conditions. The future With-Action analysis also includes occupancy findings for parking facilities. Findings are presented in a clear tabular format that facilitates the subsequent comparison of No-Action and With-Action conditions as part of the determination of significant impacts. The LOS comparison tables (for all scenarios and peak analysis hours) should be included in the traffic and parking section of the report, not in an appendix.

350. DETAILED TRANSIT ANALYSIS

For proposed projects requiring the preparation of a transit analysis, the study areas to be analyzed, assessment methodologies, and technical assumptions are outlined and documented as much as possible. Typically, such documentation outlines at least the following:

- Study areas to be analyzed for potential transit impacts. The study area(s) is based on the Level 2 Screening Assessment.
- Availability and appropriateness of existing data and the expected need, if any, to collect new data via field surveys and counts. Existing transit data should not be more than two years old assuming that there has been no major change to the bus route/station/subway line.
- The technical analysis methodologies to be used and key technical assumptions, including a preliminary projection of the number of trips to be made by transit during the proposed project's peak travel hours and a first-cut trip assignment that helps to preliminarily identify potential significant impact locations.

The text and tabular sections that follow provide the technical guidelines for conducting a transit analysis.

351. Subway/Rail and Bus Transit Study Areas

351.1. Subway/Rail Transit Study Area

For the analysis of subway and rail facilities, the study area relates to the specific subway lines and stations serving the project site. Should a proposed project site be served equally well by two different stations along the same line or along different lines, both (or all) stations and lines may need to be studied. If no station is within a reasonable walking distance of the project site, appropriate "feeder" stations at which subway passengers transfer to buses to reach the project site would be analyzed. For example, if a project is sited in the vicinity of 42nd Street and Ninth Avenue in Manhattan, it would be served by 42nd Street – Port Authority Bus Terminal station of the A/C/E lines, Times Square-42nd Street station of the 1/2/3/7 and N/Q/R/S lines, and 42nd Street–Bryant Park station of the B/D/F/M lines, all three stations would be included in the rail transit study area and should be analyzed. Alternatively, if a project built in eastern Queens on Hillside Avenue would result in bus trips that would come from or go to the 179th Street F station and more than 200 peak hour subway trips would be generated at that station, the station should be included in the transit analysis, even though the station is farther than 0.5 mile from the project. For large-scale projects or projects that affect several neighborhoods, it may be necessary to analyze the cumulative impacts of the project at key locations or at major passenger transfer locations within both the line haul and subway station analyses. NYCT should be in agreement with the assignment to lines and stations, so it is recommended to coordinate this effort with NYCT Operations Planning.

The subway station analysis must encompass all station circulation and fare control elements, whether in the free-zone or paid-zone, that would have an increase in ridership resulting from the project, such as all affected stairs, escalators, elevators, fare arrays, platforms and passageways. A platform analysis is usually conducted for projects such as the design of a new stations or a large station renovation, and is often not conducted for existing stations. However, there are instances where an analysis of an existing station is appropriate, and the lead agency, in consultation with NYCT, should determine the appropriateness of a platform analysis. Elevators should be analyzed only if they provide primary access to the subway (for example, the 181 Street–St. Nicholas Avenue station (1 line)). The study area could also include an assessment of the line-haul capacities of the specific subway lines serving those stations, since the subway cars may exceed NYCT loading guidelines.

Commuter rail lines, such as the Long Island Rail Road or Metro-North Commuter Railroad, could also be the subjects of such analyses, depending on a proposed project's modal split and origin/destination characteristics. For example, should the proposed project site be located within

0.5 mile of the LIRR station in Flushing, the key station elements and line-haul capacity may need to be addressed.

351.2. Bus Transit Study Area

The definition of the appropriate study area for bus services follows the same principles outlined above. First, a review of available bus route maps and field observations of the project site is conducted to identify the primary bus routes and stops serving the site. Based on this information and the likely entrance and exit points for the proposed project's buildings, a simple pedestrian routing analysis would indicate which bus routes and stops should be the focus of new trips. Bus routes within 0.5 mile of the project site may need to be addressed and the maximum load point along each potentially affected bus route should be identified.

352. ANALYSIS OF EXISTING CONDITIONS

Once the study areas have been defined, the analysis of existing conditions becomes the building block used to project future No-Action and With-Action conditions. The objective of the existing condition analysis is to determine existing transit ridership/pedestrian volumes and levels of service to provide a baseline from which future conditions may be projected. The definition of existing conditions is important because it is a reflection of activity levels that actually occur today as opposed to future conditions, which require at least some projection. The guidelines provided for the existing condition analyses are discussed separately below for rail transit and bus transit.

352.1. Existing Rail Transit Conditions

The existing rail transit conditions analysis identifies the rail and subway lines serving the project site, the frequency of service provided, and ridership and levels of service that exist at the current time. For sites that are well served by transit, lines and stations within a convenient walking distance are included. For other project sites not as well served by transit, it is advisable to identify the closest rail facility, providing that a significant number of people would use transit to reach the site and then access the site from the station via bus or available taxi services.

The analysis of existing rail transit conditions entails the assembly and/or collection of ridership data and pedestrian flows through the stations to be analyzed, the determination of the capacity and levels of service of the station elements that need to be analyzed, and an evaluation of the overall line-haul capacity of the routes serving the site.

352.1.1. DETERMINATION OF THE PEAK HOUR FOR ANALYSIS PURPOSES

The first step in the analysis of existing conditions is the determination of the peak travel hours to be analyzed. For most projects, at most subway stations and for most line haul analyses, the weekday morning peak hour is from 8 to 9 AM, while the weekday evening peak hour is from 5 to 6 PM. Note that there are several factors that could influence the specific timing of the peak hour:

- Increasing ridership along the shoulders of the typical peak hours may require a shift in a peak hour by 15-minutes at either end (for example, a morning peak of 8:15 to 9:15 AM).
- The further away a project or station is from the major central business districts, the earlier the AM and the later the PM peak hour will be.
- In cases when a project is projected to generate the highest amount of hourly trips during a non-traditional peak hour, a determination must be made as to whether the project's peak hour would have a greater impact on the subway system than would the hourly trips generated during a more traditional peak hour. In some cases, it may be necessary to analyze multiple peak hours.

- Stations and lines affected by such items as stadiums, large schools, summer beach crowds or special events may have peak hours that are different from or in addition to the more traditional peak hours.

Also note that peak hour subway ridership levels are typically lowest during the summer months. Therefore, data collected between July 1st and the first week of September may need to be calibrated using seasonal adjustment factors. Consult with NYCT Operations Planning for these factors or for additional guidance.

352.1.2. ASSEMBLY AND COLLECTION OF PASSENGER AND PEDESTRIAN VOLUMES WITHIN STATIONS

Available data may be used if the data is from within the past two years and if there have not been major changes in nearby land uses or transit services that have significantly affected transit usage since the data were collected. However, most of the data needed to conduct the rail transit analyses generally need to be newly collected. It is also generally appropriate to observe pedestrian movement patterns through the station and along critical platforms simultaneously with the counts. NYCT can supply recent turnstile registrations (entries only) as well as existing and, where appropriate, No-Action line-haul volumes. Required actual counts may include any or all of the following:

- Up and down movements on the street, mezzanine or platform stairways, and escalator and elevator pedestrian counts.
- The volume of pedestrians in each direction along key corridors or passageways within the station or connecting the station with other stations or on-street uses, if these elements have been identified as potentially significant impact locations within the study area.
- Passenger volume entering and exiting through turnstiles.
- The nature of queuing and walk movements on station platforms if platform congestion is a current problem or is identified as a potential problem in the future.
- The number of persons waiting at station agent booths and MetroCard vending machines only if station agent booth and vending machine lines are an existing or anticipated problem. Issues to be analyzed here could include, among others, the amount of remaining physical space available for pedestrians and potentially excessive waiting times.

Each of these counts and observations should be conducted over the course of the full peak hour in 15-minute increments.

Transit station counts and surveys should not be taken on days when activity levels are unusually low, and they should generally be taken on a Tuesday, Wednesday, or Thursday for conventional weekday peak hour analyses. With the availability of daily turnstile registration data, however, it is not necessary to conduct station counts for more than one day, assuming subway service and ridership is normal on the day the counts were taken. To determine whether the day surveyed represents a typical day for that station, obtain a full week of registration counts and adjust the survey data, if necessary.

Except for a few cases, it is generally not necessary to balance pedestrian flows among the various elements within stations. Exceptions may include areas (such as those where consistently high movements between the various stairwells and passageways are best depicted via a pedestrian flow map) where a substantial amount of activity occurs at elements in close proximity to each other and where it would be helpful to understand the relationship between flows. Passenger trip assignments to entrances and exits should be provided where there are multiple entrances/exits to a station.

352.1.3 ANALYSIS OF STATION ELEMENT LEVEL OF SERVICE

The analysis of conditions within subway stations is based on a comparison of the capacities of circulation and fare control elements against the volume of passengers expected to use them. This ratio of passenger volume and element capacity (v/c ratio) equates to a LOS rating for each station element.

Since different station circulation elements have distinctive use patterns, there are different analytical methodologies for each type of element. Methodologies for analyzing each type of station element are described below.

ANALYSIS OF STAIRS AND PASSAGEWAYS

The first steps in calculating existing and projected v/c ratios are measuring the width of stairs or passageway and to count passenger volumes, noting the degree of surging. The counts should be in 15-minute intervals, by direction, during the appropriate peak periods as described above. The v/c ratio and LOS rating of a stair or passageway is based on its peak 15-minute passenger volume divided by the capacity. The peak 15-minute volume is obtained by taking 31.25 percent of the peak hour volume (this is 25 percent above the average 15-minute volume). The peak 15-minute volume for stations that serve stadiums, large schools or special events will usually be larger than the typical 31.25 percent peaking factor; consult with NYCT Operations Planning in such cases.

For CEQR analyses, "capacity" is based on the width of the stairs or passageway, the maximum volume for that width based on NYCT capacity guidelines and adjustments for passenger flow surging and counterflow. When counting passenger volumes, it is critical to note whether or not passenger flow is surged. Typically, flows off platforms are not uniform over a 15-minute period and are surged in that passengers are densely concentrated after disembarking from trains. Passenger flows en route to platforms (via street stairs, corridors or platform stairs) tend to be more uniform over a 15-minute interval, although surged flow can sometimes result from such things as heavy transfer flow, heavy use of buses feeding a subway station, or even a traffic signal at street level which results in platoons of pedestrians crossing the street to enter a particular station.

The numerator in the v/c calculation is always the peak 15-minute passenger flow volume. The "capacity" denominator is derived from four factors: the NYCT guideline, the effective width of the stair or passageway, and surging and counterflow factors, if applicable. Each of these factors are discussed individually, followed by the calculation itself and finally, the v/c ratio ratings.

NYCT GUIDELINE CAPACITY

The NYCT guideline capacity for stairs is 10 passengers per foot per minute (pfm). The guideline capacity for passageways is 13 pfm. These rates represent conditions that are moderately crowded but not congested. These guideline capacities are then adjusted to reflect surging and counterflow (discussed below).

EFFECTIVE WIDTH

The effective width of stairs or passageway is its actual width adjusted for friction along its sides (which reflects the avoidance of sidewalls by pedestrians) and for center handrails (if present). For a stairway, this means the tread width, in feet, at its narrowest point, less 1 foot (6"of buffer for each side of the stair) and less 3" for each intermediate handrail, if present. For example, a 10-foot wide stair with one center handrail would have an effective width of 8'-9" (10'-0" minus 6" minus 6" minus 3"). For a passageway, this means the width of the passageway, at its narrowest point, less two feet (12" of buffer on each side of the passageway). Passageways usually do not have intermediate handrails.

SURGING FACTOR

When passenger flow is surged, the calculated capacity of the stair or passageway is reduced by up to 25 percent to reflect that the passenger volume counted in a 15-minute interval was actually concentrated in less time. Circulation elements that are immediately off the platform have a strong surging pattern that requires a full 25 percent reduction in capacity. In the CEQR v/c calculation, this means multiplying the "capacity" denominator by a surging factor of 0.75. Circulation elements that are fed by multiple train lines or are far from the platform are typically less surged and require a smaller surging factor. It should be noted that some elements require no surging factor at all. Tables 16-5a and 16-5b below show the surging factor that should be used for elements at different locations in the station. Table 16-5a should be used for surged flow off of platforms; Table 16-5b should be used for surged flow onto Platforms.

Table 16-5a
Surging Factors (Flows off of Platforms)

Location of Circulation Element	**Factor**	
	One or two tracks served	**Three or more tracks served**
Platform Level	0.75	N.A.
One floor above or below the platform	0.8	0.9
Two or more floors above or below the platform	0.9	0.95

Table 16-5b
Surging Factors (Flows onto Platforms)

Location of Circulation Element	**Factor**
Same level as source of surge	0.75
One floor above or below source of surge	0.8
Two or more floors above or below source of surge	0.9

FRICTION (COUNTERFLOW) FACTOR

Opposing passenger flows using the same stair or passageway creates some friction that reduces overall flow. If there is flow in both directions on the stair or passageway, the capacity should then be reduced by 10 percent (multiply the capacity by a friction factor of .90). If the flow is only in one direction or almost all in one direction (95 percent or more in one direction), then no counterflow factor is required.

VOLUME / CAPACITY RATIO CALCULATION FOR STAIRS

Equation 16-1

The formula to calculate the v/c ratio for stairs is:

$$\frac{\text{Vin}}{150 \times \text{We} \times \text{Sf} \times \text{Ff}} + \frac{\text{Vx}}{150 \times \text{We} \times \text{Sf} \times \text{Ff}}$$

Where
Vin = Peak 15-minute entering passenger volume
Vx = Peak 15-minute exiting passenger volume
We = Effective width of stairs
Sf = Surging factor (if applicable)
Ff = Friction factor (if applicable)

The 150 in the denominator is based on the NYCT guideline capacity for stairs of 10 pfm for 15 minutes (10 x 15). The "per foot" 15-minute guideline capacity is then adjusted for the width of the stair, surging and counterflow. The resultant denominator is the maximum desirable 15-minute passenger volume for a specific width stair considering surging and counterflow. The 15-minute volume is then divided by the adjusted denominator to calculate a ratio of volume to capacity. Typically there is a 15-minute volume for each scenario of analysis - base year, future No-Action, future With-Action.)

VOLUME / CAPACITY RATIO CALCULATION FOR PASSAGEWAYS

Equation 16-2

The formula to calculate the v/c ratio for passageways is:

$$\frac{\text{Vin}}{225 \times \text{We} \times \text{Ff}} + \frac{\text{Vx}}{225 \times \text{We} \times \text{Sf} \times \text{Ff}}$$

Where
Vin = Peak 15-minute entering passenger volume
Vx = Peak 15-minute exiting passenger volume
We = Effective width of the passageway
Sf = Surging factor (if applicable)
Ff = Friction factor (if applicable)

The 225 in the denominator is based on the NYCT guideline capacity for passageways of 15 pfm for 15 minutes (15 x 15). The rest of the calculation is then the same as with stairs.

CEQR V/C LOS RATINGS

Volume/Capacity ratios are assigned LOS ratings. For stairs and passageways, the relationship of v/c ratio to LOS ratings is as follows:

- 0.00 to 0.45 v/c ratio = LOS A Free flow
- 0.45 to 0.70 v/c ratio = LOS B Fluid flow
- 0.70 to 1.00 v/c ratio = LOS C Fluid, somewhat restricted
- 1.00 to 1.33 v/c ratio = LOS D Crowded, walking speed restricted

- 1.33 to 1.67 v/c ratio = LOS E Congested, some shuffling and queuing
- Above 1.67 v/c ratio = LOS F Severely congested, queued

Example Analysis:
A stair with treads 9'-6" wide with a center handrail has a peak 15-minute volume of 930 passengers, 650 entering and 280 exiting. The stair directly serves the platform.

Effective width = 8'- 3" (deduct six inches from each side and three inches for the interme-diate
handrail)
Surging factor = 0.75 for passengers exiting the platform
Counterflow factor = 0.90 (70% of flow is in one direction)

v/c ratio = (650 / (150 x 8.25 x 0.90)) + (280 / (150 x 8.25 x 0.75 x 0.90)) = 0.92 LOS C

ANALYSIS OF ESCALATORS AND TURNSTILES

For both escalators and turnstiles, the numerator in the v/c calculation is the peak 15-minute passenger flow volume. For escalators, the "capacity" denominator includes only two factors: the NYCT guideline capacity for a 15-minute interval and a surging factor of up to 25 percent. Like stairs and passageways, the surging factor is variable based on the extent of actual surging. Escalators and turnstiles immediately off of the platform with heavy detraining traffic require a 25 percent surging factor. Circulation elements that are farther from the platform, are served by multiple train lines, or are predominantly entry flow, require a smaller surging factor or none at all. Consult the Surging Factor tables, Tables 16-5a and 16-5b, for the appropriate factor to apply. Although there is no friction factor due to the one-directional nature of escalators, turnstiles are subject to two-way flow and thus a friction factor.

ANALYSIS OF ESCALATORS

NYCT uses three widths of escalators (as measured across the tread)--24", 32" and 40". Escalator width at hip height is usually about 8" wider. NYCT escalators are operated at one of two speeds--90 feet per minute (fpm) and 100 fpm. Table 16-6 indicates the guideline capacities by minute and by 15-minute interval for different escalator widths and speeds. These capacities are based on observed through-put rates of escalators under peak period conditions.

Table 16-6
Escalator Capacity (15 minute)

	Tread Speed	24" Tread	32" Tread	40" Tread
90 fpm	68 treads per minute	480	750	945
100 fpm	75 treads per minute	600	825	1050

VOLUME / CAPACITY RATIO CALCULATION FOR ESCALATORS

Equation 16-3

The formula to calculate the v/c ratio for escalators is:

$$\frac{V}{GCap \times Sf}$$

Where:

V = Peak 15-minute passenger volume

GCap = Guideline Capacity for the escalator

Sf = Surging factor (if applicable)

No counterflow friction factor is used, since escalators operate in one direction only.

The same LOS ratings and v/c ratios used for stairs and passageways is used for escalators.

ANALYSIS OF TURNSTILES

NYCT operates regular (low) turnstiles, High Entry/Exit Turnstiles (HEETs) and high exit turnstiles (HXTs) in the subway. Low turnstiles and HEETs are bi-directional and serve both entry and exit moves. Because entry requires a MetroCard swipe (and exiting does not), there are different through-put rates by direction. Therefore, turnstile analysis involves calculation of separate v/c ratios by direction, which are then combined into a single v/c ratio for the turnstile array. Surging and counterflow factors are applied as appropriate. Note that NYCT policy does not call for the use of emergency gates for everyday exiting purposes. Although passengers may make use of these gates, these passengers for analysis purposes should be assigned to turnstiles since one goal of fare array design is to provide adequate non-emergency entry and exit capacity without the use of emergency gates.

Table 16-7 indicates the NYCT guideline capacity for turnstiles by minute and by 15-minute interval for different turnstiles and directions. These capacities are based on observed through-put rates under crush conditions.

Table 16-7
Fare Array Capacities (15 minute)

	Turnstile	High Entry/Exit Turnstile	High Exit Turnstile
Entries	420	255	n/a
Exits	645	540	555

VOLUME / CAPACITY RATIO CALCULATION FOR TURNSTILES

The formula to calculate the volume to capacity ratio for turnstiles is:

Equation 16-4

$$\frac{\text{Vin}}{\text{Cin} \times \text{Ff}} + \frac{\text{Vx}}{\text{Cx} \times \text{Sf} \times \text{Ff}}$$

where

Vin = Peak 15-minute entering passenger volume
Cin = Total 15-minute capacity of all turnstiles
Vx = Peak 15-minute exiting passenger
Cx = Total 15-minute capacity of all turnstiles
Sf = Surging factor (if applicable)
Ff = Friction factor

The application of surging and friction factors is as described for stair and passageway analyses. Surging for entry flow (within a 15-minute interval) is unusual, but may occur especially at inter-modal transfer or other similar locations.

The same v/c ratio LOS ratings used for stairs and passageways are applied to turnstile ratios.

ANALYSIS OF PLATFORMS

Platforms need to accommodate both passengers who are standing waiting for trains as well as passengers who are walking along the platform. As stated above, a platform analysis is usually conducted for projects such as the design of a new station or a large station renovation, and is often not conducted for existing stations. However, there are instances where an analysis of an existing station is appropriate, and the lead agency, in consultation with NYCT, should determine the appropriateness of a platform analysis. Platforms in the New York City subway are typically between 520 and 600 feet long. Different sections of the same platform have very different concentrations of walking and/or waiting passengers. Therefore, platforms should be divided into separate zones for individual analyses.

The delineation of zones to be analyzed for a given project involves observations of platform layouts and how pedestrians exit the trains, walk along them to the stairwells, or wait for the next train. Consideration of the entire platform as a single zone would not be correct, since a platform may have sections that are very actively used and others that are seldom used or used with no apparent congestion problem. Therefore, the definition of zones that are too large could understate potential problems. On the other hand, the definition of zones that are too small—*i.e.*, generally less than one subway car length—could depict conditions that are worse than actually exist. Confirm with NYCT Operations Planning the delineation of platform zones.

The two primary methods to analyze platform conditions within any zone, depending upon the degree of segregation of waiting and walking passengers:

- If passengers walking through the zone use random paths and filter through waiting passengers, then the total number of waiting passengers within the zone should not exceed a density of 10 square feet per waiting passenger.
- If passengers walking through the zone generally maintain distinct paths and waiting passengers are relatively undisturbed within a discreet "waiting" sub-zone, then the acceptable density of waiting passengers within the sub-zone is 6 square feet per waiting passenger. Note that a projected increase in the number of walking passengers may require the pathway area to increase, causing a decrease in the sub-zone area assigned to waiting passengers.

The accumulation of waiting passengers per zone would be based on train headways within the peak 15-minute interval.

The platform analysis should incorporate the appropriate methodology based on observed conditions within the station under study. Confirm with NYCT Operations Planning if questions arise.

ANALYSIS OF ELEVATORS

An analysis of elevator service is only required when elevators will be used as general access into and out of the station, platform, or mezzanine, such as at the Clark Street station (2, 3 lines) or the 191st Street (1 line). It is not necessary to analyze elevators designed primarily for ADA use. Consult with NYCT if an elevator analysis is to be undertaken.

352.1.4. ANALYSIS OF LINE-HAUL CAPACITY AND LEVEL OF SERVICE

An analysis of line-haul capacity addresses the ability of trains to accommodate passenger loads. The analysis determines whether there is sufficient capacity per car per train to handle existing and projected future transit loads. This analysis should be done at the maximum load point of the line, or at the location where the addition of project-generated passengers to No-Action passenger volumes would be greatest.

Line-haul capacity analyses are based on per-car practical capacity guidelines used by NYCT. The guideline capacities of subway cars are identified in Table 16-8:

Table 16-8
Line-Haul Capacity Guidelines

Car Class[1]	Maximum Peak-Period Loading Guideline Capacity (per car)[2]	Maximum Off-Peak Loading Guideline Capacity (per car)[3]
R 62 (51 feet A Division)	110	54
R 142 (51 feet A Division)	110	48
R32 / R42 (60 feet B Division)	145	63
R143 (60 feet B Division)	145	54
R160 (60 feet B Division)	145	53
R44 / R46 / R68 (75 feet B Division)	175	88

Notes:
1 Since cars switch between various lines, consult with NYCT Operations Planning to determine the appropriate car length for the analysis.
2 This guideline is the maximum used to schedule subway service during weekday peak periods and is based on full occupancy of all seats and approximately 3 square feet per standing passenger.
3 This guideline is used to schedule subway service during off-peak periods and is based on an average of 125% of the seated load on each car type. During some large-scale special events, it is expected that ridership may temporarily exceed off-peak loading guidelines (but not the maximum loading guidelines).

The line-haul capacity of a given subway line is determined by multiplying the number of peak hour trains by the number of cars per train and times the guideline capacity per car. The volume of riders passing a given point may then be compared with the line haul capacity of the subway line. It should be noted that during some large-scale special events, such as during peak entrance and exit periods for a sporting event, it is expected that ridership may temporarily exceed off-peak loading guidelines (but not the maximum loading guidelines). Another means of evaluating a line's conditions is to utilize the same information differently—that is, divide the volume of riders passing a given point by the number of train cars serving that point, and determine the average passenger load per car. The resulting per-car passenger load may then be compared with guideline capacity standards to determine the acceptability of conditions.

352.2. Existing Bus Transit Conditions

The analysis of existing bus transit conditions presents bus load level and loading conditions on the routes serving the site of the proposed project to determine whether or not there is capacity available to accommodate additional project-generated trips.

For the routes and stops identified as the bus transit study area, these analyses entail the assembly and/or collection of bus ridership data at the bus stops most closely serving the project site and at the route's "maximum load point," and an analysis of bus loading levels versus their physical capacities.

352.2.1. ASSEMBLY AND COLLECTION OF BUS RIDERSHIP DATA

Data may be obtained from the relevant operator regarding the number of persons per bus at the maximum load point on each route. In some cases, on-off data (ride checks) for all stops along a route may also be available. In addition, field counts may help determine the average and maximum number of riders per bus as the bus arrives at and leaves the bus stop closest to the project site. These counts should be conducted on a typical day, as described earlier for the other traffic and transit analyses (see Subsection 342.2 at pages 16-23 and 16-24). These counts may be taken either by: a) getting on the bus and conducting a quick count of the number of riders; or b) estimating the number of persons on the bus by a visual estimate from off the bus looking through its windows (often called a "windshield count" or "point check"). The windshield estimate method should not be used if the bus windows are tinted, which would preclude the surveyor from getting an accurate reading of the passenger count. The field count effort would also note the bus route number (at multiple-route bus stops) and the number of persons waiting at the bus stop and boarding and alighting from each bus.

352.2.2. ANALYSIS OF BUS LOAD LEVELS

Generally, three types of buses are used in New York City:

- 40-foot standard buses (including both low-floor and high-floor models) operating on both local and limited-stop routes.
- 60-foot articulated buses operating on both local and limited-stop routes.
- 45-foot over-the-road coaches operating on express routes.

NYCT has adopted schedule guideline capacities for each of these bus types:

- 40-foot standard buses: total guideline capacity of 54.
    - The standard buses are scheduled based upon the capacity of the newer low-floor models. Even though the high-floor models have greater capacity than the newer low-floor models, the capacity of the low-floor model is used as the guideline because the buses are used interchangeably.
- 60-foot articulated buses: total guideline capacity of 85.
- 45-foot over-the-road coaches: total guideline capacity of 55.

Although MTABC has not adopted official guideline capacities, in practice they use those adopted by NYCT.

Typically, the number of persons per bus at the maximum load point is quantified and then compared with MTA bus operating agencies' guidelines so as to identify the extent to which bus capacity is utilized under existing conditions. On/off activity could also be quantified and presented for general informational purposes.

353. Future No-Action Condition

The future No-Action conditions account for general background growth within the study area, plus tripmaking expected to be generated by major proposed projects that are likely to be in place by the proposed project's build year. In general, the procedures and approach used are similar to those reviewed previously for traffic analyses.

353.1. Background Growth Rates

For rail and bus transit analysis purposes, NYCT and/or MTABC should be consulted for modeled projections that may be available on a per line, or possibly per station, basis. The compounded annual growth rates in Table 16-4 are recommended to calculate the background growth rate accounting for short-term and long-term patterns. For additional information regarding the assessment of the future No-Action condition, see Subsection 343.

353.2. No-Action Development Project Trip-Making

In addition to the compounded background growth rate that is applied evenly throughout the study area, the analysis also accounts for trips to and from major development projects that are not assumed to be part of an area's general growth. The determination of whether a No-Action project is considered part of the general background or superimposed on top of the general background growth calls for considerable judgment, with the following guideline suggested:

- A No-Action project that generates fewer than 100 peak hour transit trips should be considered part of the general background. Two such projects, situated on the same block and generating 200 new riders at the same station, should generally not be considered part of the background.

There are several ways to determine the amount of trip-making associated with a No-Action project. The best way is to use the trip projections cited in that project's transit analysis, if such projections exist. An alternative is to use the same methodologies described in Subsection 354, "Analysis of Future With-Action Conditions."

353.3. Preparation of Future No-Action Volumes and Levels of Service Analysis

Transit level of service analyses should be prepared following the same methodologies outlined for the existing conditions analyses. Documentation of the analyses would provide for a full description of future No-Action conditions and include text and tabular comparisons of how conditions are expected to change from existing conditions to the future No-Action scenario.

This assessment should also account for any programmed transit changes that could affect passenger flows or levels of service. For example, in the No-Action condition it may be appropriate to consider mitigation measures (*e.g.*, stairwell widening at a particular subway station) that are incorporated in the approvals for other development projects. As another example, if the NYCT has programmed the closure of a stairwell at a particular subway station, the effects of such measures would be accounted for in the No-Action analysis. In certain cases, a major transit initiative—such as the construction of a new terminal/station or an intermodal transfer facility—could affect subway, bus, and pedestrian trips. For the analysis of bus conditions, it should be assumed that service changes would be made such that future No-Action conditions would not exceed capacity on any given route. Please consult with MTA for direction and guidance on programmed changes to subway and station configuration.

354. ANALYSIS OF FUTURE WITH-ACTION CONDITION

The objective of the future With-Action condition analysis is to determine projected future conditions with the proposed project in place and fully operational. The future With-Action condition is then compared with the future No-Action scenario to determine whether or not the proposed project would likely have significant adverse impacts on the study area's transit facilities and require mitigation.

The assessment of projected future With-Action conditions consists of a series of analytical steps—trip generation, modal split, and trip assignment, discussed in detail in Subsections 311 through 321 of this chapter. A capacity and level of service analysis, defined as the evaluation of conditions within the study area with project-generated trips superimposed on the future No-Action condition, as a representation of the projected future With-Action condition, is conducted.

Once these steps have been completed, a determination of significant impacts—based on a comparison of With-Action conditions with No-Action conditions and using the impact thresholds—may be made. Generally, the transit analyses are performed in coordination with those of traffic and pedestrians.

360. DETAILED PEDESTRIAN ANALYSIS

The first step in preparing for and conducting the pedestrian impact analysis is to determine the specific locations of the pedestrian elements and facilities to be studied. The pedestrian analysis considers three pedestrian elements: crosswalks, intersection corners where pedestrians wait for a pedestrian signal to allow them to cross the street, and sidewalks and other walkways.

361. PEDESTRIAN STUDY AREA

The first step in determining the study area is to identify the routes between the site entrances/exits and the beginning/end of pedestrian components, including subway stations, bus stops, parking facilities and generators of "walk" trips. For example, the pedestrian analysis for a proposed office building in Midtown Manhattan would consider, in addition to nearby pedestrian elements (*i.e.*, sidewalks, crosswalks and corner reservoir areas) that would be used by walk trips, the major elements en route to/from the site from/to the subway stations, bus stops and parking lots reasonably expected to be used. If the combined assignments of all pedestrian trips (which include pure walk trips as well as the pedestrian component of all other modes) to any of these elements is 200 or more, then these elements should be part of the pedestrian study area.

When identifying the study area for a new or expanded school site, special consideration should be given to pedestrian elements posing safety concerns (*i.e.*, uncontrolled crossings, intersections with high number of vehicular and pedestrian accidents, *etc.*) along walking routes to/from the school. Any uncontrolled crossing, where, under the With-Action condition an increment of 20 or more students are assigned during the highest crossing hour (a threshold recommended by the Federal Highway Administration's (FHWA) 2009 edition of the Manual on Uniform Traffic Control Devices (MUTCD)) should be included in the detailed safety and operational analyses including the signal warrant analysis (please refer to Section 370 for further details).

362. DETERMINATION OF PEAK PERIODS

After the study area is determined, the next step is the determination of peak periods, which depend on the type of project. Guidance for determining the peak periods is provided in Subsection 332. Generally, the peak periods for pedestrian analysis should be the same as for the traffic analysis.

363. ANALYSIS OF EXISTING CONDITIONS

Once the study areas have been defined, the analysis of existing conditions becomes the building block that is used to project future No-Action and With-Action conditions. The analysis of existing pedestrian conditions determines whether key pedestrian routes and related elements (*i.e.,* sidewalks, crosswalks and corner reservoir areas) expected to be traversed by pedestrians under the proposed project are currently operating at an acceptable LOS, and provides an overview of general pedestrian conditions within the study area.

363.1. Determination of the Peak Hour for Analysis Purposes

The first step in the analysis of existing conditions is to determine the peak pedestrian hours to be analyzed, which should be determined independently of traffic peak hours. The pedestrian analysis considers the peak activity hours of the proposed project, the peak hours for background pedestrian traffic already existing in the study area, and which combinations of the two may generate significant impacts.

One means of quantitatively determining the peak pedestrian analysis hours is to prepare a table showing existing hour-by-hour pedestrian volumes at a set of representative locations within the area or at a cordon line around the area, side by side with hour-by-hour projections of the expected trip generation of the project. A comparison of the two sets of volumes would indicate: a) which pedestrian hours are likely to be the busiest in the future; and b) at which hours the influence, or impact, of the proposed project's trip-making levels would likely be the greatest. From this comparison, potential significant impact hours—and thus the peak pedestrian hours to be analyzed—may be identified. Should there be multiple projects in the study area, it is recommended that common peak analysis hours be used. The lead agency and DOT should be consulted if there are multiple projects in the study area.

In some cases, the peak condition to be analyzed is obvious because the peak hour of the project's trip-making would coincide with the existing peak hour. In other cases, the two peak hours may be very close, and it may be proper to use the existing peak hour and later, during the impact analysis stage, to superimpose the peak trip generation of the proposed project onto the peak existing condition. In yet other cases where the two peaks are not coincidental (or nearly coincidental), a screening analysis is needed to determine which of the two peaks (the existing peak or the proposed project's peak) would reflect the worst impact condition, or whether both hours require detailed analysis.

363.2. Assembly and Collection of Pedestrian Counts

Prior to collecting any new data, DCP and DOT should be contacted regarding the availability of any pedestrian studies as well as recently completed environmental assessments within the project study area that could be the source of available pedestrian count data and LOS analyses. However, the available data should not be more than three years old and care must be taken to ensure that the pedestrian travel patterns have not changed due to significant developments and/or modification to the existing pedestrian elements in the project study area.

New pedestrian counts should be taken for one "typical" mid-week day during representative peak periods (*i.e.,* morning, midday, evening, and/or other appropriate peak periods). Counts should be taken over the course of the full peak period and recorded in 15-minute intervals, since analyses to be conducted utilize a 15-minute analysis period for their evaluations. Counts taken during weekend peak periods or special times (such as game days or other events) should also be taken for one day. However, crosswalk counts at all study intersections should be collected for one additional mid-week day and one additional weekend day during representative peak periods to validate the data if counts for all three pedestrian elements (*i.e.,* crosswalks, sidewalks and corner reservoir areas) are collected. If a proposed action requires one pedestrian element, such as a sidewalk, to be analyzed, then counts for one additional mid-week day and one additional weekend day (if warranted) should be performed to confirm all the counts.

The pedestrian counts to be conducted depend on the pedestrian elements identified as constituting the pedestrian study area. They should include crosswalks, corner reservoirs at intersections where pedestrians queue up while waiting to cross the street and those moving between the adjoining sidewalks but not crossing the street, sidewalks, and other important routes if such are applicable (*e.g.* bridges, mid-block arcades or plazas). Two-directional counts are needed to conduct the subsequent LOS analyses.

363.3. Preparation of Existing Pedestrian Volumes and Levels of Service Analysis

The methodologies presented in the HCM 2010 are the basic analytical tools used to analyze pedestrian conditions and the HCM 2010 should be referred to for detailed information on analytical procedures. A Pedestrian LOS Worksheet should be prepared using the "Pedestrian LOS Worksheet, Sample, and Instructions" for the analysis of sidewalks, crosswalks, and corner reservoir areas.

For sidewalk or other walkways locations, the inputs for analyses are the pedestrian volumes by direction for each peak period, the peak hour factor, the effective sidewalk or walkway width (the portion of a sidewalk or walkway that can be used effectively by pedestrians) and average walking speed. A schematic of existing conditions should be prepared detailing total sidewalk or walkway width, sidewalk or walkway obstructions (*i.e.*, poles, signs, trees, hydrants, subway entrances, parking meters, newsstands, street vendors, telephone booths, *etc.*) and clear sidewalk or walkway width. Care must be taken in estimating the effective sidewalk or walkway width by taking into account shy distances of building faces and curbs, preemptive width of obstructions, and effective length of occasional obstructions. Refer to the HCM 2010 for details.

The primary performance measure for sidewalks and walkways is pedestrian space, expressed as square feet per pedestrian(ft^2/p), which is an indicator of the quality of pedestrian movement and comfort. It must be determined whether the pedestrian flow along a sidewalk or walkway location is best described as "non-platoon" or "platoon." Non-platoon flow occurs when pedestrian volume within the peak 15-minute period is relatively uniform. Platoon flow occurs when pedestrian volumes vary significantly within the peak 15-minute period, such as where nearby bus stops, subway stations and/or crosswalks account for much of the pedestrian volume. Sidewalk and walkway LOS for average pedestrian space are defined in Table 16-9 for non-platoon and platoon conditions:

Table 16-9
Sidewalk/Walkway LOS for Non-Platoon and Platoon Conditions

	Non-Platoon Flow	Platoon Flow
LOS A	> 60 ft^2/p	> 530 ft^2/p
LOS B	> 40 - 60 ft^2/p	> 90 - 530 ft^2/p
LOS C	>24 - 40 ft^2/p	>40 - 90 ft^2/p
LOS D	> 15 - 24 ft^2/p	> 23 - 40 ft^2/p
LOS E	> 8 - 15 ft^2/p	> 11 - 23 ft^2/p
LOS F	≤ 8 ft^2/p	≤ 11 ft^2/p

Street corners and crosswalks are also analyzed using the HCM 2010 procedures. The inputs for each analysis peak hour are the pedestrian volumes that turn the corner by direction, the adjacent crosswalk volumes by direction, the peak hour factor for each crosswalk and corner, the dimensions and obstructions of each corner including sidewalk width and corner radii, the crosswalk dimensions, the official and field verified signal timing, the average walking speed, and the hourly conflicting vehicles (permitted right and left turns) that turn into the crosswalk.

The primary performance measure for corners and crosswalks is pedestrian space, expressed as square feet per pedestrian (ft^2/p). Corner and crosswalk LOS for pedestrian space are defined in Table 16-10:

Table 16-10 Corner/Crosswalk LOS Pedestrian Space	
LOS A	> 60 ft^2/p
LOS B	> 40 - 60 ft^2/p
LOS C	>24 - 40 ft^2/p
LOS D	> 15 - 24 ft^2/p
LOS E	> 8 - 15 ft^2/p
LOS F	≤ 8 ft^2/p

Average pedestrian walking speed, which is used in determining crosswalk time-space, depends on the proportion of elderly and school children in the walking population. An average walking speed of 3.5 feet per second (fps) should be used if the elderly and school children proportion is less than 20 percent of the walking population; otherwise, a walking speed of 3.0 fps should be used. If the study intersection has a school crosswalk or is located within the Senior Pedestrian Focus Areas (SPFA), a walking speed of 3.0 fps should be used in the intersection corner and crosswalk analyses. To determine whether the study intersection(s) are within the designated SPFA, examine the maps provided here.

In addition to the operational analyses discussed above, high crash locations should be identified in consultation with DOT and the study area should include those intersections in the safety assessment. A high crash location is one where there were 48 or more total crashes (reportable and non-reportable) or five or more pedestrian/bicycle injury crashes in any consecutive 12 months of the most recent 3-year period for which data is available. In addition, if the proposed project is a school site, it requires the analysis of existing pedestrian safety at intersections expected to be used as main walking routes to and from schools, even if these intersections are not categorized as high-accident locations. See Section 370 for additional information.

364. Future No-Action Condition

The future No-Action conditions account for general background growth within the study area, plus tripmaking expected to be generated by major proposed projects that are likely to be in place by the proposed project's build year. The compounded annual growth rates in Table 16-4 are recommended to calculate the background growth rate accounting for short term and long term patterns in CEQR documents. For additional information regarding the assessment of the future No-Action condition, see Subsection 343.

364.1. Preparation of Future No-Action Volumes and Levels of Service Analysis

Pedestrian flow maps and pedestrian level of service analyses should be prepared following the same methodologies outlined for the existing conditions analyses. Documentation of the analyses would provide for a full description of future No-Action conditions and include text and tabular comparisons of how conditions are expected to change from existing conditions to the future No-Action scenario.

This assessment should also account for any programmed pedestrian network changes that could affect pedestrian flows or levels of service.

365. Analysis of Future With-Action Condition

The objective of the future With-Action condition analysis is to determine projected future condition with the proposed project in place and fully operational. The future With-Action condition is then compared with the future No-Action scenario to determine whether or not the proposed project would likely have significant adverse impacts on the study area's pedestrian facilities requiring mitigation.

The assessment of projected future With-Action condition consists of a series of analytical steps—trip generation, modal split, and trip assignment, discussed in detail in Subsections 311 through 321 of this chapter. Once these steps have been completed, a capacity and level of service analysis, defined as the evaluation of conditions within the study area with project-generated trips superimposed on the future No-Action condition, as a representation of the projected future With-Action condition, is conducted. Then, a determination of significant impacts—based on a comparison of With-Action condition with No-Action condition and using the impact thresholds—may be made.

Generally, the pedestrian analyses are performed in coordination with those of traffic and transit.

370. ASSESSMENT OF VEHICULAR AND PEDESTRIAN SAFETY ISSUES

In conjunction with a Detailed Traffic and/or Pedestrian Analysis, an assessment of vehicular and pedestrian safety may be appropriate. The key issue to be resolved in safety analyses is the extent to which vehicular and pedestrian exposure to crashes may reasonably be expected to increase with the proposed project in place. While many proposed projects do not require a detailed analysis of safety impacts, they may need to be addressed for some projects, such as those that would significantly redesign or reconfigure one or more streets as part of the proposed project; or those located near sensitive land uses, such as hospitals, schools, parks, nursing homes, elderly housing, or study intersections located in SPFAs (maps of SPFAs can be found here) that could be affected by increased traffic and pedestrian volumes generated by the proposed project.

Increased pedestrian crossings at documented high-accident locations may result in increasingly unsafe conditions. Generating measurable pedestrian crossings at non-controlled locations, midblock or intersection, especially for sites generating young pedestrians, such as schools, parks or other similar facilities, may also lead to unsafe conditions. One example would be a new school where a principal access path transverses a high crash location, defined as a location with 48 or more total reportable and non-reportable crashes or five or more pedestrian/bicyclists injury crashes in any consecutive 12 months of the most recent 3-year period for which data is available.

"Reportable crashes" are defined as all crashes involving death or injury that must be "reported" to the NYS Department of Motor Vehicles (DMV) by the police agencies, as well as those crashes resulting in death, injury or property damage in excess of $1,000 must be reported to the DMV by the involved party.

"Non-reportable" crashes contain less detail than reportable crashes, and are entered and retained in the computerized accident file by DMV. Property Damage Only (PDO) crashes reported by police agencies, but not by the involved motorists, are filed by the DMV as "non-reportable." PDO crashes filed by motorists are considered "non-reportable" if the property damage reported is either less than $1,000 or not provided.

In addition, the absence of controlled pedestrian crosswalks at key access points leading to/from a proposed project, crossing locations with difficult sight lines, *etc.*, may all serve as indicators of current or future problems that could create the potential for significant impacts.

The assessment of safety impacts should indicate the nature of the impact, the volumes affected by or affecting such impacts (including the types of vehicles, such as trucks; and the age group of pedestrians, such as children or the elderly), accident types and severity, and other contributing factors. Increased pedestrian crossings at already-documented high-crash locations would result in increasingly unsafe conditions. In addition, increased pedestrian crossings at non-controlled locations (midblock or intersection), may also lead to unsafe conditions, especially for projects generating young pedestrians, such as schools, parks and other similar locations.

The analysis of the proposed project should also consider potential safety effects on bicycle activity. For example, does the proposed project affect heavily-used bicycle routes or paths? A quantitative analysis should be conducted indicating the number of bicycle accidents at the location, and may be combined with the evaluation of pedestrian safety.

Summary accident data for the most recent three-year period is available from DOT. In addition, the following reference material may be helpful in addressing these issues: a) accident records at New York Police Department; and b) New York State Department of Transportation (NYSDOT) data. The types of measures to improve traffic and pedestrian safety should be identified and coordinated with DOT (See Section 540 for mitigation of pedestrian impacts).

380. DETAILED PARKING ANALYSIS

The first step in preparing for and conducting the parking analysis is to determine the specific locations of the parking facilities to be studied.

381. Study Area

An appropriately sized parking study area encompasses those facilities—*i.e.*, parking lots and garages and on-street curb spaces—in which vehicular traffic destined for the site of the proposed project would likely park. The extent of the area corresponds to the maximum distance that someone driving to the site would be willing to walk. This walking distance is a function of several parameters, including the following:

- How much accessory and/or public parking would be provided on-site as part of the proposed project? Would it be sufficient or would project-generated vehicles need to park off-site? If on-site parking would be sufficient, there would be no need to define a parking study area unless the proposed project would eliminate a significant amount of available public parking.
- What is the nature of the site's surrounding area? Is the site centrally located within the surrounding street network or, for example, is it a waterfront site from which drivers cannot proceed in all four directions to find parking? Is the area somewhat desolate in peak project hours, thereby making drivers anxious about walking greater distances from their parked cars to the site? Is there an abundance of available parking in the area that affords the driver the opportunity to walk short distances and not require an analysis of parking sites more distant from the project site?

In general, a 0.25 mile walk is considered the maximum distance from primary off-site parking facilities to the project site, although it could be longer or shorter depending on the factors noted above. Amusement parks, arenas, beaches, and recreational facilities are examples of land uses with parking demands that often extend beyond 0.25 miles of the project site. Should the parking spaces available within this distance of the site, along with whatever amount of parking is provided on-site, prove insufficient to accommodate the peak parking demand, consideration should be given to extending the study area to a maximum of 0.5 mile of the site. However, it should be noted that this is the extent to which drivers would generally go to find available parking, and it does not necessarily indicate that this extended parking study area supply is acceptable. It merely constitutes a piece of information to be disclosed to decision-makers and the public at large.

382. Existing Parking Condition

The objective of the existing parking condition analysis is to document the extent to which public parking is available and utilized in the study area. The analysis consists of an inventory of on- and off-street (*i.e.*, parking lot and garage) spaces, and a summary tabulation indicating the number of parking spaces available for potential future parkers in the area.

382.1. On-Street Parking Analyses

Typically, a parking analysis provides both a qualitative overview of parking in the area and quantified summaries of the nature and extent of parking that occurs. Qualitatively, it should include a general overview of the type of parking regulations that exist in the area. For example, is it generally an "alternate-side-of-the-street" type parking area with metered parking available along key retail streets (with those key streets specified by name)? Is it an area where curb parking is generally prohibited to allow maximum street frontage for commercial vehicle deliveries or for additional traffic capacity, as is the case in much of Midtown Manhattan?

Quantitatively, the analysis should include a tabulation of the number of legal on-street parking spaces that exist within the parking study area by the critical times of day for parking. For a conventional office or residential project, the critical times are 7 a.m. to 9 a.m. when people arrive at work or leave their homes to go to work; at midday (usually between 12:00 and 2:00 p.m.) when parking in a business area is frequently at peak occupancy; and at any other times when parking regulations change significantly (such as in areas where alternate-side-of-the-street parking regulations exist—typically from 8:00 a.m. to 11:00 a.m. or from 11:00 a.m. to 2:00 p.m.—and where curb occupancies change just before and just after the hours that the restrictions are in place). The number of spaces may be obtained by tabulating the length of curb space at which it is legal to park (*i.e.*, excluding fire hydrants, driveways, restricted parking areas, *etc.*) and dividing by an average parking space length of 20 feet, or by counting the number of cars actually parked at the curb plus those that could fit within available gaps.

The analysis should include a tabulation of how many legal on-street parking spaces exist at the likely periods of lowest supply and highest demand, such as 8:00 a.m., 11:00 a.m. and 3:00 p.m., since the peak times for parking activity and parking facility utilization often differ from the peak times for potential traffic impacts, as well as how many of these spaces are occupied and how many are vacant. For proposed projects that have significant trip-making activities at other times, those other peak times are also assessed. For example, this could include weekend or weeknight hours for a concert hall, sports arena, convention center, movie theater, *etc.*

It is also advisable to include a more detailed map indicating the key parking regulations on the block faces of the project site and within a more convenient walking distance than the full parking study area. This is needed for two reasons: 1) to provide a better picture of actual conditions at the site; and 2) to facilitate the determination of the spaces to be taken should a future parking shortfall be identified and additional on-street parking prohibitions be needed as mitigation for traffic impacts.

382.2. *Off-Street Parking Analyses*

The location of all public parking lots and garages within the study area should be inventoried and mapped. The licensed capacity of each (which must be posted at its entrance) should be noted. Then, one or two mid-week day surveys of the occupancy levels of each parking lot and garage should be undertaken to determine the extent to which each is occupied at a representative morning peak hour, such as 8:00 a.m. to 9:00 a.m., and at a time of typical maximum occupancy, such as 12:00 p.m. to 1:00 p.m., or 1:00 p.m. to 2:00p.m.

For specific types of projects that generate a significant amount of in and out parking activity, an hour-by-hour parking occupancy survey may be needed. Examples of this include shopping centers, multiplex movie theaters, and major mixed-use development projects. For several of these uses, weekend and/or weeknight surveys may also be appropriate. For example, a proposed museum may be expected to generate traffic and parking activity weekdays from 10:00 a.m. to 8:00 p.m. and on weekends from 10:00 a.m. to 6:00 p.m. For this proposal, parking occupancy surveys might be performed at 10:00 a.m., when museum employees would come to work and look for nearby parking; at 12:00 p.m. or 2:00 p.m., when visitor activity would build to an assumed maximum; an evening hour, such as 7:00 p.m., when there would be a significant amount of patronage and demand for parking in the area from other uses; and at a representative weekend peak hour, when visitor traffic is expected to be greatest and/or when parking facilities in the area are most fully utilized. Reasonable judgment is needed.

The tabulation of off-street parking should include the name and location of each facility, its posted capacity, number of spaces utilized, and the percentage utilization for the representative critical hours identified. A summary statement of the overall extent to which such parking is available in the study area should be included. For example, it could be that only 65 percent of a study area's off-street parking supply is occupied at peak hours, but that the three facilities closest to the proposed project site are fully utilized because development density is greatest there. These important findings should be highlighted.

Occupancy surveys may be taken in one of several ways. The most appropriate procedure is a physical count of the number of vehicles parked at the lot or garage. General practice has been to interview the lot manager or an attendant and ask to what extent the facility fills up by time of day, or to make a visual judgment of the utilization of a parking facility. As this information cannot be validated, other methods should be pursued that result in first-hand counts.

383. FUTURE NO-ACTION PARKING CONDITION

The objective of this assessment is to identify the future on- and off-street parking conditions without the proposed project. The projection of future No-Action on- and off-street parking needs includes applying an annual background growth rate (see Table 16-4) to the existing on- and off-street parking demand and assigning the No-Action projects' parking demand to these facilities. The projected parking demand is then compared to study area's parking supply by considering any changes to the street network, on-street parking regulations, closure or reduction of existing off-street parking facilities, and/or addition of any new parking facilities within the study area. The parking garage/lot assessment should be shown as an hourly parking utilization/accumulation, while on-street utilization may be focused on the analysis peak periods. Should any analysis peak hour indicate that the garage/lot parking utilization is at or exceeds 98 percent of its capacity, then the parking facility is considered "at capacity" for that hour and no vehicles should be assigned to the garage/lot. All hourly shortfalls should be identified in the parking utilization table.

384. FUTURE WITH-ACTION CONDITION

The objective of this assessment is to identify the future on- and off-street parking conditions with the proposed project in place, which requires estimating the action's daily and hourly parking demand and the study area's future parking supply (which may include on- and off-site parking facilities as well as on-street curb spaces), and assigning the project-related vehicles to these facilities. Should any analysis peak hour indicate that the garage/lot parking utilization is at or exceeds 98% of its capacity, then the parking facility is considered "at capacity" for that hour and no vehicles should be assigned to the garage/lot. This information should be presented in an hourly parking utilization table that compares the future No-Action and With-Action conditions and identifies excess capacity and/or parking shortfalls.

400. DETERMINING IMPACT SIGNIFICANCE

The comparison of expected conditions in the future with and without the proposed project in place determines whether any impacts, or changes in future conditions, are to be expected. Nationally, there are no hard federal or industry-wide standards in use that define impact significance. Each municipality, county, or state agency responsible for traffic, transit, pedestrian, parking operations and/or site plan approvals has either developed its own local set of standards, or responds to development proposals more qualitatively based on their sense of whether the proposal's trip generation is likely to be significant.

The proposed project's context, location, and hours of operation, and the types of travel modes it would generate play a key role in determining whether or not a project's impacts are deemed significant. For example, if two distinct proposed projects would generate the same number of trips or result in the same levels of service, but one project would generate its trips during the conventional peak travel hours and the other would generate its traffic during non-peak hours, one project's impacts may be significant while the other's may not be considered as such. In another example, if two proposed projects would generate the same volume of traffic, but one would be situated in a commercial area and the other on a quiet residential street, it is possible that only one of these projects would have significant impacts.

Correspondingly, the determination of significant impacts must respond to several important questions:

- Would generated vehicle trips likely cause a noticeable change in volumes on study area streets?
- Would generated vehicle trips likely cause additional traffic delays considered to be unacceptable?
- Would generated vehicle trips likely exacerbate or create unsafe conditions?
- Would generated vehicle trips likely worsen pedestrian crossing conditions on the affected streets?
- Would generated vehicle trips likely create significant delays for surface transit trips?
- Would generated pedestrian trips likely cause noticeable delays and congestion to vehicular traffic?
- Would the location and use of truck loading docks or other goods delivery areas create significant problems for vehicles, pedestrians, and bicycles?
- Would the volume of project-generated subway trips likely cause congestion, delays, or unsafe conditions on station stairwells, platforms or corridors, or through its turnstiles?
- Would the volume of project-generated bus passengers cause overcrowding on buses? Would it necessitate adding more bus service?
- Could the volume of pedestrian trips generated by the proposed project be accommodated on study area sidewalks and safely within its crosswalks and corners at key intersections?

The sections that follow present recommended guidelines for determining impact significance for each transportation element.

410. DETERMINATION OF SIGNIFICANT TRAFFIC IMPACTS

Different municipalities and agencies around the country use different definitions of a significant traffic impact. There is no industry wide standard for the definition of a significant traffic impact. In general, however, there is agreement that deterioration in levels of service (LOS) within the clearly acceptable range (LOS A through LOS C) is not considered significant. Deterioration to marginally acceptable LOS D (mid-LOS D or better) is also not considered significant. If the LOS under the With-Action condition deteriorates to worse than mid-LOS D, then the determination of whether the impact is considered significant is based on a sliding scale that varies with the No-Action LOS. This impact determination is premised on the assumption that deterioration in LOS under the With-Action condition becomes less tolerable when there is a poor LOS in the No-Action condition. The following guidelines should be applied in determining whether or not the traffic impacts of a proposed project being evaluated are significant.

411. Signalized Intersections

Determination of significant impacts for signalized intersections is summarized as follows:

- If a lane group under the With-Action condition is within LOS A, B or C, or marginally acceptable LOS D (average control delay less than or equal to 45.0 seconds/veh), the impact is not considered significant. The level of service changes, however, could affect neighborhood character should they occur on residential streets, and, therefore, should be disclosed (see Chapter 21, "Neighborhood Character," for further guidance). However, if a lane group under the No-Action condition is within LOS A, B or C, then a deterioration under the With-Action condition to worse than mid-LOS D (delay greater than 45.0 seconds/veh) should be considered a significant impact.
- For a lane group with LOS D under the No-Action condition, an increase in projected average control delay of 5.0 or more seconds should be considered significant if the With-Action delay exceeds mid-LOS D (delay greater than 45.0 seconds/veh).

- For a lane group with LOS E under the No-Action condition, an increase in projected delay of 4.0 or more seconds should be considered significant.
- For a lane group with LOS F under the No-Action condition, an increase in projected delay of 3.0 or more seconds should be considered significant.

412. Unsignalized Intersections

For unsignalized intersections the same criteria as for signalized intersections would apply. For the minor street to trigger a significant impact, 90 PCEs must be identified in the future With-Action conditions in any peak hour.

413. Basic Freeway Segments

The determination of significant impacts for basic freeway segments is summarized as follows:

- If the level of service under the no-action condition is LOS D, an increase in the projected density of 5 or more passenger cars per mile per lane (pc/mi/ln) under the action condition should be considered a significant impact.
- If the level of service under the no-action condition is LOS E, an increase in the projected density of 4 or more pc/mi/ln under the action condition should be considered a significant impact.
- If the level of service under the no-action condition is LOS F, an increase in the projected density of 3 or more pc/mi/ln under the action condition should be considered a significant impact.

414. Freeway Weaving and Freeway Merge and Diverge Segments

The determination of significant impacts for freeway weaving and freeway merge and diverge segments is summarized as follows:

- If the level of service under the no-action condition is LOS D, an increase in the projected density of 4 or more passenger cars per mile per lane (pc/mi/ln) under the action condition should be considered a significant impact.
- If the level of service under the no-action condition is LOS E, an increase in the projected density of 3 or more pc/mi/ln under the action condition should be considered a significant impact.
- If the level of service under the no-action condition is LOS F, an increase in the projected density of 2 or more pc/mi/ln under the action condition should be considered a significant impact.

420. DETERMINATION OF SIGNIFICANT SUBWAY/RAIL TRANSIT IMPACTS

The determination of significant impacts differs for stairways, passageways/corridors, turnstiles, and platform conditions. For all circulation elements, however, it is important to highlight incremental changes in passenger volumes as well as v/c changes. NYCT is the agency in New York responsible for implementing or overseeing the implementation of rail transit mitigation measures, should they be needed. There may be cases where alternative assessments may be warranted to cover either unique conditions or alternative With-Action analysis methodologies.

421. Stairways and Passageways

NYCT has defined significant stairway impacts in terms of the width increment threshold (WIT) needed to bring the stair or passageway back to its No-Action v/c ratio or to bring it to a v/c ratio of 1.00, whichever is greater. Please note that the WIT is used to determine significant impact, and is not the actual widening that would be required to mitigate a significant impact (see Section 520 for stairway/passageway mitigation).

To determine the WIT, use the following formula if both the No-Action v/c and the With-Action v/c ratios are greater than 1.00:

Equation 16-5

$$\mathrm{WIT} = \frac{\mathrm{We} \times \mathrm{Vp}}{\mathrm{Vna}}$$

Where: WIT = width increment threshold
We = effective width in inches in the No-Action
Vp = 15-minute project-induced change in passenger volume
Vna = No-Action passenger volume

In instances where the No-Action v/c ratio is less than 1.00 but the With-Action v/c ratio is greater than 1.00, then the WIT should be calculated to bring the v/c back to 1.00, rather than the to the No-Action v/c. Use the following formula to calculate the WIT in cases where the No-Action v/c is less than 1.00:

Equation 16-6

$$\mathrm{WIT} = \left(\frac{\mathrm{Vb\ up}}{150 \times \mathrm{Sfup} \times \mathrm{Ff}} + \frac{\mathrm{Vb\ down}}{150 \times \mathrm{Sfdown} \times \mathrm{Ff}} - \mathrm{Wef}\right) \mathrm{X}\ 12$$

Where: WIT = width increment threshold
Wef = effective width in the No-Action (in feet)
Vb up = total With-Action volume in the up direction
Vb down = total With-Action volume in the down direction
150 = guideline capacity of stairway (use 250 for passageways)
Ff = friction factor
Sf = surge factor (Sf = 1 in the non-surged direction)

Stairways and passageways that are substantially degraded in v/c, or which result in the formation of extensive queues are classified as significantly impacted. Significant impacts are typically considered to occur once the following WIT are reached or exceeded:

Table 16-11

With-Action v/c	WIT for Significant Impact (inches)	
	Stairway	**Passageway**
1.00-1.09	8	13
1.1-1.19	7	11.5
1.20-1.29	6	10
1.3-1.39	5	8.5
1.4-1.49	4	6
1.5-1.59	3	4.5
1.6 and up	2	3

422. Turnstiles, Escalators, Elevators and High-Wheel Exits

Proposed projects that cause a turnstile, escalator or high-wheel exit gate to increase from v/c below 1.00 to v/c of 1.00 or greater are considered to create a significant impact. Where a facility is already at a v/c of 1.00 or greater, a 0.01 change in v/c ratio is also considered significant.

423. Platforms

NYCT guidelines define the objective of maintaining LOS C/D occupancy conditions along platforms. For platforms (and for station mezzanine or concourse levels) there are two concerns: capacity for passenger movement and waiting; and passenger safety. However, platform widths and configurations are also the most difficult of the station elements to modify or enlarge.

A future With-Action increment that causes a platform zone to exceed a v/c ratio of 1.33 is considered a significant impact. A full description of what deterioration between or within given levels of service mean to passengers and train operation should also be included.

424. Line-Haul Capacity

In the area of line-haul capacity, there are constraints on what service improvements are potentially available to NYCT. The comparison of future With-Action load levels per car with future No-Action levels would indicate whether, and to what extent, ridership per car would increase.

Any increases in average per car load levels that remain within the guideline capacity limits identified in Table 16-8 are generally not considered significant impacts. However, projected increases from a No-Action condition within guideline capacity to a With-Action condition that exceeds guideline capacity may be considered a significant impact if the proposed project is generating five more transit riders per car. This is based on a general assumption that at guideline capacity, the addition of even five more riders per car is perceptible.

430. DETERMINATION OF SIGNIFICANT BUS TRANSIT IMPACTS

The With-Action evaluations provide an analysis of projected load levels per bus at each affected route's maximum load point to determine whether this future load level would be within a typical bus's total capacity or above total capacity. As previously noted, MTA buses are scheduled to operate at a maximum load of 54 (standard) or 85 (articulated) or 55 (over-the-road) passengers per bus—their maximum seated-plus-standee load—at the bus's maximum load point. According to current MTA bus operating agencies' guidelines, increases in bus load levels to above their maximum capacity at any load point is defined as a significant impact since it necessitates adding more bus service along that route.

440. DETERMINATION OF SIGNIFICANT PEDESTRIAN IMPACTS

The guidance described below is based on the general comfort and convenience levels of pedestrians and should be used in determining the significance of pedestrian impacts. As defined previously, pedestrian LOS D refers to restricted flow conditions for sidewalks and crosswalks (a level where pedestrians do not have freedom to select their walking speeds and to bypass other pedestrians) and to "no touch" zones (standing without touching is possible) for corner reservoir areas. LOS E refers to severely restricted conditions for sidewalks and crosswalks (space is not sufficient for passing slower pedestrians) and to "touch" zones (standing in physical contact with others is unavoidable) for corner reservoir areas, and LOS F refers to conditions where movement is extremely difficult if not impossible. LOS D through F, therefore, have undesirable implications regarding comfort and convenience of pedestrian flow. In addition, severely restricted flow conditions may have potential safety implications.

When evaluating pedestrian impacts, the location of the area being assessed is an important consideration. For example, Central Business District (CBD) areas, such as Midtown and Lower Manhattan, Downtown Brooklyn, Long Island City, Downtown Flushing, Downtown Jamaica, and other areas having CBD type characteristics, have a substantially higher level of pedestrian activity than anywhere else. Pedestrians there have, to some extent, become acclimated to, and tolerant of, restricted level of service conditions that might not be considered acceptable elsewhere. Therefore, acceptable LOS for CBD areas is generally taken to be mid-LOS D or better, while acceptable LOS elsewhere in the City (non-CBD areas) is generally taken to be LOS C or better. The following sections offer guidance in determining impact significance for pedestrian elements.

441. Corners and Crosswalks

Determination of significant impacts for corners and crosswalks depends on whether the area type is considered a CBD or non-CBD. It is recommended that DOT be consulted prior to conducting corner or crosswalk level of service analyses to determine area types to be used in determining potential significant impacts.

441.1. Corners and Crosswalks in Non-CBD Areas

For corners and crosswalks in non-CBD areas, average pedestrian space under the With-Action condition deteriorating within acceptable LOS (LOS C or better) should generally not be considered a significant impact. If the pedestrian space under the With-Action condition deteriorates to LOS D or worse, then the determination of whether the impact is considered significant is based on a sliding scale that varies with the No-Action pedestrian space. This impact determination is premised on the assumption that the reduction in pedestrian space under the With-Action condition becomes less tolerable when there is less pedestrian space to begin with under the No-Action condition. Determination of significant impacts for corners and crosswalks within a non-CBD area is summarized as follows:

- If the average pedestrian space under the No-Action condition is greater than 26.6 ft^2/p, then a decrease in pedestrian space under the With-Action condition to 24.0 ft^2/p or less (LOS D or worse) should be considered a significant impact. If the pedestrian space under the With-Action condition is greater than 24.0 ft^2/p (LOS C or better), the impact should not be considered significant.
- If the average pedestrian space under the No-Action condition is between 5.1 and 26.6 ft^2/p, a decrease in pedestrian space under the With-Action condition should be considered significant according to the sliding scale formula in Equation 16-7 or using Table 16-12:

Equation 16-7

$$Y \geq \frac{X}{9.0} - 0.31$$

where,
Y = decrease in pedestrian space in ft^2/p to be considered a potential significant impact
X = No-Action pedestrian space in ft^2/p

TABLE 16-12 SIGNIFICANT IMPACT GUIDANCE FOR CORNERS AND CROSSWALKS NON-CBD LOCATION	
No-Action Condition Pedestrian (Ped) Space (sf/ped)	**With-Action Condition Ped Space Reduction to be Considered Significant Impact (sf/ped)**
>26.6	With-Action Condition ≤ 24.0
25.8 to 26.6	Reduction ≥ 2.6
24.9 to 25.7	Reduction ≥ 2.5
24.0 to 24.8	Reduction ≥ 2.4
23.1 to 23.9	Reduction ≥ 2.3
22.2 to 23.0	Reduction ≥ 2.2
21.3 to 22.1	Reduction ≥ 2.1
20.4 to 21.2	Reduction ≥ 2.0
19.5 to 20.3	Reduction > 1.9
18.6 to 19.4	Reduction ≥ 1.8
17.7 to 18.5	Reduction ≥ 1.7
16.8 to 17.6	Reduction ≥ 1.6
15.9 to 16.7	Reduction ≥ 1.5
15.0 to 15.8	Reduction ≥ 1.4
14.1 to 14.9	Reduction ≥ 1.3
13.2 to 14.0	Reduction ≥ 1.2
12.3 to 13.1	Reduction ≥ 1.1
11.4 to 12.2	Reduction ≥ 1.0
10.5 to 11.3	Reduction ≥ 0.9
9.6 to 10.4	Reduction ≥ 0.8
8.7 to 9.5	Reduction ≥ 0.7
7.8 to 8.6	Reduction ≥ 0.6
6.9 to 7.7	Reduction ≥ 0.5
6.0 to 6.8	Reduction ≥ 0.4
5.1 to 5.9	Reduction ≥ 0.3
< 5.1	Reduction ≥ 0.2

- If the decrease in pedestrian space is less than the value calculated from the formula in Equation 16-7 or Table 16-12, the impact is not considered significant.
- If the average pedestrian space under the No-Action condition is less than 5.1 ft^2/p, then a decrease in pedestrian space greater than or equal to 0.2 ft^2/p should be considered significant.

For example, if a crosswalk under the No-Action condition in a non-CBD area has an average pedestrian space of 19.8 ft^2/p, then a reduction in pedestrian space equal to or greater than 1.9 ft^2/p (Y = 19.8/9.0 – 0.31 = 1.9) should be considered a significant impact.

441.2. Corners and Crosswalk in CBD Areas

The procedure for corners and crosswalks in CBD areas is similar to that for non-CBD areas, except that With-Action condition average pedestrian space that is considered to be acceptable ranges from LOS A to mid-LOS D (as opposed to LOS A through LOS C for non-CBD areas). If the pedestrian space under the With-Action condition deteriorates to worse than mid-LOS D, then the determination of whether the impact is considered significant is based on the same sliding scale as for non-CBD areas. Determination of significant impacts for corners and crosswalks in a CBD area is summarized as follows:

- If the average pedestrian space under the No-Action condition is greater than 21.5 ft^2/p, then a decrease in pedestrian space under the With-Action condition to less than 19.5 ft^2/p (worse than mid-LOS D) should be considered a significant impact. If the pedestrian space under the With-Action condition is greater than or equal to 19.5 ft^2/p (mid-LOS D or better), the impact should not be considered significant.
- If the average pedestrian space under the No-Action condition is between 5.1 and 21.5 ft^2/p, a decrease in pedestrian space under the With-Action condition should be considered significant according to the sliding scale formula in Equation 16-7 or using Table 16-13.

TABLE 16-13
SIGNIFICANT IMPACT GUIDANCE FOR CORNERS AND CROSSWALKS
CBD LOCATION

No-Action Condition Ped Space (sf/ped)	With-Action Condition Ped Space Reduction to be Considered a Significant Impact (sf/ped)
> 21.5	With-Action Condition < 19.5
21.3 to 21.5	Reduction ≥ 2.1
20.4 to 21.2	Reduction ≥ 2.0
19.5 to 20.3	Reduction ≥ 1.9
18.6 to 19.4	Reduction ≥ 1.8
17.7 to 18.5	Reduction ≥ 1.7
16.8 to 17.6	Reduction ≥ 1.6
15.9 to 16.7	Reduction ≥ 1.5
15.0 to 15.8	Reduction ≥ 1.4
14.1 to 14.9	Reduction ≥ 1.3
13.2 to 14.0	Reduction ≥ 1.2
12.3 to 13.1	Reduction ≥ 1.1
11.4 to 12.2	Reduction ≥ 1.0
10.5 to 11.3	Reduction ≥ 0.9
9.6 to 10.4	Reduction ≥ 0.8
8.7 to 9.5	Reduction ≥ 0.7

TABLE 16-13 Continued

7.8 to 8.6	Reduction $\geq$ 0.6
6.9 to 7.7	Reduction $\geq$ 0.5
6.0 to 6.8	Reduction $\geq$ 0.4
5.1 to 5.9	Reduction $\geq$ 0.3
< 5.1	Reduction $\geq$ 0.2

- If the decrease in pedestrian space is less than the value calculated from the formula, or Table 16-13, the impact should not be considered significant.
- If the average pedestrian space under the No-Action condition is less than 5.1 ft^2/p, then a decrease in pedestrian space greater than or equal to 0.2 ft^2/ped should be considered significant.

For example, if a crosswalk under the No-Action condition in a CBD has an average pedestrian space of 12.8 ft^2/p, then a reduction in pedestrian space equal to or greater than 1.1 ft^2/p (Y = 12.8/9.0 – 0.31 = 1.1) should be considered a significant impact.

442. Sidewalks

Determination of significant impacts for sidewalks/walkways depends on the pedestrian flow type (*i.e.*, non-platoon or platoon) and the area type (*i.e.*, non-CBD or CBD). It is recommended that the lead agency consult with DOT prior to conducting sidewalk levels of service analyses to determine pedestrian flow types and area types to be used in determining potential significant impacts.

442.1. Sidewalks with Non-Platoon Flow in Non-CBD Areas

For sidewalks exhibiting non-platoon flow in non-CBD areas, average pedestrian space under the With-Action condition deteriorating within acceptable LOS (LOS C or better) should generally not be considered a significant impact. If the pedestrian space under the With-Action condition deteriorates to LOS D or worse, then the determination of whether the impact is considered significant is based on a sliding scale that varies with the No-Action pedestrian space. This impact determination is premised on the assumption that the reduction in pedestrian space under the With-Action condition becomes less tolerable when there is less pedestrian space to begin with under the No-Action condition. Determination of significant impacts for sidewalks with non-platoon flow in a non-CBD area is summarized as follows:

- If the average pedestrian space under the No-Action condition is greater than 26.6 ft^2/p, then a decrease in pedestrian space under the With-Action condition to 24.0 ft^2/p or less (LOS D or worse) should be considered a significant impact. If the pedestrian space under the With-Action condition is greater than 24.0 ft^2/p (LOS C or better),the impact should not be considered significant.
- If the average pedestrian space under the No-Action condition is between 5.1 and 26.6 ft^2/p, a decrease in pedestrian space under the With-Action condition should be considered significant using the sliding scale formula in Equation 16-8 below or Table 16-14:

Equation 16-8

$$Y \geq \frac{X}{9.0} - 0.31$$

where,

Y = decrease in pedestrian space in ft^2/p to be considered a potential significant impact

X = No-Action pedestrian space in ft^2/p

TABLE 16-14
SIGNIFICANT IMPACT GUIDANCE FOR SIDEWALKS
NON-PLATOONED FLOW
NON-CBD LOCATION

No-Action Condition Pedestrian (Ped) Space (sf/ped)	**With-Action Condition Ped Space Reduction to be Considered a Significant Impact (sf/ped)**
> 26.6	With-Action Condition ≤ 24.0
25.8 to 26.6	Reduction ≥ 2.6
24.9 to 25.7	Reduction ≥ 2.5
24.0 to 24.8	Reduction ≥ 2.4
23.1 to 23.9	Reduction ≥ 2.3
22.2 to 23.0	Reduction ≥ 2.2
21.3 to 22.1	Reduction ≥ 2.1
20.4 to 21.2	Reduction ≥ 2.0
19.5 to 20.3	Reduction ≥ 1.9
18.6 to 19.4	Reduction ≥ 1.8
17.7 to 18.5	Reduction ≥ 1.7
16.8 to 17.6	Reduction ≥ 1.6
15.9 to 16.7	Reduction ≥ 1.5
15.0 to 15.8	Reduction ≥ 1.4
14.1 to 14.9	Reduction ≥ 1.3
13.2 to 14.0	Reduction ≥ 1.2
12.3 to 13.1	Reduction ≥ 1.1
11.4 to 12.2	Reduction ≥ 1.0
10.5 to 11.3	Reduction ≥ 0.9
9.6 to 10.4	Reduction ≥ 0.8
8.7 to 9.5	Reduction ≥ 0.7
7.8 to 8.6	Reduction ≥ 0.6
6.9 to 7.7	Reduction ≥ 0.5
6.0 to 6.8	Reduction ≥ 0.4
5.1 to 5.9	Reduction ≥ 0.3
< 5.1	Reduction ≥ 0.2

- If the decrease in average pedestrian space is less than value calculated from the formula in Equation 16-8 or Table 16-14, the impact should not be considered significant.
- If the average pedestrian space under the No-Action condition is less than 5.1 ft^2/p, then a decrease in pedestrian space greater than or equal to 0.2 ft^2/p should be considered significant.

For example, if a sidewalk under the No-Action condition with non-platoon flow in a non-CBD area has an average pedestrian space of 23.5 ft^2/p has an average pedestrian space of 23.5 ft^2/p, then a reduction in pedestrian space greater than or equal to 2.3 ft^2/p (Y = 23.5/9.0 – 0.31 = 2.3) should be considered a significant impact.

442.2. Sidewalks with Non-Platoon Flow in CBD Areas

The procedure for sidewalks exhibiting non-platoon flow in CBD areas is similar to that for non-CBD areas, except that With-Action condition average pedestrian space that is considered to be acceptable ranges from LOS A to mid-LOS D (as opposed to LOS A through LOS C in non-CBD areas). If the average pedestrian space under the With-Action condition deteriorates to worse than mid-LOS D, then the determination of whether the impact is considered significant is based on the same sliding scale as for non-CBD areas. Determination of significant impacts for sidewalks with non-platoon flow in a CBD is summarized as follows:

- If the average pedestrian space under the No-Action condition is greater than 21.5 ft^2/p, then a decrease in pedestrian space under the With-Action condition to less than 19.5 ft^2/p(worse than mid-LOS D)should be considered a significant impact. If the average pedestrian space under the With-Action condition is greater than or equal to 19.5 ft^2/p (mid-LOS D or better), the impact should not be considered significant.
- If the average pedestrian space under the No-Action condition is between 5.1 and 21.5 ft^2/p, a decrease in pedestrian space under the With-Action condition should be considered significant according to the formula in Equation 16-8 or using Table 16-15.

TABLE 16-15
SIGNIFICANT IMPACT GUIDANCE FOR SIDEWALKS
NON-PLATOONED FLOW
CBD LOCATION

No-Action Condition Ped Space (sf/ped)	With-Action Condition Ped Space Reduction to be Considered Significant Impact (sf/ped)
> 21.5	With-Action Condition < 19.5
21.3 to 21.5	Reduction ≥ 2.1
20.4 to 21.2	Reduction ≥ 2.0
19.5 to 20.3	Reduction ≥ 1.9
18.6 to 19.4	Reduction ≥ 1.8
17.7 to 18.5	Reduction ≥ 1.7
16.8 to 17.6	Reduction ≥ 1.6
15.9 to 16.7	Reduction ≥ 1.5
15.0 to 15.8	Reduction ≥ 1.4
14.1 to 14.9	Reduction ≥ 1.3
13.2 to 14.0	Reduction ≥ 1.2
12.3 to 13.1	Reduction ≥ 1.1
11.4 to 12.2	Reduction ≥ 1.0
10.5 to 11.3	Reduction ≥ 0.9
9.6 to 10.4	Reduction ≥ 0.8
8.7 to 9.5	Reduction ≥ 0.7
7.8 to 8.6	Reduction ≥ 0.6
6.9 to 7.7	Reduction ≥ 0.5
6.0 to 6.8	Reduction ≥ 0.4
5.1 to 5.9	Reduction ≥ 0.3
< 5.1	Reduction ≥ 0.2

- If the decrease in average pedestrian space is less than the value calculated from the formula in Equation 16-8 or Table 16-15, the impact should not be considered significant.
- If the average pedestrian space under the No-Action condition is less than 5.1 ft^2/p, then a decrease in pedestrian space greater than or equal to 0.2 ft^2/p should be considered significant.

For example, if a sidewalk under the No-Action condition with non-platoon flow in a CBD area has an average pedestrian space of 12.8 ft^2/p, then a reduction in pedestrian space greater than or equal to 1.1 ft^2/p (Y = 12.8/9.0 – 0.31 = 1.1) should be considered a significant.

442.3. Sidewalks with Platoon Flow in Non-CBD Areas

For sidewalks exhibiting platoon flow in non-CBD areas, average pedestrian space under the With-Action condition deteriorating within acceptable LOS (LOS C or better) should generally not be considered a significant impact. If the pedestrian space under the With-Action condition deteriorates to LOS D or worse, then the determination of whether the impact is considered significant is based on a sliding scale that varies with the No-Action pedestrian space. This impact determination is premised on the assumption that the reduction in pedestrian space under the With-Action condition becomes less tolerable when there is less pedestrian space to begin with under the No-Action condition. Determination of significant impacts for sidewalks with platoon flow in a non-CBD area is summarized as follows:

- If the average pedestrian space under the No-Action condition is greater than 44.3 ft^2/p, then a decrease in pedestrian space under the With-Action condition to 40.0 ft^2/p or less (LOS D or worse) should be considered a significant impact. If the average pedestrian space under the With-Action condition is greater than 40.0 ft^2/p (LOS C or better), the impact should not be considered significant.
- If the average pedestrian space under the No-Action condition is between 6.4 and 44.3 ft^2/p, a decrease in pedestrian space under the With-Action condition should be considered significant using the sliding scale formula in Equation 16-9 below or using Table 16-16:

Equation 16-9

$$Y \geq \frac{X}{9.5 - 0.321}$$

where,
Y = decrease in pedestrian space in ft^2/p to be considered a potential significant impact
X = No-Action pedestrian space in ft^2/p

TABLE 16-16 SIGNIFICANT IMPACT GUIDANCE FOR SIDEWALKS PLATOONED FLOW NON-CBD LOCATION			
No-Action Condition Ped Space (sf/ped)			**With-Action Condition Ped Space Reduction to be Considered Significant Impact (sf/ped)**
> 44.3			With-Action Condition ≤ 40.0
43.5	to	44.3	Reduction ≥ 4.3
42.5	to	43.4	Reduction ≥ 4.2
41.6	to	42.4	Reduction ≥ 4.1
40.6	to	41.5	Reduction ≥ 4.0
39.7	to	40.5	Reduction ≥ 3.9
38.7	to	39.6	Reduction ≥ 3.8
37.8	to	38.6	Reduction ≥ 3.7
36.8	to	37.7	Reduction ≥ 3.6
35.9	to	36.7	Reduction ≥ 3.5
34.9	to	35.8	Reduction ≥ 3.4
34.0	to	34.8	Reduction ≥ 3.3
33.0	to	33.9	Reduction ≥ 3.2
32.1	to	32.9	Reduction ≥ 3.1
31.1	to	32.0	Reduction ≥ 3.0
30.2	to	31.0	Reduction ≥ 2.9
29.2	to	30.1	Reduction ≥ 2.8
28.3	to	29.1	Reduction ≥ 2.7
27.3	to	28.2	Reduction ≥ 2.6
26.4	to	27.2	Reduction ≥ 2.5
25.4	to	26.3	Reduction ≥ 2.4
24.5	to	25.3	Reduction ≥ 2.3
23.5	to	24.4	Reduction ≥ 2.2
22.6	to	23.4	Reduction ≥ 2.1
21.6	to	22.5	Reduction ≥ 2.0
20.7	to	21.5	Reduction ≥ 1.9
19.7	to	20.6	Reduction ≥ 1.8
18.8	to	19.6	Reduction ≥ 1.7
17.8	to	18.7	Reduction ≥ 1.6
16.9	to	17.7	Reduction ≥ 1.5
15.9	to	16.8	Reduction ≥ 1.4
15.0	to	15.8	Reduction ≥ 1.3
14.0	to	14.9	Reduction ≥ 1.2
13.1	to	13.9	Reduction ≥ 1.1
12.1	to	13.0	Reduction ≥ 1.0
11.2	to	12.0	Reduction ≥ 0.9
10.2	to	11.1	Reduction ≥ 0.8
9.3	to	10.1	Reduction ≥ 0.7

TABLE 16-16 Continued	
No-Action Condition Ped Space (sf/ped)	With-Action Condition Ped Space Reduction to be Considered Significant Impact (sf/ped)
8.3 to 9.2	Reduction ≥ 0.6
7.4 to 8.2	Reduction ≥ 0.5
6.4 to 7.3	Reduction ≥ 0.4
< 6.4	Reduction ≥ 0.3

- If the decrease in average pedestrian space is less than the value calculated from the formula in Equation 16-9 or Table 16-16, the impact should not be considered significant.
- If the average pedestrian space under the No-Action condition is less than 6.4 ft^2/p, then a decrease in pedestrian space greater than or equal to 0.3 ft^2/p should be considered significant.

For example, if a sidewalk under the No-Action condition with platoon flow in a non-CBD area has an average pedestrian space of 35.7 ft^2/p, then a reduction in pedestrian space greater than or equal to 3.4 ft^2/p (Y = 35.7/9.5 - .321 = 3.4) should be considered a significant impact.

442.4. Sidewalks with Platoon Flow in CBD Areas

The procedure for sidewalks exhibiting platoon flow in CBD areas is similar to that for non-CBD areas, except that With-Action condition average pedestrian space that is considered to be acceptable ranges from LOS A to mid-LOS D (as opposed to LOS A through LOS C in non-CBD areas). If the average pedestrian space under the With-Action condition deteriorates to worse than mid-LOS D, then the determination of whether the impact is considered significant is based on the same sliding scale as for non-CBD areas. Determination of significant impacts for sidewalks with platoon flow in a CBD is summarized as follows:

- If the average pedestrian space under the No-Action condition is greater than 39.2 ft^2/p, then a decrease in pedestrian space under the With-Action condition to less than 31.5 ft^2/p (worse than mid-LOS D) should be considered a significant impact. If the average pedestrian space under the With-Action condition is greater than or equal to 31.5 ft^2/p (mid-LOS D or better), the impact should not be considered significant.
- If the average pedestrian space under the No-Action condition is between 6.4 and 39.2 ft^2/p, a decrease in average pedestrian space under the With-Action condition should be considered significant according to the formula in Equation 16-9 or using Table 16-17.

TABLE 16-17
SIGNIFICANT IMPACT GUIDANCE FOR SIDEWALKS PLATOONED FLOW CBD LOCATION

No-Action Condition Ped Flow (ped/min/ft)	With-Action Condition Ped Flow Increment to be Considered a Significant Impact (ped/min/ft)
> 39.2	With-Action Condition < 31.5
38.7 to 39.2	Reduction ≥ 3.8
37.8 to 38.6	Reduction ≥ 3.7
36.8 to 37.7	Reduction ≥ 3.6
35.9 to 36.7	Reduction ≥ 3.5
34.9 to 35.8	Reduction ≥ 3.4
34.0 to 34.8	Reduction ≥ 3.3
33.0 to 33.9	Reduction ≥ 3.2
32.1 to 32.9	Reduction ≥ 3.1
31.1 to 32.0	Reduction ≥ 3.0
30.2 to 31.0	Reduction ≥ 2.9
29.2 to 30.1	Reduction ≥ 2.8
28.3 to 29.1	Reduction ≥ 2.7
27.3 to 28.2	Reduction ≥ 2.6
26.4 to 27.2	Reduction ≥ 2.5
25.4 to 26.3	Reduction ≥ 2.4
24.5 to 25.3	Reduction ≥ 2.3
23.5 to 24.4	Reduction ≥ 2.2
22.6 to 23.4	Reduction ≥ 2.1
21.6 to 22.5	Reduction ≥ 2.0
20.7 to 21.5	Reduction ≥ 1.9
19.7 to 20.6	Reduction ≥ 1.8
18.8 to 19.6	Reduction ≥ 1.7
17.8 to 18.7	Reduction ≥ 1.6
16.9 to 17.7	Reduction ≥ 1.5
15.9 to 16.8	Reduction ≥ 1.4
15.0 to 15.8	Reduction ≥ 1.3
14.0 to 14.9	Reduction ≥ 1.2
13.1 to 13.9	Reduction ≥ 1.1
12.1 to 13.0	Reduction ≥ 1.0
11.2 to 12.0	Reduction ≥ 0.9
10.2 to 11.1	Reduction ≥ 0.8
9.3 to 10.1	Reduction ≥ 0.7
8.3 to 9.2	Reduction ≥ 0.6
7.4 to 8.2	Reduction ≥ 0.5
6.4 to 7.3	Reduction ≥ 0.4
< 6.4	Reduction ≥ 0.3

- If the decrease in average pedestrian space is less than the value calculated from the formula or Table 16-17, the impact should not be considered significant.
- If the average pedestrian space under the No-Action condition is less than 6.4 ft^2/p, then a decrease in pedestrian space greater than or equal to 0.3 ft^2/p should be considered significant.

For example, if a sidewalk under the No-Action condition with platoon flow in a CBD has an average pedestrian space of 14.8 ft^2/p , then a reduction in pedestrian space greater than or equal to 1.2 ft^2/p (Y = 14.8/9.5 - .321 = 1.2) should be considered a significant impact.

450. DETERMINATION OF SIGNIFICANT PARKING SHORTFALLS

Should the proposed project generate the need for more parking than it provides, this shortfall of spaces may be considered significant. The availability of off-street and on-street parking spaces within a convenient walking distance (about 0.25 mile) as well as the availability of alternative modes of transportation are considered in making this determination. For example, should the number of available parking spaces within this distance from the project site be ample to accommodate the project's parking shortfall following the guidance provided below, the shortfall would not be considered significant. If the available parking supply is not sufficient to accommodate the proposed project's shortfall, the determination whether a parking shortfall is considered significant should take into account the following:

- For proposed projects located in Parking Zones 1 and 2, as shown in Map 16-2 (CEQR Parking Zones) the inability of the proposed project or the surrounding area to accommodate a project's future parking demands is considered a parking shortfall, but is generally not considered significant due to the magnitude of available alternative modes of transportation.

  NOTE: To view detailed maps of parking zones 1 and 2 for areas outside of Manhattan (which is all considered Parking Zones 1 and 2), see the maps for the South Bronx, Flushing, Jamaica, Long Island City/Astoria, Downtown Brooklyn, and Greenpoint/Williamsburg.

- For proposed projects located in residential or commercial areas not designated as Parking Zones 1 and 2, as shown in the Map 16-2 (CEQR Parking Zones), a project's parking shortfall that exceeds more than half the available on-street and off-street parking spaces within 0.25 mile of the site can be considered significant. The lead agency should consider additional factors to determine whether such shortfall is significant, including: the availability and extent of transit in the area; the proximity of the project to such transit; any features of the project that are considered trip reduction or travel demand management measures (TDM) as set forth in Subsection 515; and travel modes of customers of area commercial businesses; and patterns of automobile usage by area residents. The sufficiency of parking within 0.5 mile (rather than 0.25 mile) of the project site to accommodate the projected shortfall may also be considered.

500. DEVELOPING MITIGATION

The identification of significant impacts leads to the need to identify and evaluate suitable mitigation measures that mitigate the impact or return projected future conditions to an acceptable level that is not considered a significant impact, following the same impact criteria as defined by the guidelines in Section 400. Identification of feasible and practical mitigation/improvement measures should be guided by DOT's 2009 *Street Design Manual,* the detailed guide to the City's transportation policies.

In general, the mitigation analysis begins by identifying those measures that would be effective in mitigating the impact at the least cost and then proceeds to measures of increasingly higher cost only if the lower cost measures are deemed insufficient. In doing so, care should be exercised that the implementation of a given measure should not mitigate impacts in one area—either geographic or technical—while creating new significant impacts or aggravating already projected significant impacts elsewhere.

For example, for a significantly impacted stairwell from a subway station, stairwell widening could be an appropriate mitigation, but such widening should not narrow the adjacent street-level sidewalk to the point where it does not have sufficient capacity to process pedestrians passing along it and consequently creates a significant adverse pedestrian impact. Consideration should be given to widening the sidewalk or relocating the stairwell into a project building, if conditions permit. Creation of a bus "lay-by"—where the sidewalk width is reduced to provide an exclusive berth for buses to pick-up and drop-off passengers—should also not lengthen the pedestrian path, reduce the sidewalk width or reduce the corner reservoir area by an amount that creates significant impacts. One commonly recommended traffic mitigation measure is the re-timing of existing traffic signals to provide increased green time—and thus increased capacity—to the intersection approach that is significantly impacted. Not only should the traffic analysis make sure that other intersection approaches that would lose green time could afford to do so, and that existing signal progression along an important arterial not be unduly impacted, but also that pedestrians crossing the street still have sufficient green time at the cross-walks that would lose pedestrian walk time. The same concern is apparent with respect to parking, where the prohibition of curbside parking along an intersection approach that requires an additional travel lane could reduce the supply of parking spaces by an amount large enough to trigger a parking shortfall. Also, traffic mitigation analyses need to consider potential implications on air quality, noise, and, possibly, neighborhood character analyses.

Consequently, it is important that the each transportation element and facility be considered as a comprehensive system, wherein changes in one could impact activity patterns and/or levels of service in another. It is possible that recommendation of a major new transit service—such as institution of ferry service at a new waterfront site—that is generally viewed as a major overall access benefit, may also have secondary impacts that need to be evaluated as to their significance. For example, the lead agency should examine whether pedestrian flows to and from the ferry landing would cause impacts, whether intersection capacity would be affected if buses are rerouted to connect with the ferry, or whether there would be sufficient parking for ferry users. This does not mean that these broader, more effective or desirable mitigation measures should not be considered, but rather that a comprehensive look and evaluation is needed.

LOS analysis should be conducted and documented for those transit and pedestrian elements that undergo mitigation and/or for those elements that may be impacted as a result of mitigation measures of another element as described above. This analysis is referred to as the "Action-with-Mitigation" condition and is then compared to the No-Action condition. The impact is considered fully mitigated if there would be no significant impact based on the same impact criteria as described above. A significant adverse impact that has no feasible mitigation or cannot be fully mitigated must be identified as an unmitigated impact.

As an example, suppose a sidewalk with platooned flow in a CBD has an average pedestrian space of 14.8 ft^2/p under the No-Action condition, and under the With-Action condition the average space is decreased to 12.4 ft^2/p. This is considered a significant impact because the reduction in average space is 2.4 ft^2/p, and from Equation 16-9 or Table 16-17, a reduction in pedestrian space greater than or equal to 1.2 ft^2/p ($Y = 14.8/9.5 - .321 = 1.2$) should be considered a significant impact. To be considered fully mitigated, the reduction in average pedestrian space under the Action-with-Mitigation condition relative to the No-Action condition would have to be less than 1.2 ft^2/p. This means the average pedestrian space under the Action-with-Mitigation condition would have to be brought up to greater than 13.6 ft^2/p.

Once the mitigation analyses have been completed, it is necessary to review the required mitigation measures with DOT for its approval as the agency responsible for their implementation. Similarly, for transit mitigation, NYCT-Operations Planning should be contacted. For EISs, it is recommended to contact the implementing agency prior to the draft EIS stage because the approval of mitigation must be finalized before the issuance of the Final EIS. Below are the specific mitigation measures that could be implemented.

510. TRAFFIC MITIGATION

When considering traffic mitigation, the impact is considered fully mitigated when the resulting degradation in the average control delay per vehicle under the Action-with-Mitigation condition compared to the No-Action condition is no longer deemed significant following the impact criteria as described in Section 420. For example, if a No-Action condition lane group has an average control delay of 57.0 seconds/vehicle (LOS E) and the average delay in the With-Action condition increases to 65.0 seconds (LOS E), it is considered a significant impact as the increment in delay (8.0 seconds) is greater than the impact threshold of 4.0 or more seconds identified for LOS E. For this impact to be mitigated, the average delay would have to be brought down to less than 61.0 seconds so that the delay increment between the With-Action and No-Action conditions is less than 4.0 seconds. For future No-Action LOS A, B, or C, mitigation to mid-LOS D is required. For example, if a No-Action condition lane group has an average control delay of 34.0 seconds/vehicle (LOS C) and the average delay in the With-Action condition increases to 50.0 seconds (LOS D), it is considered a significant impact. For this impact to be mitigated, the average delay would have to be brought down to 45.0 seconds (mid-LOS D).

The range of traffic mitigation measures can be viewed as encompassing five categories: a) low-cost, readily implementable measures; b) moderate-cost, fairly readily implementable measures; c) higher capital cost measures; d) enforcement measures; and e) trip reduction or travel demand management (TDM) measures. Some discussion of the benefits and issues associated with each of these types of measures is presented below. If the lead agency, in consultation with DOT, determines such measures are impracticable for a particular project or in a particular location, other mitigation measures may then be considered. In addition, when geometric changes to City streets are proposed to mitigate significant transportation impacts, the proposed changes must conform to the guidance in DOT's 2009 *Street Design Manual*, which sets the City's policy for designing existing and new streets. Mitigation measures often require implementation by, or approval from, agencies (such as DOT, MTA and the New York City Transit Authority, FDNY, NYPD, etc.). Since many of the City's highways are under NYSDOT jurisdiction, coordination and approval from that agency, in addition to NYCDOT, is required. Such approval should be agreed to in writing by the implementing agency before such mitigation is included in the FEIS. Table 16-18 below describes typical traffic mitigation measures, the approvals required before including such mitigation in the FEIS, and the policies that guide the design of certain measures:

Table 16-18		
Type of measure	**Approval required**	**Must follow**
511. Low-cost, readily implementable measures		
Signal phasing, timing modifications, and multiway stop control	DOT Signals Division	*Manual on Uniform Traffic Control Devices for Multiway stop control warrant*
Parking regulation modifications, two-way stop control	DOT Borough Engineering	
Lane restriping and pavement marking changes	DOT Highway Design and Construction	*Street Design Manual*
Street direction and other signage-oriented changes	DOT Traffic Planning Division, Highway Design and Construction, Borough Engineering	
512. Moderate-cost, fairly readily implementable measures		
Intersection channelization improvements	DOT Highway Design and Construction	*Street Design Manual*
Traffic signal installation, left-turn signal	DOT Signals Division	Intersection Control Analysis
513. Higher-Cost Mitigation Measures		
Geometric improvements	DOT Highway Design and Construction, FDNY	*Street Design Manual*
Street widening	DOT Highway Design and Construction	*Street Design Manual*
Construction of new streets	DOT Highway Design and Construction	*Street Design Manual*
Construction of new highway ramps	DOT Highway Design and Construction, NYS DOT (for State-owned highways)	*Street Design Manual*
514. Enforcement Measures		
Traffic enforcement agents	New York City Police Department (NYPD)	
515. Trip Reduction or Travel Demand Management Measures		
Carpooling and vanpooling		
Staggered work hours and flextime programs		
Improved bus service	MTA-New York City Transit, DOT Highway Design and Construction (if geometric changes are proposed)	*Street Design Manual* (if geometric changes are proposed)
New transit services	MTA-New York City Transit	
Telecommuting		
Bicycle facilities	DOT Office of Bicycle and Pedestrian Programs	

Mitigation analysis would typically start with the identification of low-cost, readily implementable measures and proceed to the higher cost measures. It is recommended that TDM or similar measures that would promote efficient means of travel, reduce auto dependency and encourage transit, pedestrian and bicycle modes be considered to the extent practicable concurrently with the low-cost measures.

511. Low-Cost, Readily Implementable Measures

These mitigation measures typically include signal phasing and timing modifications, parking regulation modifications, lane restriping and pavement marking changes, turn prohibitions, street direction changes, and other traffic-signage-oriented changes. DOT approval is required for the acceptance and implementation of these measures.

SIGNAL PHASING AND TIMING MODIFICATIONS

The goal of signal timing modifications, which is often the first traffic mitigation measure considered, is to shift green time from intersection approaches that have clearly sufficient capacity to those that need additional green time to accommodate their traffic demand. Signal phasing modifications are considered when a specific movement at an intersection requires exclusive time for its movement to be completed. For example, northbound left turns at an intersection may often proceed together with all other north- and southbound traffic. Provision of a separate signal phase for left turns would generally allow them to move conflict-free and, thus, at a better level of service. Care should always be exercised that provision of such an exclusive phase would not significantly impact other traffic movements at the intersection. Should a left-turn phase be proposed, a left-turn warrant analysis is required for DOT review and approval. See the Appendix for the left-turn warrant analysis.

Signal phasing modifications need not only be the provision of a separate phase for a particular left turn volume. It could also be an advance phase for an entire approach to an intersection or a combination of different movements that do not conflict. Phasing and timing modifications may also be helpful in mitigating pedestrian crossing problems at particular intersections. Application to DOT must be made for signal phasing and/or timing modifications. In addition, should the proposed signal timing changes exceed four seconds of green time reallocation, a signal progression analysis is likely required. The lead agency should consult DOT to determine whether such analysis is needed as well as study corridor(s) and the analysis tool (e.g., Synchro/SimTraffic) to be used.

Evaluation of signal timing measures also considers their implication on pedestrian crossings and waiting areas as well as on the overall signal progression along a corridor or through a CBD area. It should be emphasized that time needed for pedestrians to safely cross the street must be maintained if a reallocation of green time is proposed. An average walking speed of 3.5 feet/second (fps) should be used if the elderly and school children proportion is less than 20 percent of the population, otherwise a walking speed of 3.0 fps should be used (see DOT official signal timing plan for average walking speed). If the study intersection has a school crosswalk or is located in a Senior Pedestrian Focus Area, a walking speed of 3.0 fps should be used. The minimum time required for pedestrians should be estimated using the following guidelines:

Equation 16-10

$$\text{Minimum Pedestrian Time} = \text{WI} + \text{PCT}$$

where,

WI (Walk Interval) = minimum of 7.0 seconds,

PCT (Pedestrian Clearance Time) = PCI + BI = crosswalk length/average walking speed,

PCI (Pedestrian Change Interval aka Flashing Don't Walk) should not be less than 6.0 seconds, and

BI (Buffer Interval aka Don't Walk) is the same as the amber plus all-red time and should not be less than 5.0 seconds.

PARKING REGULATION MODIFICATIONS

The goal of this measure is to restrict, remove, or relocate parking (including bus stops) by modifying curbside regulations along streets where additional travel lanes are needed for traffic capacity reasons, or to reduce conflicts between cars involved in parking maneuvers and through traffic. In adding capacity by removing on-street parking, the analysis also evaluates impacts on bus service and whether there is sufficient parking space within the study area to accommodate those parked cars that have been displaced. Please note that when a parking modification is proposed as mitigation, the scaled schematic should identify a curbside travel lane no less than 11-feet wide and include a turning radii using the appropriate design vehicle turn template for DOT's review and approval. It should be noted that relocation of bus stops would require NYCT/MTABC review and approval of such mitigation measures.

LANE RESTRIPING AND PAVEMENT MARKING CHANGES

The objective of these measures is to make more efficient use of a street's width by providing an exclusive turning lane, if warranted, restriping the lane markings to give greater width to those movements with substandard lane widths, *etc.* For example, an intersection approach characterized by a very heavy right-turn movement and moderate through and left-turn movements may currently provide a 10-foot wide right-turn lane and two 11-foot wide lanes for the other movements. Restriping the approach to provide a 11-foot wide right-turn lane and two 10.5-foot wide lanes for the other movements may provide right-turning vehicles with the capacity they need. It should be emphasized that any proposed lane widths modifications should follow the DOT guidelines (e.g., a travel lane could be 10 feet wide, but it should not be greater than 11 feet unless it is a bus lane in which case it could be 12 feet wide, a curb lane and a travel lane next to the centerline should be 11 feet wide, etc.. One other objective would be to improve pedestrian operation by widening crosswalks at impacted locations in conformance with the guidance in DOT's 2009 *Street Design Manual*. Please note that whenever a turning bay and/or shift in centerline is proposed, a scaled schematic covering the transition area should be submitted for DOT review and approval.

STREET DIRECTION AND OTHER SIGNAGE-ORIENTED CHANGES

At times, it may be advisable, or necessary, to convert a two-way street to one-way operation or vice versa, or convert a pair of two-way streets into a pair of one-way streets. The one-way operation tends to provide greater traffic capacity since it removes conflicts typically inherent in two-way traffic operation, particularly from left turns vs. oncoming traffic movements at high volume intersections. It should be noted that the one-way operation could also result in undesirable safety impacts due to higher vehicle speeds. Any street direction changes require re-analysis of all potentially affected intersections in the study area (and outside the area, if appropriate) for traffic and safety impacts, pursuant to the methodologies described in earlier in this chapter.

Other traffic mitigation measures include the prohibition of left- or right-turns, or signage that requires all vehicles in a given lane to turn left or right or to only proceed through the intersection. Since it generally takes more time and capacity for vehicles to make turns than to proceed straight through an intersection, turn prohibitions often offer substantial capacity benefits. Again, the traffic analysis would need to assess carefully the diversions of traffic and their impacts to other streets and intersections.

Any parking regulation modification, lane striping, pavement marking, street direction, and other signage-related changes require the preparation of scaled schematic drawings depicting existing and proposed conditions for DOT's review and approval. In addition, the text and schematic drawing should include the number of lost parking spaces.

512. Moderate-Cost, Fairly Readily Implementable Measures

These measures typically involve a level of capital costs somewhat higher than those defined above, yet which are generally considered moderate overall. These measures include intersection channelization improvements, traffic signal installation, and others.

- Intersection channelization improvements. Channelization improvements are intended to provide traffic movements with greater clarity or ease of movement. They may include minor widening of the approach to an intersection to provide an increased curb radius for right-turning vehicles, a median separating the two directions of traffic flow on a two-way street, or islands for pedestrian refuge or to delineate space for turn movements through an intersection. In addition, any proposed channelization would require the preparation of scaled schematic drawing depicting existing and proposed changes for DOT's review and approval.
- Traffic signal installation. At times, it may be necessary to propose the installation of a traffic signal where an unsignalized intersection does not possess sufficient capacity to process cross-street traffic volumes or where it would mitigate vehicular or pedestrian safety impacts. DOT requires the preparation of traffic signal warrant analyses if a new signal is proposed at the draft EAS or EIS stage (see Appendix for "Intersection Control Analysis"). The analysis should include projected future volumes, the appropriate modal split, and future volume flow maps. There are City, State, and Federal guidelines on the conduct of signal warrant analyses. The DOT guidelines should be utilized in conducting a warrant analysis to determine the likelihood that a signal is warranted. DOT would approve the new signal once the warrants have been satisfied. Please note that the applicant must identify the funding for the design and installation of a new traffic signal and a private applicant must provide a commitment letter to DOT.

513. Higher-Cost Mitigation Measures

In general, this category of mitigation measures includes street widening, construction of new streets, construction of new ramps to or from an existing highway, implementation of a sophisticated computerized traffic control system, and other measures that are typically physically oriented and not readily implementable. These measures would require review and approval by DOT.

GEOMETRIC IMPROVEMENTS

A variety of methods are available to change the physical configuration of the street so as to improve safety and rationalize traffic movements to improve flow. Methods such as curb extensions, medians, traffic calming treatments, and other elements should follow the guidelines provided in the *Street Design Manual*.

STREET WIDENING

When implementation of capacity improvements such as signal phasing and timing changes, curb parking prohibitions, bus stop relocations, and others are not sufficient to provide the required capacity within the existing street width, it may be possible to widen the street, to provide wider travel lanes or additional travel lanes. However, wider streets may result in detrimental effects related to safety and the quality of the walking environment and should be avoided in existing built-up areas. The effect on pedestrian, bicycle, and surface transit movements in the area would be jointly analyzed with this mitigation measure.

CONSTRUCTION OF NEW STREETS

At times, it may be advantageous to either reopen a closed or demapped street, or construct a new street leading to a development site. This access improvement could thus potentially provide a new access route to the site and alleviate projected congestion on existing routes. It is a relatively uncommon measure that is occasionally available to large projects in settings where existing street access is rather limited.

CONSTRUCTION OF NEW HIGHWAY RAMPS

The objective of this measure is to provide an additional means of access from the primary regional route(s) leading to a project site. When access to the site is via an existing highway ramp that leads to an already congested local street en route to the site, construction of a new ramp could relocate traffic to another street better able to accommodate it. Since many of the City's highways are under NYSDOT jurisdiction, coordination and approval from that agency, in addition to DOT, is required.

514. Enforcement Measures

These measures generally involve costs that accrue to the City over a period of time, rather than as one-time construction costs, and include the deployment of traffic enforcement agents (TEAs), or certain types of physical improvements that are variable by time of day.

TRAFFIC ENFORCEMENT AGENTS

TEAs are often deployed by the New York City Police Department (NYPD) at critical locations where it is important to minimize spillback through an intersection, and thus avoid potential gridlock. At times, by virtue of their being stationed at busy intersections, the TEAs also manually override the traffic signal timing patterns to improve traffic operations for intersection approaches experiencing congestion. The recommendation of deploying TEAs at a significant impact location may be appropriate where: a) an intersection is unsignalized and a TEA could ensure that minor street traffic gets the enough gaps needed to pass into or through the intersection; or b) an intersection requires several different timings to function optimally at different times of the day (*e.g.*, during peak exit periods from a sporting event).

In addition, TEAs may be deployed by NYPD to ensure that on-street parking regulations are obeyed and that the required number of moving travel lanes—and thus capacity—is maintained during critical time periods. Within the traffic analyses, it may be insufficient to assume that the mere replacement of an existing curb parking regulation with a more restrictive one would automatically ensure that the curb lane is fully free of parked cars at times when its capacity is needed for moving traffic. At critical locations, the deployment of TEAs would assist in ensuring that the lane's capacity would be available.

It should be noted that the use of enforcement agents as mitigation is not a preferred measure due to their recurring annual cost. Historically, enforcement agents have been considered only for City-sponsored projects as a matter of City policy. However, for construction-related impacts that are temporary in nature, enforcement agents may be an appropriate measure. In addition, if a private applicant recommends the use of TEAs, the lead agency/applicant must secure approval from NYPD.

515. Trip Reduction or Travel Demand Management (TDM) Measures

Trip reduction or TDM measures seek to reduce either the volume of vehicular trips generated by a project, divert them from single-occupancy vehicles to higher-occupancy vehicles, or divert them to hours that are not as critical as the hours for which significant impacts were identified. These measures include carpooling or vanpooling, staggered work hours or flextime programs, new transit services or transit subsidies, telecommuting, and a range of other measures.

CARPOOLING AND VANPOOLING

The objective here is to promote the formation of carpools or vanpools that would draw people out of their single-occupant vehicles or otherwise increase the average occupancies of all vehicle traffic generated by the site.

STAGGERED WORK HOURS AND FLEXTIME PROGRAMS

The objective of these measures is to stagger the times at which people drive to and leave their workplace so as to reduce the volume of vehicular traffic on the road during the affected area's peak commuting hours. With staggered work hours, employees work somewhat different shifts; under flextime, employees are free to arrive at work at any time within a given range (say, 7:30 a.m. to 9:30 a.m.) and leave within a given range (say, 4:00 p.m. to 6:00 p.m.).

IMPROVED BUS SERVICE

This measure may include the provision or expansion of dedicated bus lanes to improve the operation of major bus routes in the study area by introducing the elements of Select Bus Service (*i.e.*, high-speed boarding, limited-stop service, off-board fare collection, *etc.*). Because most bus service is provided by MTA and its member agencies, coordination with and approval from NYCT/MTABC is required.

NEW TRANSIT SERVICES

This measure may include provision of a company shuttle bus linking the workplace with the nearest mass transit stop, initiation of shuttle bus or jitney service for midday trips to local retail areas, or extension or enhancement of existing bus routes to the site, with the objective of promoting transit usage to the maximum extent possible. Because most bus service is provided by MTA and its member agencies, coordination and prior written approval from NYCT/MTABC is required.

TELECOMMUTING

With telecommuting, employees may work a specified number of days per week or per month either at a telecommuting center where they may complete their assignments on a centralized set of computers or work stations, or at employer-provided installations in their home. The objective is to reduce the volume of trips being made.

BICYCLE FACILITIES

The objective of this measure is to promote the use of bicycles as a mode of travel to work by providing bicycle facilities such as secure indoor bicycle storage areas, locker rooms, and showers, when not already required by zoning. Studies have shown that up to 3.9 percent of those who would normally use an automobile or taxi to travel to work would use a bicycle if bicycle facilities were available. If it is anticipated that a portion of projected users of the site would use bicycles instead of automobiles, then the number of projected automobile person trips could be reduced by up to 3.9 percent for sites such as offices and industrial workplaces.

For example, if a proposed project's person trips have 12 percent auto share based on a previously researched or approved modal split, and the proposed development would provide bicycle facilities, the person auto share could be reduced to approximately 11.5 percent (12.0% * (100% - 3.9%) = 11.5%).

MANAGED DELIVERIES

This measure would commit the project owner/operator/tenant to reducing or eliminating deliveries during peak periods. It would require scheduling deliveries and ensuring that staff is available on the receiving end during off-peak hours (*i.e.,* evening and overnight).

Although the measures described above may be implemented individually, their implementation may also be sought as a collective menu of trip reduction options—referred to as TDM.

It should be noted, however, that embracing TDM as mitigation means that the project developer, sponsor, and/or tenant needs to make a binding commitment to measures that may to some degree affect the way their business is conducted (*e.g.*, altering work schedules, commitment to vanpools). For any proposed TDM measures not described in the above list, the lead agency should consult with DOT as early as possible regarding use of this strategy as mitigation. Additionally, any commitments to mitigation and TDM measures should be memorialized in the Statement of Findings.

516. Traffic Monitoring Plan

A Traffic Monitoring Plan (TMP) is recommended for medium- to large-scale developments that have identified unmitigatible impacts as well as projects that propose capital improvements such as widening of roadway, curb extension (neck-down/bulb-out), raised median, signal installation, *etc.* The TMP would help DOT verify the need and effectiveness of the proposed mitigation measures identified in the EIS or similar measures through use of traffic data collection and analyses when the proposed project is built and occupied. The TMP should include both locations for which mitigations are identified and locations that are determined to be unmitigatible in the EIS. The monitoring commitments should be acknowledged in the FEIS and in the DOT sign-off letter. A detailed TMP scope of work should be submitted for DOT review and approval prior to commencing any data collection and analysis. The lead agency, in consultation with DOT, should determine whether a TMP is required and, if so, what technical areas (*i.e.*, traffic, parking, pedestrian, *etc.*) and locations should be included in the TMP.

520. RAIL TRANSIT MITIGATION

There is a range of rail transit measures available to mitigate certain types of significant impacts that may be projected for a proposed project. These measures are primarily related to the station elements that are analyzed and could be affected by a proposed project. Significant line-haul impacts, on the other hand, may be extremely difficult to mitigate.

521. Stairways

Stairway widening is the most common form of mitigation for projected significant impacts, provided that NYCT deems it practicable, *i.e.*, that it is worthwhile to disrupt service on an existing stairway to widen it and that a given platform affected by such mitigation is wide enough to accommodate the stairway widening.

It may also be possible to mitigate stairway impacts by adding vertical capacity (*i.e.*, adding an elevator, escalator or additional stairways) in the vicinity of the impacted stairway, rather than widening the stairway itself. As stated earlier, NYCT approval is needed. Stairway widening or new stairways must conform to the NYCT Station Planning and Design Guidelines.

Where the calculated WIT triggers a significant impact and potential mitigation, actual stair widening is planned using NYCT guidance. Typically, stair widths are considered in terms of 30" pedestrian lanes. Thus, a stair that is 100 inches wide and has a WIT of 6 inches should be widened to 120 inches to create four 30-inch pedestrian lanes. New stairs are also ideally built in 30-inch increments.

522. Station Passageways

The consideration of appropriate mitigation measures for station passageways and corridors is very similar to that for the station stairways. Here, too, widening of a congested passageway or the construction of a new passageway to divert some passenger activity away from the existing one may be considered. Both of these types of measures are extremely costly. They are likely to be considered only for severe impacts. Where physical constraints permit, passageways should be constructed or widened to create passageways based on 30" pedestrian lanes.

There is a close physical and analytical relationship between stairways connecting station platforms with passageways over or under the platforms. For cases where both stairways and passageways would be characterized by significant impacts, the provision of widened stairways might increase the pedestrian flow rate into the passageway, thereby exacerbating congestion there. Mitigation analyses for all these elements need to be conducted simultaneously.

523. Turnstiles, High-Wheel Exits, Escalators, and Elevators

The most logical and readily available measure to mitigate projected impacts on turnstile or high-wheel exits is to add more turnstiles or high-wheel exits, provided there is sufficient space within the station to accommodate them. A measure to mitigate projected escalator or elevator shortages is the addition of appropriate vertical processor capacity, preferably an escalator or elevator. As mentioned above, transit station mitigation should consider the entire station as a system and make sure that improvements in one area do not affect operations in another.

524. Station Agent Booths and Control Areas

Mitigation of excessive queuing and/or delays at booths and MetroCard vending machines may entail the provision of additional machines, where space permits. As mentioned above for turnstiles, the analysis of mitigation measures may need to consider potential effects on other elements of the station as well.

525. Platforms

Mitigation of platform impacts is difficult since the lengths and widths of existing platforms are generally fixed. There are relatively minor measures that may be considered, including the relocation of trash receptacles and other platform furniture that reduce platform width at critical locations. It is also possible that the opening of new stairways could alleviate problem conditions at the congested locations. NYCT may also consider widening side platforms where congestion is severe.

526. Line-Haul Capacity

Generally, the generation of significant line-haul impacts can only be mitigated by operating additional trains over a given subway line, which may not be operationally or fiscally practicable. It is generally accepted that the determination of significant line-haul capacity impacts is made for disclosure purposes rather than to provide mitigation; these impacts usually remain unmitigated.

530. BUS TRANSIT MITIGATION

Significant bus impacts generally may be mitigated by increasing the frequency of service on existing bus lines. This must be approved and implemented by the operator and is subject to operational and fiscal constraints. In addition, the mitigation measures below should be considered if impacts are identified. As some of these measures are more applicable outside of the urban core, it is important to consult with NYCT/MTABC to determine the appropriate mitigation measure. For developments that have an existing bus service, the following should be considered:

If the main building entrance is near the street, the following options are available for consideration:

- Inclusion of a pedestrian entrance on the side of the building facing the bus route;
- Inclusion of a curb-side bus stop that would allow buses to pull out of traffic and discharge and pick-up passengers;
- Inclusion of space for a bus-shelter for passengers and/or
- Inclusion of real time bus arrival information for passengers.

If the main building entrance is not near the street, two options are available for consideration:

- Routing the bus through the project site, with:
  - Inclusion of a bus turnaround area;
  - Inclusion of a bus stop; and/or
  - Inclusion of a bus shelter.
- Stopping the bus on the street adjacent to the Project Site with:
  - The same mitigation measures listed above; and optionally,

- The inclusion of a lit, sheltered pedestrian walkway between the building's entrance and the bus stop.

If the development is not served by an existing bus route, MTA should be consulted about possibly extending a bus route to serve the site with the above-mentioned mitigation measures being considered along with the following modifications:

- Space provided at a bus stop adequate for bus operational needs; or
- Access for bus drivers to the rest-rooms at terminals.

If a significant number of bus passengers are expected to be generated, a covered, secure location for fare-vending machines could be considered for inclusion in the project's site-plan.

The developer should also consult with NYCT about locating a designated space for Access-A-Ride vehicles adjacent to the accessible entrances of the development to the extent practicable.

This listing of possible mitigation measures is not meant to be exhaustive, and other appropriate mitigation measures with respect to transit impacts should be considered. MTA should be consulted. As some of these mitigation measures have the potential to impact available sidewalk space, close coordination with the pedestrian analysis is integral.

540. PEDESTRIAN MITIGATION

Identification of feasible and practical mitigation measures should be consistent, to the extent practicable, with DOT's 2009 *Street Design Manual*, the detailed guide to the City's transportation policies. Available measures to mitigate significant pedestrian impacts may include:

- Providing additional green signal time or new signal phases, such as a leading pedestrian interval, for pedestrians crossing at signalized intersections. Signal timing changes should still leave vehicular traffic with sufficient green time to avoid a significant adverse traffic impact.
- Widening intersection crosswalks to provide additional pedestrian crossing capacity. Care must be taken so that turning vehicles have time to react to pedestrians in all areas of the crosswalk. Crosswalk widening typically should not extend past the building line of the adjacent sidewalk to maintain visibility. For example, a crosswalk width should be determined from the property line to the face of the curb minus two feet.
- Relocating street furniture, newsstands, or other obstacles that reduce pedestrian capacity at sidewalks or corner reservoirs.
- Adding new traffic signals or other intersection control measures for uncontrolled pedestrian crossings. This measure may require a traffic level of service analysis.
- Providing curb extensions, neck-downs or lane reductions to reduce pedestrian crossing distance.
- Widening the sidewalk or other pedestrian path.
- Providing a pedestrian refuge island where analysis indicates that pedestrians would not have enough time to cross the street.
- Creating mid-block crossings and cut-throughs (*i.e.*, arcades, plazas, *etc.*) on long blocks.
- Providing direct connections from adjacent transit stations to major proposed projects that reduce the need for transit patrons to traverse overtaxed pedestrian street elements.
- Constructing a pedestrian bridge to separate pedestrian and vehicular flows.

- Simplifying intersection operations by aligning/normalizing the intersecting streets close to a ninety degree angle, where practicable. It may include modifying/closing the existing channelization (slip roadways) and/or little used street approaches.
- Creating a part-time or full-time pedestrian mall by closing streets to vehicular traffic. Any street closure for more than 180 days must follow the requirements of Local Law 24 of 2005.
- Creating high visibility crosswalks to alert motorists of the pedestrian crossing and improve pedestrian safety

Again, the relationship between traffic, transit, and pedestrian needs must be fully considered in developing and evaluating alternative mitigation measures.

550. PARKING MITIGATION

Measures that could generally be considered to alleviate projected parking shortfalls or mitigate significant parking impacts include the following:

- Providing additional parking spaces as part of the proposed project, including such provision off-site but within a convenient walking distance from the site.
- Modifying existing on-street parking regulations in an appropriate manner—for example, where a less restrictive parking regulation would not affect the capacity of the street to process adjacent vehicular traffic demands.
- Implementing paid commercial parking or Parksmart (a DOT initiative to increase metered parking rates during peak periods). DOT has found that these measures improve the availability of parking by encouraging drivers to park no longer than necessary in locations where high turnover is desired.
- Implementing new transit services (*e.g.*, bus routes or bus route extensions) or trip reduction initiatives that would change the projected modal split or reduce the number of vehicles traveling to (and parking at) the project site. The addition of bicycle facilities such as indoor secure storage areas, locker rooms and showers would encourage the use of bicycles to travel to the workplace.

In general, where a parking shortfall or significant impact has been identified, a proposed project must strive to provide the amount of parking it needs as part of the proposed project rather than relying on available on- and off-site parking supplies.

600. DEVELOPING ALTERNATIVES

610. DEVELOPMENT OF ALTERNATIVES

The alternatives analysis section of the EIS is intended to depict and analyze alternatives to the proposed project that are likely to eliminate or reduce significant impacts expected to be generated by the proposed project. Since traffic, transit, pedestrian and parking impacts are often among those determined to be significant, there are attributes of a proposed project that, if changed, may result in a reduction of expected impacts. Guidance regarding the development of such alternatives follows.

611. Reductions in Size

The first and most logical alternative is a scaling down of the size of the proposed project, *e.g.*, reducing the amount of proposed square footage to reduce its overall trip generation. This approach would generally lead to a proportional reduction in the amount of trips generated, but not necessarily in the magnitude of the impacts that would occur. For example, if a significant impact is projected under the proposed project that requires a widening of the crosswalk, this proposed mitigation measure may not be warranted under the alternative that would reduce the size of the proposed development. Similarly, an unmitigated impact in the proposed project may be mitigated under the lesser density alternative.

612. Different Uses

A second type of alternative involves replacement of a high trip-generating land use component of the proposed project with a land use that generates fewer trips. Care would be needed to make sure that the times in which trips are reduced are those times at which significant impacts are expected. For example, potential replacement of office space with retail space may reduce the volume of trips generated by auto in the AM when retail activity is light, but not at midday when retail uses are very active. Should the preceding With-Action analyses determine that there would be a significant traffic or pedestrian impact in only the midday peak hour, this replacement alternative would not be beneficial.

Consideration of this category of alternatives must also recognize that different types of land uses may tend to have different modal splits as well, and that a land use that has a lower overall trip generation rate may not necessarily generate fewer trips by all modes. For example, framing an alternative that responds to a significant traffic impact under the proposed project with a less-intensive overall trip generator that has a higher auto-plus-taxi use percentage may not result in a removal of the impact. The alternatives analysis would consider the type of impact found significant and consider alternatives that reduce that impact during the specific significant impact hour.

613. Changes in Access and Circulation

Another type of alternative revolves around physical site changes that do not necessarily reduce the overall volume of trips generated or the number of trips generated during a specific impact hour, but that affect access and circulation patterns and effectively move traffic to locations or routes that would not be significantly impacted. There are several examples of this.

Relocation of a project's proposed parking facility or the facility's entrance may positively affect traffic patterns and divert traffic away from significant impact locations. Provision of parking—or additional parking—may reduce the undesirable circulation of vehicles on-street in search of hard-to-find parking spaces. This is especially true for proposed projects that do not include parking as part of their project, or proposed projects where the amount of parking is appreciably short of the demand. For major projects that include large parking garages (*e.g.*, 500 or more parking spaces), it may be advantageous to split the parking into two sites rather than one, to disperse traffic and pedestrians to different routes rather than having all of it concentrated at a single entrance and exit location and a single primary access route.

Relocation of a project's main entrance may also alter access patterns for both vehicular, transit, and pedestrian access. A proposed project that generates a substantial volume of vehicular drop-offs, such as a hotel in Midtown Manhattan, could potentially shift its main entrance to a location on the site that reduces significant traffic impacts at critical locations or that minimizes conflicts between vehicles engaged in picking up or dropping off passengers and other vehicles driving past the site. Such "front door" relocation may also make pedestrian access from nearby subway stations more convenient, alter pedestrian patterns or increase utilization of a particular subway station or station entrance over another one, and reduce congestion at key crosswalks or corner reservoir spaces in the affected area.

Relocation of a project's loading docks, or their reconfiguration, could also have similar benefits in moving the goods delivery function to a location that does not significantly impact traffic or pedestrian flow. Reconfiguration of a proposed loading dock from a back-in operation to one in which the trucks may pull directly into the delivery area would also relieve pressure on traffic and pedestrian movements. It should also be noted that DOT has indicated a strong preference for front-in and front-out truck operations.

Ideally, these options should be considered both in the early planning for a project as well as during the analysis of impacts of the project. While it is possible that they may constitute an Alternative, it is more logical to include this in the future With-Action analysis.

614. Other Alternatives

There may be other alternatives that are tailored to a specific proposed project at a specific site that could be developed. In general, to be effective, they should either (1) reduce the overall level of trip-making or shift trip-making to noncritical hours or to noncritical modes, or (2) alter the physical design of a project to relocate trips away from identified significant impact locations. However, all alternatives must be approved by the lead agency.

620. EVALUATION OF ALTERNATIVES

In evaluating the impacts of the alternatives relative to the impacts previously determined for the proposed project, it may not be necessary to conduct a full analysis of the traffic and parking systems like the one conducted as part of the With-Action analyses. However, regardless of the technical approach taken, the analyses of alternatives must provide a degree of confidence comparable to that which is provided by the analysis of the proposed project.

For alternatives that reduce the size but do not change the land use mix of the proposed project, it may be possible to scale down the proposed project's trip generation projection and then pro-rate the findings of the traffic and parking analyses accordingly. Yet, while the scaling down of volumes may be appropriate, the pro-rated evaluation of vehicle delay time and other level of service analyses may not. Therefore, those locations determined to have significant impacts under the proposed project should be reanalyzed and those findings (*i.e.*, the magnitude of impacts and any subsequent changes to the mitigation measures), along with the overall trip reduction that would occur under the alternative, should be reported.

For alternatives that alter the mix of land uses within the proposed project or replace a more intensive trip generator with another less intensive trip generator, it would generally be necessary to first quantify the magnitude of changes in the projected trip generation by travel mode for the peak analysis hours, and then determine the likelihood that new impacts could be created from those determined for the proposed project. Afterwards, the technical analysis approach could follow the guidelines provided above.

For alternatives that contain physical design changes that alter access and circulation patterns, the analysis would evaluate the likely access routes expected under the alternative, and where these changes would positively and adversely affect traffic conditions. If this review indicates that traffic increases would occur along routes and at locations that likely would not be significantly impacted, this evaluation is documented. If it encompasses locations that have not been analyzed earlier in the EIS, and it is readily apparent those conditions are not currently problematic nor are they likely to be problematic, that evaluation would suffice but is reported. If this evaluation cannot be made with a reasonable degree of certainty, other available sources of data would be sought to make a preliminary evaluation. If this preliminary evaluation indicates that problematic levels of service currently exist, or that significant impacts may occur in the future with background growth and the project-generated trips factored in, these findings would be documented based on the data at hand.

In general, the evaluation of alternatives documents the following:

- Would the alternative result in increased or decreased trip-making by travel mode during the peak analysis hours? This finding is typically quantified.
- Would the alternative result in the reduction or elimination of significant impacts, and by what amount? It is preferable to determine whether all significant impacts would be avoided or reduced under the alternative. However, for very large-scale proposed projects, a representative set of significant impact locations may suffice as long as the technical analysis provides a degree of confidence comparable to that which is provided by the analysis of the proposed project. An assessment of the implications of the analyses on this representative set of locations is presented for the overall study area.
- Would any new significant impacts be expected to occur under an alternative? This would be especially germane for alternatives that alter travel patterns within the study area.

700. REGULATIONS AND COORDINATION

710. REGULATIONS AND STANDARDS

There are no specific regulations governing the conduct of transportation analyses. Therefore, the procedures and methodologies that are described in this Manual are intended to provide assistance in the structuring and conduct of EIS and EAS transportation impact analyses.

711. NEW YORK CITY LOCAL LAW 24 (CRIA)

Local Law 24 of 2005 amended the administrative code of the City of New York regarding the creation of a review process in the event of the closure of a publicly mapped street. The Community Reassessment Impact Amelioration (CRIA) statement is required if a street is closed for more than 180 consecutive days and a permit from DOT is needed. As a result, a CRIA (or EAS/EIS in lieu of a CRIA) must be issued to the Council Member and Community Board prior to the 210th day of the closure. In addition, one public forum must be held prior to the issuance of the CRIA/EAS/EIS; the applicant/project sponsor assists DOT in conducting the forum. DOT makes entities applying for permits to close streets for more than 180 days the responsible party for producing the CRIA and helping DOT to lead the public forum. The CRIA or EAS/EIS would:

- State the objectives of the closure and why the closure is necessary to attain objectives;
- Identify alternatives, including the least expensive one, the cost of alternatives and an explanation if no alternative is available;
- Assess impacts of the closure on access, traffic, parking, pedestrian safety, businesses, residences, community facilities, emergency services, public transportation including para-transit and school buses, *etc.*; and
- Provide recommendations/solutions to mitigate adverse impacts on the above referenced and increase access to the area.

720. APPLICABLE COORDINATION

Lead agencies should be aware that it is necessary to seek approvals for mitigation measures from agencies that would be responsible for implementing those measures. In these instances, the lead agency should confer with the appropriate agencies, namely NYCT for rail, subway, and bus mitigation/improvement measures and DOT for traffic, parking, and goods delivery analyses and pedestrian mitigation/improvement measures. DOT is also responsible for the designation of bus stops in the City. It is also advisable to confer with DCP regarding its policy guidelines. NYC Parks and Recreation approval would be required for mitigation measures involving park-edge sidewalks and pedestrian/bicycle greenway systems. It is also important to note that coordination with the analysis of other technical areas (*e.g.*, air quality, noise, neighborhood character) may be needed; other chapters of this Manual should be referred to regarding those analyses.

730. REQUIRED DOCUMENTS FOR REVIEW

To ensure a timely review, the lead agency should submit the following documents to DOT (for traffic, pedestrians and parking) or MTA (for transit):

- EAS forms (if applicable);
- Traffic, Transit, Pedestrian and Parking sections/studies;
- Electronic and hard copies of back-up material (*i.e.*, ATR, turning movement/vehicle classification counts, physical inventory, official and field verified signal timing, pedestrian and bicycle counts, queue observations, recent three-year crash history, *etc.*);

- Back-up material for travel demand factors (TDF) including source information and surveys, if conducted;
- Electronic files and hard copies of the levels of service analyses (Synchro or similar DOT/MTA-approved software) for all peak hours and scenarios;
- Documentation identifying any modification(s) to the HCS (Synchro or other software) default factors as well as all quantifiable and verifiable field information to support the change(s);
- Parking analysis, including field survey, parking utilization and related text, figures and tables;
- Traffic signal warrant analysis if a new signal or left-turn signal is proposed;
- Signal coordination and progression analysis if timing reallocation in excess of four seconds is proposed; and
- Scaled schematic of existing and proposed conditions if geometric improvements are recommended.

740. LOCATION OF INFORMATION

Much, but certainly not all, of the information needed to conduct the traffic and parking analyses may be available within the technical libraries and files maintained by City and State agencies. For the transit analysis, NYCT has most information needed. Although it is likely that a significant amount of data will need to be collected via field surveys and traffic counts, contact should be made with MOEC, DOT, NYCT, MTA BC, DCP, and other agencies that may possess information that would be helpful and could save time and resources. In some cases, use of a specific set of available data may be preferable to conducting new counts or new surveys. This may be true, for example, where a similar study has been recently completed in the same or neighboring area; it is important for the data and findings of that study and the analysis of the proposed project to be consistent.

An initial listing of the location of primary sources of available traffic and parking data is presented below, and followed with an indication of those technical areas in which original research or surveys are often required. This list may be revised or augmented from time to time.

741. Sources of Available Traffic Data

- EISs and EASs that contain original volume or survey data that are recent enough to be valid for the area surveyed. It is strongly preferred that traffic count data not be more than three years old at the time the draft EIS is certified as complete. It may be possible to use somewhat older data, but only for areas that have undergone very little change and for which the data still validly represent conditions in the area.
    - Sources: MOEC, 100 Gold Street, 2nd Floor, Manhattan, NY 10038; DCP, Environmental Assessment and Review Division, 22 Reade Street, Manhattan, NY 10007 (http://www.nyc.gov/planning); DEP, Office of Environmental Planning, 59-17 Junction Boulevard, Elmhurst, Queens, NY 11373 (http://www.nyc.gov/dep); and DOT, Traffic Planning Division, 55 Water Street, Manhattan, NY 10041 (http://www.nyc.gov/dot).
- Traffic studies with original volume or survey data that satisfy the guidelines above.
    - Sources: DOT, Traffic Planning Division, 55 Water Street, Manhattan, NY 10041 (http://www.nyc.gov/calldot) or DCP, Transportation Division, 2 Lafayette Street, Manhattan, NY 10007 or Environmental Assessment and Review Division, 22 Reade Street, Manhattan, NY 10007 (http://www.nyc.gov/planning).
- DOT 24-hour automatic traffic recorder (ATR) counts or other intersection counts, with the same timeframes noted above.

- Sources: DOT, Traffic Planning Division, 55 Water Street, Manhattan, NY 10041 or DCP, Transportation Division, 2 Lafayette Street, Manhattan, NY 10007 or Environmental Assessment and Review Division, 22 Reade Street, New York, NY 10007.

- Bridge and tunnel volume information, including screenline volumes, peak hour volumes and growth trends, which may help in developing trend line projections and understanding seasonal fluctuations in traffic volumes.
    - Source: DOT, Traffic Planning Division, 55 Water Street, Manhattan, NY 10041.
- DOT Truck Regulations, which define the designated truck routes to be used for traffic analyses.
    - Source: DOT, Traffic Planning Division, 55 Water Street, Manhattan, NY 10041.
- DOT signal operations information, which provides signal phasing and timing information needed to conduct the traffic analyses.
    - Source: DOT, Signals Division, 34-02 Queens Boulevard, Long Island City, Queens, NY 11101
- DOT parking regulations inventory, which provides a computer listing of all approved parking regulation signs throughout the City, for use in the traffic analyses should field surveys indicate that signs have been vandalized or stolen.
    - Source: DOT, 28-11 Queens Plaza North, Long Island City, Queens, NY 11101 (http://www.nyc.gov/calldot).
- Institute of Transportation Engineers (ITE) Trip Generation publication (latest edition), which provides a comprehensive summary of trip generation rates for determining the volume of trips that a proposed project would generate. These rates are based on nationwide, rather than local, surveys which may not be appropriate for New York City conditions in many cases.
    - Sources: DOT, Traffic Planning Division, 55 Water Street, Manhattan, NY 10041 (http://www.nyc.gov/dot); ITE Headquarters, 1099 14 Street, NW, Suite 300, Washington, DC 20005 (http://www.ite.org); or DCP, Transportation Division, 2 Lafayette Street, Manhattan, NY 10007 or Environmental Assessment and Review Division, 22 Reade Street, NY 10007 (http://www.nyc.gov/planning).
- Trip generation and temporal distribution data published in Urban Space for Pedestrians by Pushkarev & Zupan (1975).
    - Sources: DOT, Traffic Planning Division, 55 Water Street, Manhattan, NY 10041; or DCP, Transportation Division, 2 Lafayette Street, Manhattan, NY 10007 or Environmental Assessment and Review Division, 22 Reade Street, NY 10007.
- The following publications provide bicycle data and research:
    - DOT, 2010 New York City Cycling Map (Regular Updates);
    - DOT, New York City Bicycle Master Plan (1997);
    - Department of Health and Mental Hygiene (DOHMH), DOT, Department of Parks and Recreation (DPR), NYPD, Bicyclist Fatalities and Serious Injuries in New York City (1996 – 2005);
    - DOT, Street Design Manual (2009);
    - DCP, Greenway Plan for New York City (1993);
    - DCP, New York Bicycle Lane and Trail Inventory (Regular Updates);
- *DOT Street Design Manual* (2009). The New York City Street Design Manual provides policies and design guidelines to City agencies, design professionals, private developers and community groups for

the improvement of streets and sidewalks throughout the five boroughs. It is intended to serve as a comprehensive resource for promoting higher quality street designs and more efficient project implementation.

  - Sources: DOT, Traffic Planning Division, 55 Water Street, Manhattan, NY 10041
  - Additional information may be downloaded here.

- DOT Library contains DOT policies and reports, traffic rules and laws, street furniture and street lighting rules, community presentations and plans, transportation and traffic data, DOT research papers, presentations, specifications, and drawings. This information may be obtained here.
- *DOT Sustainable Streets* (2008) (Regular Updates) is the strategic plan for DOT that focuses on safety, mobility, world class streets, infrastructure, greening, global leadership and customer service. Additional details may be found here.
- It is also possible that additional surveys or original research are needed to provide either the most up-to-date representation of conditions where available data are too old to be used or where the data required simply are not available. Moreover, recently collected original survey data are typically preferred, providing they are obtained in a proper manner and reflect the specific nature and geographical setting of the proposed project.

742. Sources of Available Rail Transit Data

- EISs and EASs that contain appropriate ridership or capacity utilization information. The key guideline rests with how representative the counts or data are of existing conditions. Historically, this has included data not more than three years old at the time the draft EIS was completed, but it could include somewhat older data for areas that have undergone very little change and for which the data still represent conditions there.
  - Sources: MOEC, 100 Gold Street, 2nd Floor, Manhattan, NY 10038; DCP, Environmental Assessment and Review Division, 22 Reade Street, Manhattan, NY 10007; NYC Department of Environmental Protection (DEP), Office of Environmental Planning, 59-17 Junction Boulevard, Elmhurst, Queens, NY 11373 (http://www.nyc.gov/dep); and DOT, 55 Water Street, Manhattan, NY 10041.
- Transit studies with volumes or analyses that are relatively recent.
  - Source: MTA, 347 Madison Avenue, New York, NY 10017 (http://www.mta.info).
- New York City subway system turnstile registration counts, which detail the volume of riders entering each subway station by turnstile bank.
  - Source: NYCT Operations Planning, 2 Broadway, 17th Floor, New York, NY 10004
- Biannual survey of system riders indicating the number of subway riders entering the central business district cordon line.
  - Source: MTA, 347 Madison Avenue, New York, NY 10017

743. Sources of Available Bus Transit Data

- EISs or EASs that contain bus ridership information for the specific study area and bus routes affected, provided the data are reasonably recent and bus service has not changed appreciably.
  - Sources: MOEC, DCP, or DOT, as cited above.
- Bus studies that are recent enough to be valid.
- MTABC Operations Planning, 2 Broadway, 21st Floor, New York, NY 10004 (www.mta.info/busco).

- NYCT Operations Planning, 2 Broadway, 17th Floor, New York, NY 10004 (http://www.mta.info/nyct/index.html).
- NYCT/MTABC Bus Guide, bus maps, and websites for bus routes, hours of operation, and frequency of service.
  - Source: NYCT/MTABC, as cited above.
- Bus ridership, or load levels, for the maximum load points on each route. This information is helpful in identifying the bus stop at which bus occupancy levels are highest, thereby also defining the amount of bus capacity remaining for additional riders.
  - Source: NYCT/MTABC as cited above. Also, franchise bus operators who provide public bus service within the City.

744. Sources of Pedestrian Data

- EISs or EASs that contain pedestrian volume information and/or pedestrian LOS findings for a particular study area, providing such information is reasonably recent.
  - Source: MOEC, DCP, or DOT, as cited above.
- Pedestrian volume is generally one of the more difficult technical areas in which to obtain readily usable data, and new pedestrian counts are almost always needed for detailed analyses.

745. Sources of Available Parking Data

- EISs or EASs that contain parking inventory or occupancy information that is reasonably representative of current conditions.
  - Sources: MOEC, DCP, DEP, or DOT, as cited above.
- Parking studies that contain such data.
  - Sources: DOT, Traffic Planning, 55 Water Street, Manhattan, NY 10013; or DCP, Transportation Division, 2 Lafayette Street, Manhattan, NY 10007 or Environmental Assessment and Review Division, 22 Reade Street, NY 10007, as cited above.
- DOT parking regulations inventory.
  - Source: DOT, 28-11 Queens Plaza North, Long Island City, Queens, NY 11101 (http://www.nyc.gov/calldot).
- ITE Parking Generation publication, which provides the maximum parking supply needed to serve a proposed land use. As discussed earlier for trip generation data, it should be noted that data contained in the Parking Generation Manual is based on nationwide sources of survey data that may not be fully appropriate in New York City.
  - Sources: DOT, Traffic Planning, 55 Water Street, Manhattan, NY 10041; or ITE Headquarters, 1099 14 Street, NW, Suite 300, Washington, DC 20005 (http://www.ite.org).
- Parking capacities and licensing information.
  - Sources: New York City Department of Consumer Affairs, 80 Lafayette Street, Manhattan, NY 10013 (www.nyc.gov/consumers); or DCP, Transportation Division, 2 Lafayette Street, Manhattan, NY 10007 or Environmental Assessment and Review Division, 22 Reade Street, NY 10007 (http://www.nyc.gov/planning).

**For further information, please refer to the Transportation Appendix which has been updated.